SERVICE BULLETIN 8198-1

SEPTEMBER, 1970

CLASS 8198 HIGH VOLTAGE MOTOR STARTERS

- Installation
- Operation
- Maintenance
- Parts Listing

SQUARE D COMPANY

P. O. Box 9247 • Columbia, S.C. 29290

CLASS 8198 HIGH VOLTAGE MOTOR STARTERS

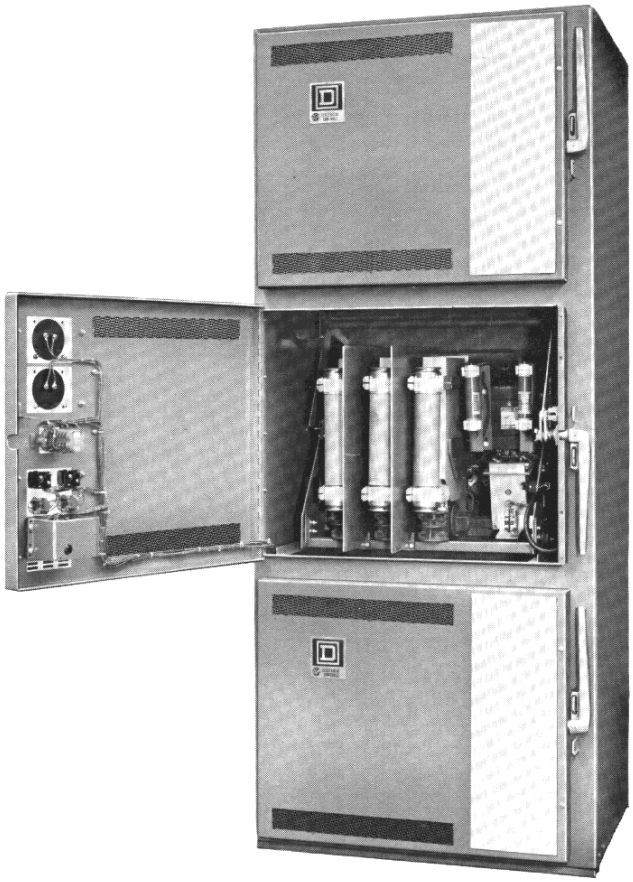


Figure 1. Class 8198 Type CFN-1
Full Voltage Starter

PRELIMINARY INSPECTION

UNCRATING.

Examine the shipping crate before unpacking the starter to make sure it has not been damaged in transit. If the shipping crate is damaged, note the area and pay particular attention when unpacking to see if concents are also damaged. If damage is found, notify the carrier. Also notify the local Square D field office of the damage claim. See paragraph 5 of Square D Conditions of Sale.

Contactors may be shipped either in seperate crates or within the cabinet. All control devices are shipped installed in the cabinet. Check the packing list against the order to make sure shipment is complete and all components have been received.

Take care when unpacking not to insert tools into crates and damage contents. Use a nail puller and wire cutter. Do not insert pry bar in crates and force open.

INSPECTION.

Inspect components as follows after uncrating:

a. Inspect all parts for secure mounting and good electrical connections. Check visually for good condition. Operate shafts, handle, and wheels manually to check for free movement.

b. Check that all fuses fit snugly in fuse clips. Check that the fuse holder clips are not bent or deformed.

c. Over-ride the door interlock as directed in Operation section and check that the shutter mechanism over the line finger assemblies moves smoothly and freely.

d. Manually press the armature toward the coil of the contactor. Check that the operating shaft rotates easily and that the movable contact tips align simultaneously with the stationary contact assembly. The contacts should engage squarely and across the full surface. Release the armature and check that the shaft rotates out of engagement freely and instantaneously.

e. Check that the cabinet is not dented or damaged. Swing the door to make sure it pivots easily. Check that the wiring harnesses are securely fastened in the cabinet.

f. Inspect control circuit plug and receptacle in contactor side for bent pins or other damage.

g. Make sure cable insulators and clamps in cabinet are in good condition.

h. Check contact surface condition. Surfaces should be clean and bright.

APPLICATION DATA

STARTER RATINGS

No. of Poles	Enclosed Continuous Ampere Rating 8 Hr. Basis	Starter KVA Interrupting Capacity at		Maximum Horsepower					
				2000-2500 volts			4000-5000 volts		
				Synchronous		Induction	Synchronous		Induction
		2500 v	5000 v	1.0 pf	0.8 pf		1.0 pf	0.8 pf	
3	360	150,000	250,000	1750	1500	1500	3000	2500	2500

CONTACTOR RATINGS

Voltage ..... 2500/5000 volts
Frequency ..... 60 cycles
Current ..... 400 amps (open rating)
Interrupting Capacity ..... 50 mva
Control Voltage ..... 120 volts, 60 cycles
Control Current:
  Initial ..... 3.55 amp
  Continuous ..... 0.61 amp
Cycles to Close ..... 13 cycles
Cycles to Open ..... 6 cycles

GENERAL INSTRUCTIONS

CABINET MOUNTING.

The cabinet should be easily accessible for maintenance and securely fastened in place. This is particularly important in a wall mounted cabinet installation. With the contactor weighing 350 lbs. and the cabinet 420 lbs., the wall mounted installation should be made with ample provision for the weight of the contactor and the cabinet. Make sure cabinet is level and square and fully supported when mounted. Free standing cabinets should be bolted in place. If the cabinet is not securely supported and level, doors will not swing properly and drawout mechanism may not operate properly. Make sure sufficient space is allowed at the front of the cabinet for contactor maintenance and removal. A minimum clearance of 58 inches must be provided at front of starter if Class 8198 Type HJ-1 contactor lifting device is used, 37 inches minimum clearance is required for door swing and contactor removal if lifting device is not used. Rear access space is not necessary. See specific job drawings for dimensional information.

CABLE ROUTING.

When a starter is mounted in a cabinet without a power bus compartment, a terminal box for the incoming line leads is located on the side of the middle compartment. The terminal box has a slip-on protective cover. Branch cables from the terminal box feed the line receptables in all compartments. Figures 3, 4, and 5 on pages 4 and 5 show suggested cable routings for a three starter installation. If only one starter is installed, the same cable arrangements can be used. If special problems occur regarding cable routing, contact the local Square D field office for assistance.

CAUTION

MAKE SURE MAIN SWITCH IS LOCKED OPEN BEFORE INSTALLING CABLES AND CONTACTORS. LINE LEADS CARRY HIGH VOLTAGE (2200-4800).

ELECTRICAL CONNECTIONS.

Install line and load leads with correct current carrying capacity and proper insulation. Make sure no electrical connections within the contactor have been damaged during installation. Use the schematic diagram supplied with the specific equipment to check electrical connections. Test outside leads to make sure there are no grounds or short circuits.

INSTALLATION INSTRUCTIONS for TYPE CFNG-1

(WALL MOUNTED, ACROSS-THE-LINE INDUCTION MOTOR STARTER)

The wall mounted starter enclosure is shipped as a complete unit, but consists of a pullbox and a cabinet.

To mount the shallow (6-inch deep) pull box, figure 2, to facilitate the connection of line and load cables, separate the cabinet from the pull box. To do this first remove the low voltage current harness wiring from the terminal board on the rear of the pull box and the movable shutter assembly from the stationary assembly of the incoming line shutter box. Then remove four (4) screws (2 on each side) holding the cabinet to the pull box and separate.

After the incoming line connections have been made to the incoming line shutter box and the load connections have been made to the terminal lugs on the loadside of the current transformers, the cabinet may be hung back onto the pull box.

Install external low voltage control leads and connect to the terminal board (see wiring diagram) on the low voltage panel located in the right hand side wall. Check overall wiring for possible loose connections.

Before installing the contactor be sure the arc chutes are in place and completely down and the phase barriers are in place. Complete the starter check-out by going to page 5 - CONTACTOR INSTALLATION.

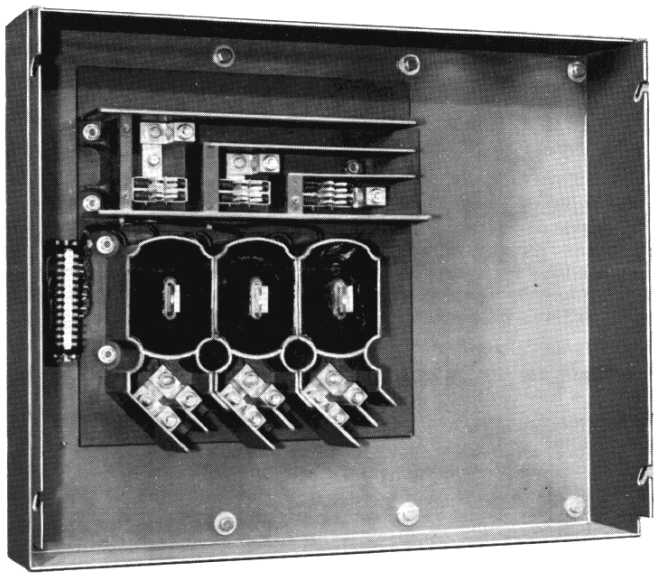


Figure 2. Wall Cabinet Pull Box

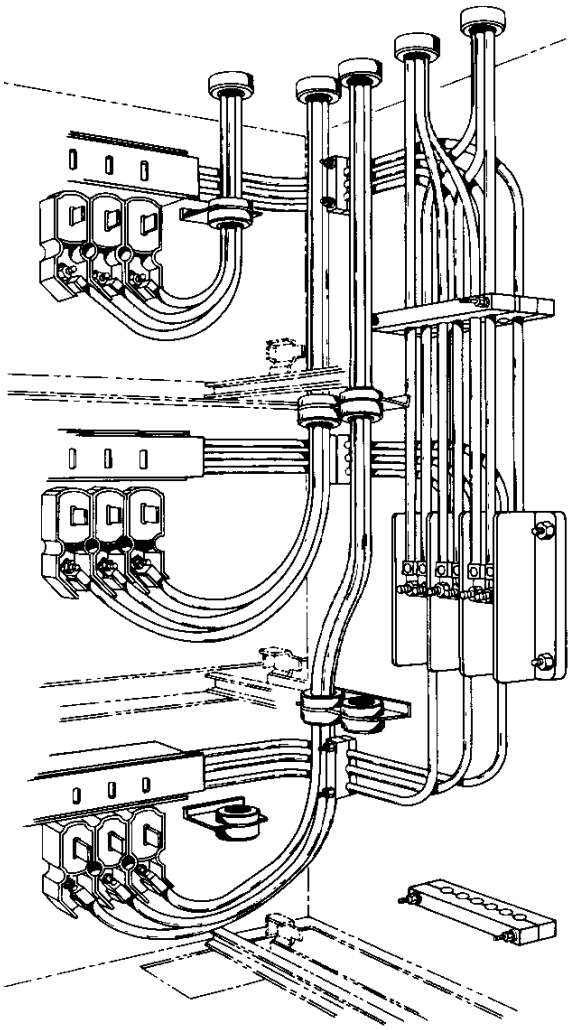


Figure 3. Cable Routing for Top Conduit Entry (Without Power Bus)

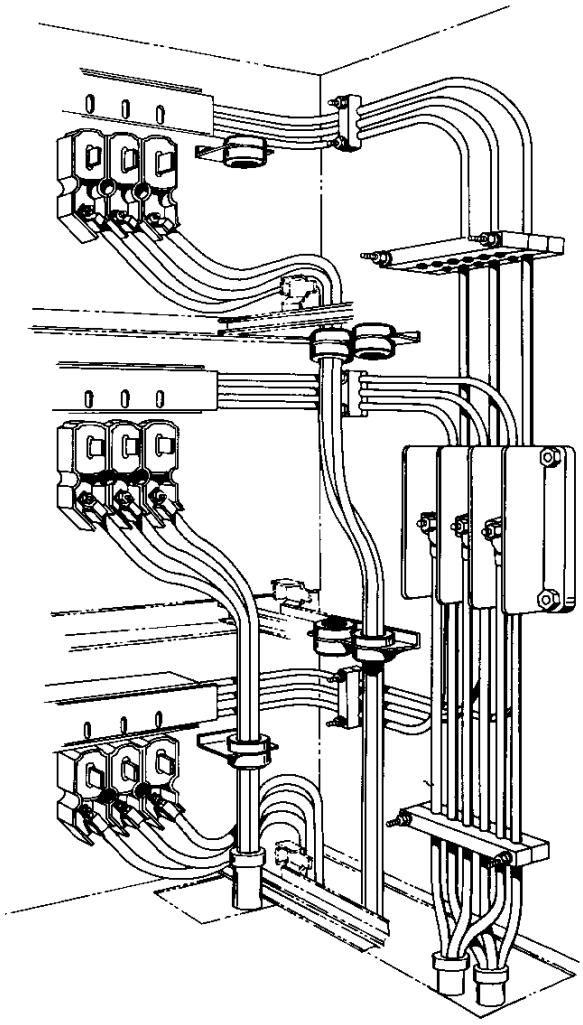


Figure 4. Cable Routing for Bottom Conduit Entry (Without Power Bus)

INSTALLATION INSTRUCTIONS for TYPE CFN-1 or CFL-1

(FREE STANDING, ACROSS-THE-LINE INDUCTION MOTOR STARTERS/CONTACTORS)

The contactor portion of this starter is shipped either in a separate crate, or within the vertical enclosure. If the contactor is shipped within the enclosure, first remove the contactor (see page 9 - REPAIR - for instructions) and then place the enclosure assembly in proper position. Install power wiring as outlined on page 3 - CABLE ROUTING.

Install external low voltage control leads and connect to the terminal board (per wiring diagram) on the low voltage panel located on the right hand sidewall. Check overall wiring for possible loose connections.

Before installing the contactor, be sure the arc chutes are in place and completely down and the phase barriers are in place. Complete the starter check-out by going to page 5 CONTACTOR INSTALLATION.

INSTALLATION INSTRUCTIONS for TYPE CRN-1

(FREE STANDING, PRIMARY REACTOR REDUCED VOLTAGE INDUCTION MOTOR STARTER)

The two contactors making up this starter are shipped either in separate crates, or within the vertical enclosure. If the contactors are shipped within the enclosure, first remove the contactors (see page 9 - REPAIR - for instructions) and then place the enclosure assembly in proper position. Install power wiring as outlined on page 3 - CABLE ROUTING.

Install external low voltage control leads and connect to the terminal boards (per wiring diagram) on the low voltage panels located in the center and upper compartments on the right hand sidewall. Check overall wiring for possible loose connections.

Before installation contactors, be sure arc chutes are in place and completely down and the phase barriers in place. Identify the two (2) contactors as the "start contactor" (having power fuses) and the "run contactor" (without the power fuses). The start

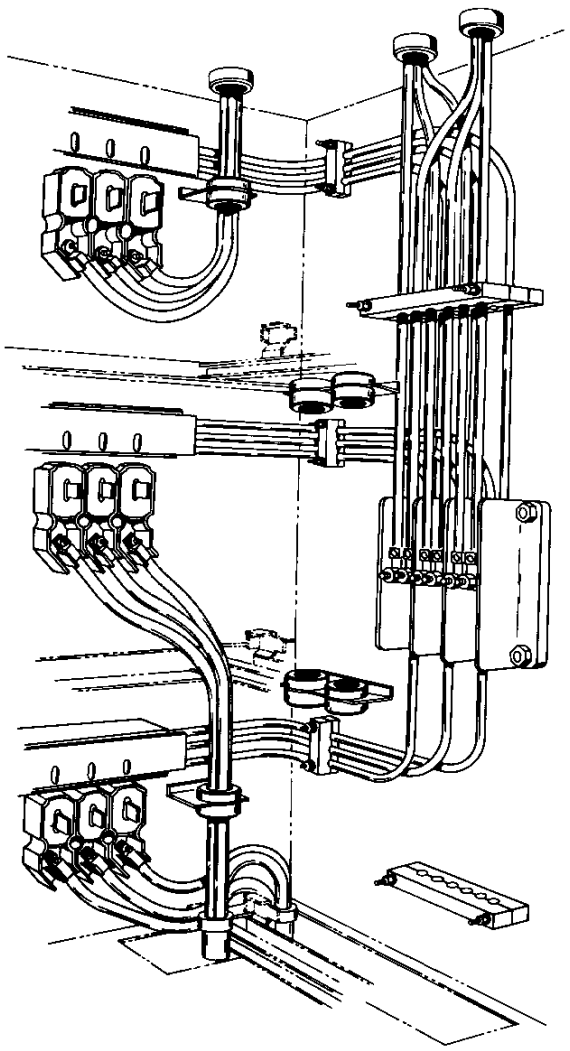


Figure 5. Cable Routing for Top and Bottom Conduit Entry (Without Power Bus)

contactor is to be installed in the center compartment and the run contactor is to be installed in the top compartment. The start contactor is the line disconnecting means and is the movable contactor which engages and disengages the line and load connections by the operation of the external operating handle. The run contactor is manually engaged during installation. This contactor is in the engaged position when it is pushed past the spring retainers on the contactor rails. A track limit switch insures that the contactor is completely engaged. Complete the starter check-out by going to the section entitled CONTACTOR INSTALLATION.

INSTALLATION INSTRUCTIONS for TYPE SFN-1

(FREE STANDING, ACROSS-THE-LINE, SYNCHRONOUS MOTOR STARTER)

The contactor portion of this starter is shipped either in a separate crate, or within the vertical enclosure. If the contactor is shipped within the enclosure, first remove the contactor (see page 9 - REPAIR - for instructions) and then place the enclosure assembly in proper position. Install power wiring as outlined on page 3 - CABLE ROUTING.

Install external low voltage control leads and connect to the terminals (per wiring diagram) on the low voltage relay panel mounted in the upper compartment on the right hand sidewall and/or the synchronous field panel mounted in the upper compartment on the left hand sidewall. Make sure that the motor field connections have been made to the synchronous field panel and that a source of dc power has been connected to the synchronous field panel. If the starter has been supplied with a factory installed static exciter, this source of dc power has already been wired into the synchronous field panel. Check overall wiring for possible loose connections.

Before installing the contactor, be sure the arc chutes are in place and completely down and the phase barriers are in place. Complete the starter check-out by going to the section entitled CONTACTOR INSTALLATION.

INSTALLATION INSTRUCTIONS for TYPE SRN-1

(FREE STANDING, PRIMARY REACTOR REDUCED VOLTAGE SYNCHRONOUS MOTOR STARTER)

The two contactors making up this starter are shipped either in separate crates, or within the vertical enclosure. If the contactors are shipped within the enclosure, first remove the contactors (see page 9 - REPAIR - for instructions) and then place the enclosure assembly in proper position. Install power wiring as outlined on page 3 - CABLE ROUTING.

Install external low voltage control leads and connect to the terminals (per wiring diagram) on the terminal board panels located in the upper and center compartments mounted on the right hand sidewall in the first vertical section; and to the terminals of the relay panel or synchronous field panel located in the upper compartment of the second vertical section. Make sure that the motor field connections have been made to the synchronous field panel and a source of dc power has been connected to the synchronous field panel. If the starter has been supplied with a factory installed static exciter, this source of dc power has already been wired into the synchronous field panel. Check overall wiring for possible loose connections.

Before installing the contactors, be sure the arc chutes are in place and completely down and the phase barriers are in place. Determine the start and run contactors as listed under the General Installation Instructions for the 8198 Type CRN-1 starter. Complete the starter check-out by going to the section entitled CONTACTOR INSTALLATION.

CONTACTOR INSTALLATION

INSTALLING CONTACTOR IN CABINET.

Move the contactor into position using a fork lift truck, a Class 8198 Type HJ-1 lifting device or other similar device as shown in figure 6. Make sure to block the contactor on the platform when moving.

Raise contactor to correct height for compartment and engage wheels on track. Roll contactor in until the rear wheel passes the spring retainers on the contactor rails.

Figure 6. Using Class 8198 Type HJ-1 Lifting Device to Position Contactor for Installation

CHECKING ENGAGEMENT.

Force draw-out and door interlock toward side of cabinet as shown in figure 7 to clear path of draw-out linkage. Raise handle, moving contactor into compartment. When handle is UP and vertical, rear wheels should be touching rear wheel stop. Measure distance between rear corner of contactor side plate and back of cabinet as shown in figure 8. Distance should be 6-1/4 inches. If dimension is not correct, loosen nut on draw-out turnbuckle (figure 7) and adjust turnbuckle. Tighten screws when adjustment is correct. It may also be necessary to adjust rear wheel stops. This assures full engagement of stab and finger assemblies.

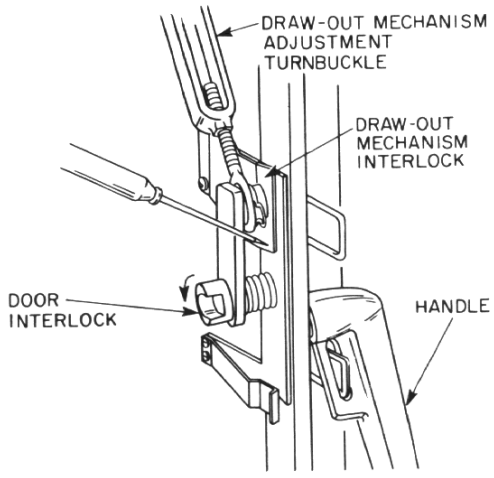


Figure 7. Over-riding Interlock to Engage Contactor with Door Open

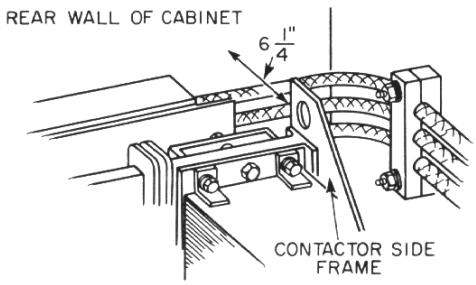


Figure 8. Critical Dimension for Full Engagement of Stab and Finger Assemblies

TESTING CONTACT CLOSING.

Move the handle DOWN to rack out the contactor. Connect test plug (furnished with starter) with shorting block installed into the upper (or only) receptacle in the side of the contactor as shown in figure 9 and into a source of 120 vac power. See page 8 - TEST CORD. The test plug provides 120 volts to pins (4) and (5) of the receptacle; see figure 10, bypassing potential transformer secondary to prevent induced high voltage in the transformer primary. Check that all three main contactor contacts close instantaneously and fully. Check mechanical interlock on contactor shaft to make sure that contactor cannot be withdrawn with coil energized. Refer to figure 8A for clearance dimension between mechanical interlock arm on contactor and adjustable bracket on contactor track. Remove the test plug.

NOTE

These adjustments have been made at the factory with the contactor in place and need only be changed when adverse shipping conditions have been experienced.

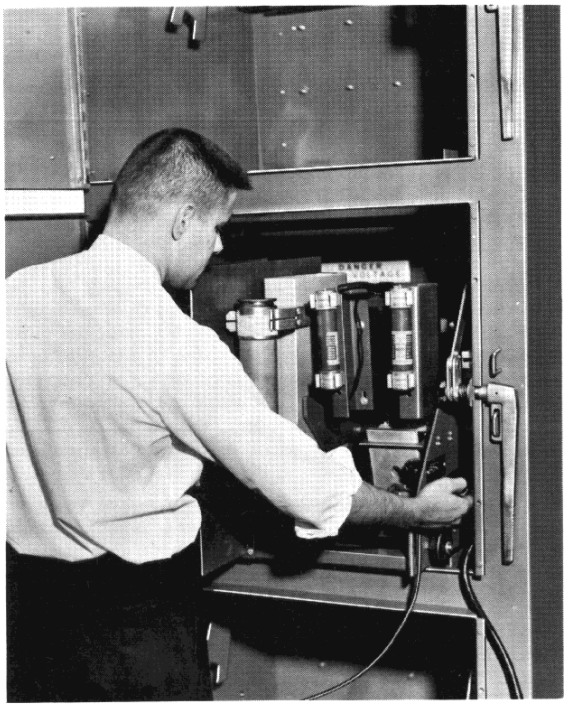


Figure 9. Testing Contact Closing

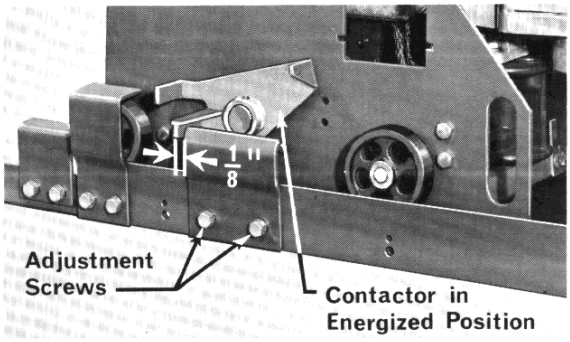


Figure 8A - Critical Dimension for Proper Operation of Mechanical Interlock.

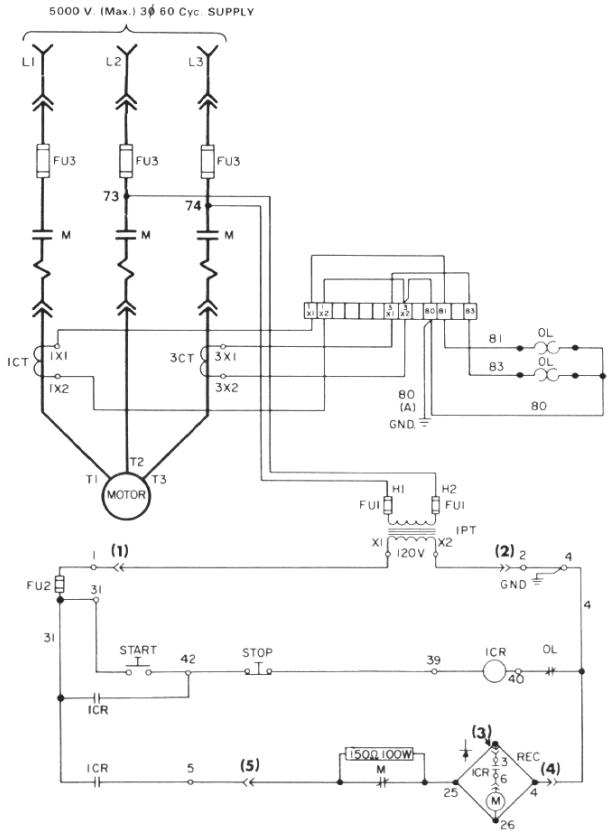
FINAL INSTALLATION.

Plug the control cord plug of the wiring harness (es) into the receptacle(s) in the side of the contactor. On starters supplied with two (2) control cord plugs, one cord is marked "top" and the other "bottom" in reference to the contactor which will be supplied with two (2) receptacles mounted one above the other. Be sure correct plug is in proper receptacle. Close the cabinet door, checking that the stud in the door mates with the blind slot in the round piece at the end of the door handle spring assembly. Raise the door handle, racking in the contactor.

NOTE

The main switch can now be closed and motor can be started by operating pilot circuit device.

Figure 10. Schematic Diagram



OPERATION

DRAW-OUT MECHANISM.

The lever-type handle indicates the position of the contactor in the cabinet. When the handle is in the vertical UP position, the contactor is engaged. When the control circuit is DEENERGIZED, the handle can be moved to the DOWN position, disengaging the contactor from BOTH line and motor leads.

OPERATING SEQUENCE.

The operating sequence of a typical full-voltage starter can be traced on the schematic diagram, figure 10.

When the START pushbutton is depressed, a circuit from the secondary of the potential transformer 1 PT is closed through the coil of the control relay 1 CR. When the coil is energized, the normally opened 1 CR contacts close, closing a holding circuit for the coil so it remains energized when the START pushbutton is released. Other 1 CR contacts close a circuit to the rectifier REC and to the coil M of the main contactor. When the coil M is energized, it pulls in the armature, rotating the shaft and closing the three main contacts. As the armature seals it opens the NC interlock "M" inserting the economizing resistor into the contactor coil circuit. When the main contacts close, the line circuit to the motor leads is energized, starting the motor.

As the shaft rotates, it actuates a series of interlock switches, closing the normally open contact and opening the normally closed contact of each interlock switch. These interlock switches are provided to actuate external equipment.

Two current transformers, 1 CT and 3 CT, are connected to the overload relay coils—OL. In case of an overload, the associated overload relay contact opens, deenergizing the control relay 1CR. This causes the normally opened contacts of 1 CR to open, deenergizing the circuit through the rectifier and coil M. The main contacts and interlock contacts open, and the motor leads are deenergized.

When the STOP pushbutton is depressed, the circuit to the coil of the control relay 1 CR is opened and the contactor opens as described above.

The overload relays can be reset by pushing the reset bar in the door at the lower part of the control panel.

OVER-RIDING DOOR INTERLOCK.

CAUTION

MAKE SURE THE MAIN SWITCH IS LOCKED IN THE OFF POSITION BEFORE ATTEMPTING TO OPEN THE DOOR WITH THE CONTACTOR ENGAGED. DO NOT ATTEMPT TO DEFEAT THE DOOR INTERLOCK UNLESS IT IS DEFINITE THAT THE CONTACTOR IS MALFUNCTIONING.

If the contactor door will not open, the door interlock can be defeated to gain entrance to the cabinet as follows:

(continued)

OVER-RIDING DOOR INTERLOCK (cont'd)

Move the door handle down until it is about 30 degrees from the vertical so that handle will just clear lock hasp. Use a heavy screw-driver and pry the handle away from the cabinet side as shown in figure 11. This will release the door.

If the contactor is frozen in the engaged position, the draw-out mechanism can be operated with the door open as shown in figure 7, page 6, however, the contactor armature must first be in the fully open position. If the draw-out linkage is broken, grasp the contactor by the two slotted openings in the front frame and pull it out of engagement.

If contactor does not seem to be functioning properly, check the contact operation with the test plug as shown in figure 9, page 6. This will isolate trouble to contactor operation or other malfunction.

Check service bulletin 8110-5 for possible causes and remedies of contactor malfunctions.

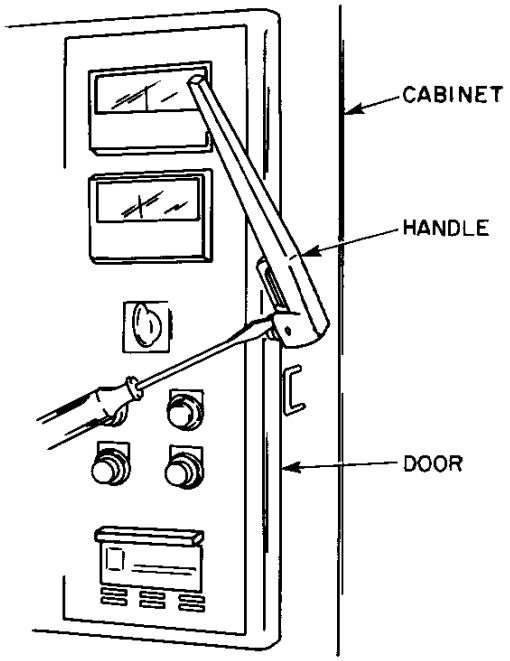


Figure 11. Over-riding Door Interlock

ROUTINE MAINTENANCE

SEE SERVICE BULLETIN 8110-5 FOR CONTACTOR MAINTENANCE.

TEST CORD

Starter lineups are supplied with a test cord that allows testing of the complete starter control circuit or just the contactor.

The test cord consists of a female and male plug and a protective cap (or shorting cap).

When the test cord is to be used for testing the contactor only, the control cord plug (upper control plug on contactors supplied with two control cord plugs) is removed. The female end of the test cord is plugged into the contactor with the protective cap (or shorting cap) inserted into the male plug of the test cord. Inserting the test cord into a source of 120 volts ac will allow the testing of the contactor.

NOTE

The test cord is supplied with a polarized 3-prong male plug for proper grounding of the starter control circuit. The plug should be inserted only into 3-wire receptacles wired per NEC Standards. If a 3-wire receptacle is not available, a 3-wire to 2-wire adapter may be used if proper attention is given to polarities.

For testing of the complete starter control circuit, the control cord plug (upper control cord plug on contactors supplied with two (2) control cord plugs) is removed . The female end of the test cord is plugged into the contactor with the protective cap (or shorting cap) removed from the male plug on the test cord. (CAUTION: this exposes live 120 v terminals). The control cord plug that was removed from the contactor is now plugged into the male plug on the test cord. With the test cord inserted into a source of 120 vac, the complete starter control circuit can be tested.

CONTROL CIRCUIT CHECK.

If the contactor operates on test cord and does not operate under normal conditions, refer to the schematic diagram supplied with the specific equipment and check the low voltage control circuit. Refer to figure 12, page 9, for data on the control relay.

If the overload relays in the door do not reset, check that the reset bar is in good condition before replacing the overload relay.

POTENTIAL TRANSFORMER CHECK.

Measure the potential transformer output at the terminal board at the side of the cabinet. Output should be 120 volts ac, 60 cycles, single phase. To do this, wire metering leads across secondary of transformer, close the door, and draw in contactor in the normal way. If the output is not correct, check line voltage to insure that power is at proper level. If so, remove the potential transformer and replace it with an identical component.

WIRING HARNESS CHECK.

Two wiring harnesses are supplied, one from the current transformers to the door panel components, and one for the control circuit on the side of the cabinet and the remaining door components. Both are tied harnesses. Check that the wires are not frayed or deteriorated. Check that connections are tight and not corroded. Make sure the harnesses are secured in the cabinet and routed so they do not interfere with mechanical operation of the door, draw-out linkage, or contactor rack movement. Keep harnesses dry and clean. Check that connections are correct according to the schematic diagram supplied with the specific equipment.

DRAW-OUT MECHANISM CHECK.

Over-ride the door interlock as shown in figure 7 and check the operation of the draw-out linkage. Make sure the contactor is fully engaged in the engaged position as shown in figure 8 and described under installation. Check that the shutter for the line finger assemblies closes and opens smoothly and completely. If the draw-out mechanism is not operating properly, refer to "Checking Engagement" on page 6. Check figure 13 for linkage parts.

DRAW-OUT MECHANISM LUBRICATION.

Lubricate all pivot points of the draw-out linkage with a light grease. Carefully wipe off all excess grease.

REPAIR

Major repairs of the contactor should not be performed with the contactor in the cabinet. Rack the contactor out of engagement and use the hand holes in the front of the contactor side frame to pull the contactor out on the tracks until it contacts the safety stop. Use a fork lift truck or Class 8198 Type HJ-1 lifting device as shown in figure 8, page 6, to carry the contactor. Roll the contactor onto the platform of the carrying vehicle. Block the contactor securely on the platform. Remove the contactor to an electrical repair shop. See service bulletin 8110-5 for contactor parts list. Use the illustrations to identify the parts required for repair. Make sure to identify the basic contactor on your order.

Major repairs on the cabinet or interlock mechanism should not be attempted with the contactor in the cabinet. Remove the contactor as directed above. Repair of components mounted on the door or side of the cabinet is not recommended except for magnet coils and contact tips of magnetic relays. Replace defective components.

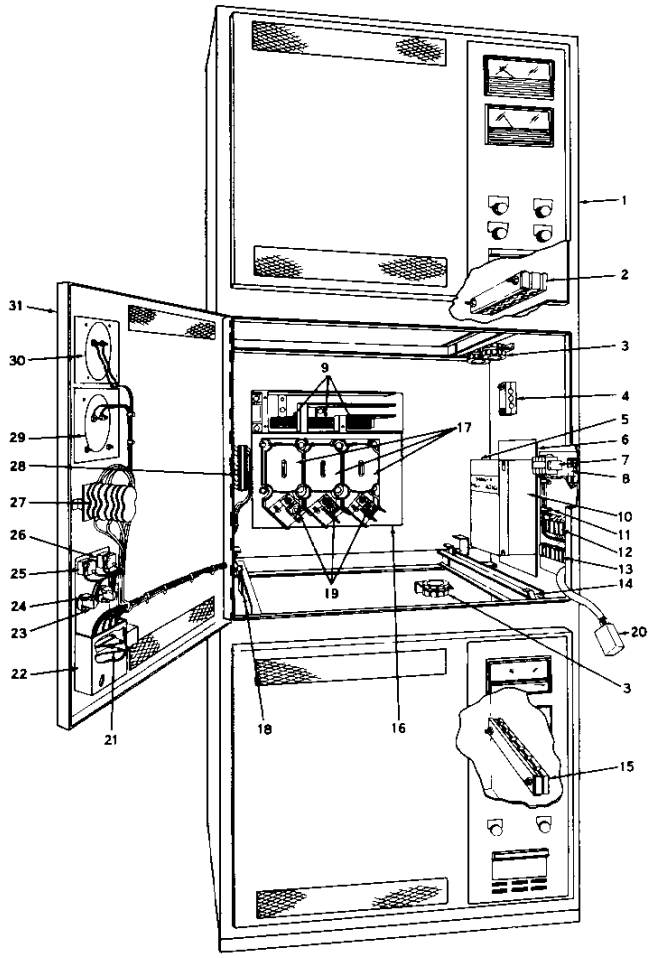


Figure 12. Typical Internal Components of Cabinet (2 or 3 High)

Item No.	Part Number	Description
1	A51202-500	Cabinet
2	A51202-060-01	Lead Clamp
3	FP-35N17	Insulator
4	A51199-050-02	Lead Clamp
5	A51202-359-50	Connection Box Cover
6	A51202-360-01	Barrier
7	Class 8501 GO-40	Control Relay
8	25405-00100	Bus NON10 Fuse (L.V. Control)
9	A51033-042-51	Disconnect Assembly, L1, L2 & L3
10	B51202-357-50	Connection Box
11	T & B TY-35	Ty-Rap Tie
12	Class 9080 BA16	Terminal Block
13	Class 9080 BA32	Terminal Block
14		Stop Spring (see figure 13)
15	A51202-061-01	Lead Clamp
16	A51202-213-01	Insulator
†17		Current Transformer, 3 req'd.
18	A51202-055-01	Stop Plate
19	25065-04801	Terminal Lug
20A	A51202-236-50	Control Cable - 35"
20B	A51202-236-51	Control Cable - 50"
20C	A51202-236-52	Control Cable - 29"
21	A51202-223-01	Reset Spring
22	A51202-216	Overload Relay Assembly (per W/D)
*23	Class 9001 TR2A	Stop Push Button
*24	Class 9001 TR1A	Start Push Button
*25	Class 9001 TP-1G	Off Light
*26	Class 9001 TP-1R	On Light
*27		Selector Switch (per W/D)
28	Class 9080 BA-13	Terminal Block
*29		Voltmeter (per W/D)
*30		Ammeter (per W/D)
31	C51202-111-50	Door (3 High Only)

*Optional Equipment
†Refer to schematic diagram supplied with specific equipment for part number.

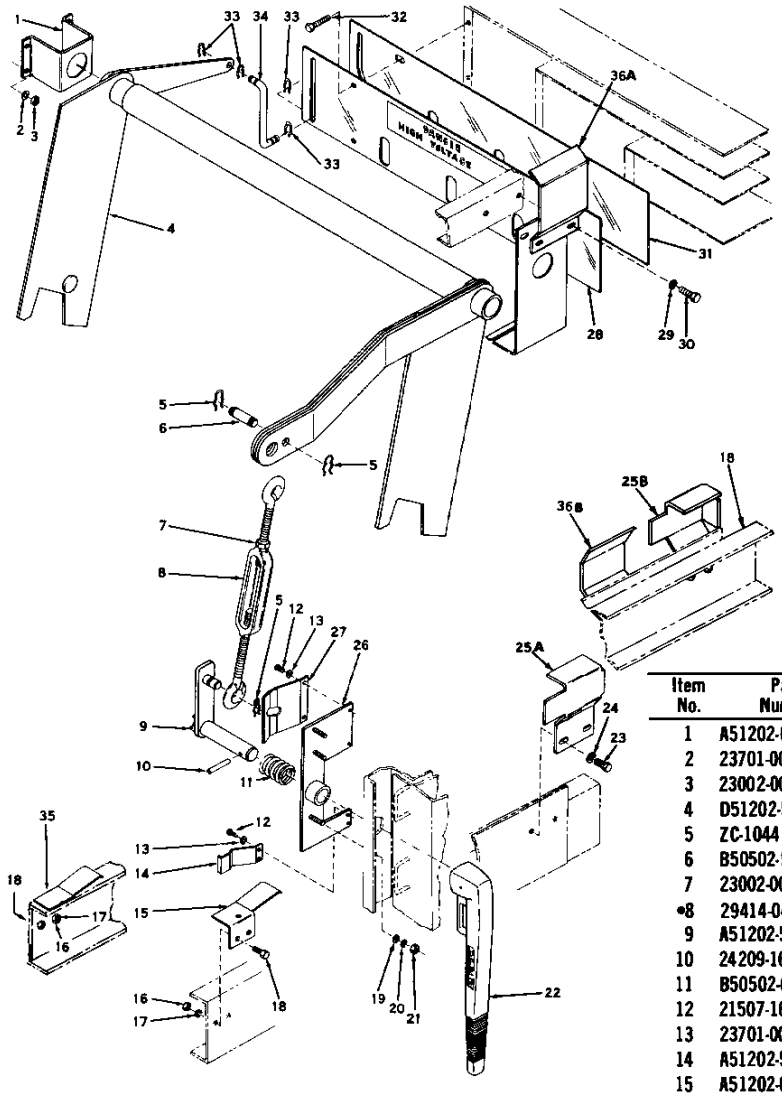


Figure 13. Drawout Mechanism, Exploded View

Item No.	Part Number	Description
1	A51202-046-02	L.H. Mounting Bracket
2	23701-00200	Lock Washer, 4 req'd.
3	23002-00200	Nut, 4 req'd.
4	D51202-528-50	Draw-out Arm Assembly
5	ZC-1044 T-293	Hair Pin Cotter, 3 req'd.
6	B50502-974-11	Pin
7	23002-00240	3/8" - 16 Hexagon Nut
•8	29414-04240	HINDLEY No. 16 Turnbuckle
9	A51202-532-50	Operating Shaft Assembly
10	24209-16480	1/4" x-1-1/2" Roll Pin
11	B50502-601-31	Spring
12	21507-16080	No. 10-24 x 1/4" Screw, 4 req'd.
13	23701-00160	No. 10 Plain Washer, 4 req'd.
14	A51202-549-01	Stop Spring
15	A51202-073-01	Contactor Stop Spring, R.H.
16	23002-00240	3/8"-16 H. Nut, 2 req'd.
17	23701-00240	3/8" Lock Washer, 2 req'd.
18	21401-24320	3/8"-16 x 1" H.H. Cap Screw, 2 req'd.
19	23602-11069	1/4" Plain Washer, 3 req'd.
20	23701-00200	1/4" Lock Washer, 3 req'd.
21	23002-00200	1/4"-20 H. Nut, 3 req'd.
22	B51202-550-01	Operating Handle
23	21401-22240	5/16"-18 x 3/4" H.H. Cap Screw, 2 req'd.
24	23701-00220	5/16" Lock Washer, 2 req'd.
25A	A51202-079-01	Wheel Retainer & Stop, R.H.
25B	A51202-079-02	Wheel Retainer & Stop, L.H.
26	A51202-535-50	Handle Bearing & Stop
27	A51202-541-01	Latch Spring
28	A51202-553-50	Stationary Shutter Plate Assembly
29	23701-00220	5/15" Lock Washer, 2 req'd.
30	21401-22240	5/16"-18 x 3/4" H.H. Cap Screw, 2 req'd.
31	A51202-554-01	Movable Shutter Plate
32	21495-16160	No. 10-24 x 1/2" Tapping Screw, 3 req'd.
33	S5340 T-293	Hair Pin Cotter, 4 req'd.
34	A51202-552-01	Shutter Connection Rod
35	A51202-073-02	Contactor Stop Spring, L.H.
*36A	A51202-901-01	End Plate
36B	A51202-055-01	End Plate

*Used on right hand contactor rail for all starters except bottom compartment of three high. For bottom compartment of three high substitute Item 36B.

•Minor revision since previous issue.

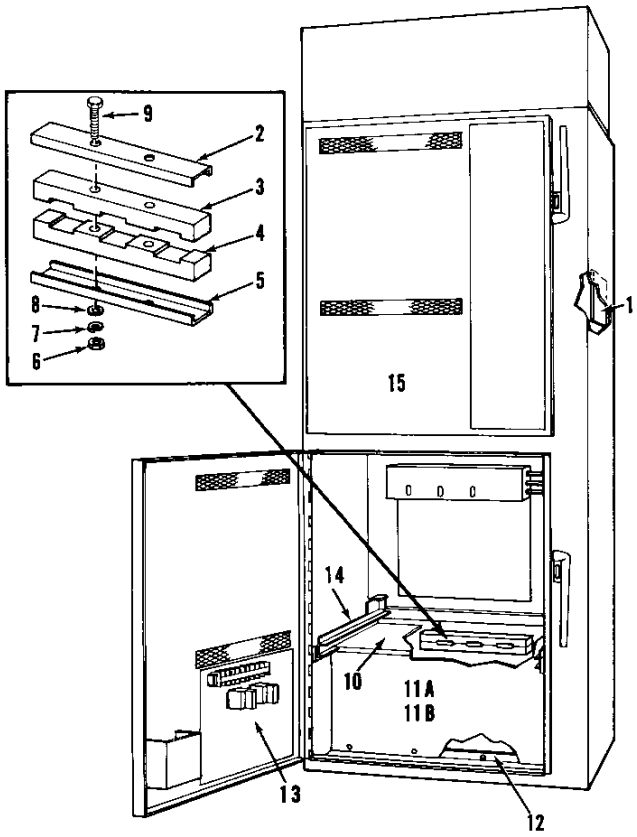


Figure 14. Typical Components for Two High Construction

Item No.	Part No.	Description
1	A51202-902-01	Terminal Board Mounting Plate
2	B51202-680-05	Lead Clamp Backup Channel
3	B51202-680-01	Lead Clamp Member
4	B51202-680-02	Lead Clamp Member
5	B51202-680-03	Lead Clamp Backup Channel
6	23002-00280	1/2" - 13 Hex Nut
7	23701-00280	1/2" P.L. Lock Washer
8	23601-00261	1/2" Plain Washer
•9	21401-28902	1/2" - 13 x 5½" H.H. Bolt
10	B51202-684-01	Horizontal CT Barrier
11A	A51202-685-01	Vertical CT Barrier (Top Section NEMA 1 encl.)
	A51202-706-01	Vertical CT Barrier (Top Section NEMA 3 encl.)
11B	A51202-685-02	Vertical CT Barrier (Bottom Section NEMA 1 encl.)
	A51202-706-02	Vertical CT Barrier (Bottom Section NEMA 3 encl.)
12	A51202-669-01	Vertical CT Barrier Mtg. Angle
	A51202-669-02	Vertical CT Barrier Mtg. Angle (Bottom Sec. NEMA 3 encl. only)
13	A51203-003-01	Relay Panel Mounting Plate
14	A51202-683-01	Horizontal CT Barrier (NEMA 1 encl.)
	A51202-683-02	Horizontal CT Barrier (NEMA 3 encl.)
15	C51202-896-50	Door (2 High Only)

•Minor revision since previous issue.

FACTORY PREPARED SPACE

The flexibility of the Class 8198 control center design allows a cubicle space to be prepared at the factory for a future starter. On factory installed prepared spares the power cable connection is installed between the contactor shutter box and the line terminal box on the right hand side wall or to the optional power bus assembly on top of the starter enclosure. In addition to the factory wired power cable connection, the following equipment is supplied on factory installed prepared space.

Drawout Mechanism
Contactor Shutter Box
Contactor Track Accessories
Insulator (behind contactor shutter box)

FIELD INSTALLATION OF A STARTER

INTO PREPARED SPACE

For field installation of a starter into a factory installed prepared space, the following typical equipment is supplied:

Class 8110 Contactor Assembly

Overload Relay Assembly

Relay Panel

Door Panel Assembly (If needed)

A5-1202-177-50 Hardware Kit
1393-026441 # 14 Control Wire (As required)

1550-040012 5†8" Insulated Sleeving

Current Transformer Assembly

Cable Brackets (As required)

Lead Clamps (As required)

Tinnerman Clamps (As required)

1351-030002 5 KV Cable (If needed)

INTO NON-PREPARED SPACE

For starters being field installed into starter cubicles that have not been factory prepared for a future starter, the following equipment is supplied in addition to the equipment provided for installing a starter into a factory prepared space.

Drawout Mechanism
Contactor Connection Box
Insulator (behind contactor connection box)
Contactor track accessories
Back plate (If required)