

Allen-Bradley Centerline Medium-Voltage Air Break Contactor • 400 Amp Size

SPECIFICATIONS

Maximum Voltage

- 5000
- 7200

Rated Current (Amps.)

- Open Type-400A
- Enclosed Type:

Type 1	Type 1
	w/gasket
	Type 12

1 High	360A	360A
Total per Section -	360A	360A
2 High - Middle	300A	200A
Bottom	340A	300A
Total per Section -	600A	400A
3 High -	240A	180A
	240A	180A
	240A	180A
Total per Section -	720A	540A

Horsepower Ratings

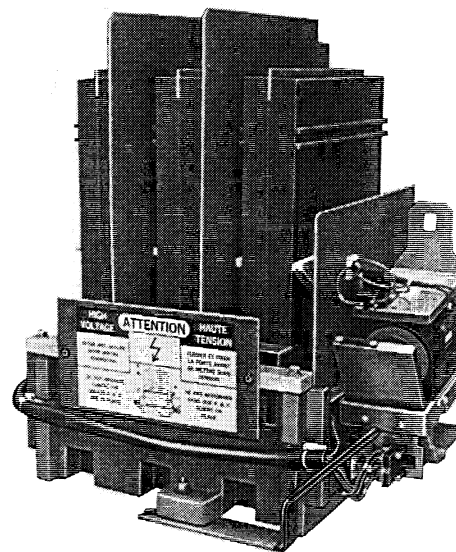
- 2400V
Induction Type 1500 HP
Synchronous Type (1.0PF) 1750 HP
(0.8PF) 1500 HP
- 4600V
Induction Type 2500 HP
Synchronous Type (1.0PF) 3000 HP
(0.8PF) 2500 HP
- 6600V
Induction Type 4000 HP
Synchronous Type (1.0PF) 5000 HP
(0.8PF) 4000 HP

Interrupting Ratings

- Fused, E2 200 MVA at 2400V
400 MVA at 4600V
570 MVA at 6600V

Basic Impulse Level

- 60 KV Crest



Catalog No. **1502-A4C3D1**
(5000 Volts)

INTRODUCTION – The intent of this manual is to provide an outlined procedure for handling, installation and maintenance of CENTERLINE medium-voltage contactors.

Should problems relating to installation or operation be encountered that are not covered in this manual, refer to ALLEN-BRADLEY.

Note: Keep these instructions for future reference.

DESCRIPTION – CENTERLINE medium-voltage contactor operating voltages are 120V AC for the control circuit and 104V DC for the contactor coil. The contactor weighs 230 lbs. (165 lbs. with arc-chutes and interphase barriers removed). It is 26" (66 cm) high 16-1/8" (41 cm) high with arc-chutes and interphase barriers removed), 17-3/4 (45 cm) long and 23-3/8" (59 cm) wide.

Publication 1500-5.0—April, 1985

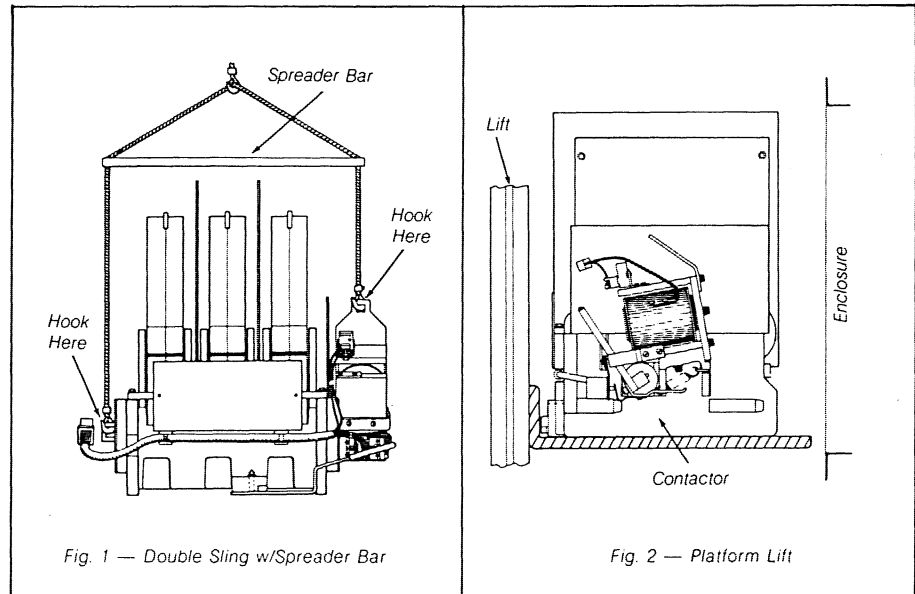
Supersedes Publication 1500-5.0—September, 1976

Publication 1500-5.2—August, 1977

Publication 1500-5.3C—September, 1983

RECEIVING: Before leaving the factory, all CENTERLINE medium-voltage contactors have been tested both mechanically and electrically. Immediately upon receiving the controller, remove the packing and check for possible shipping damage. Report any damage immediately to the claims office of the common carrier.

HANDLING: Each contactor can be lifted with the aid of a double sling with spreader bar (see Fig. 1) or with a platform lift (see Fig. 2). The contactor is provided with two lifting brackets located to properly distribute the weight.



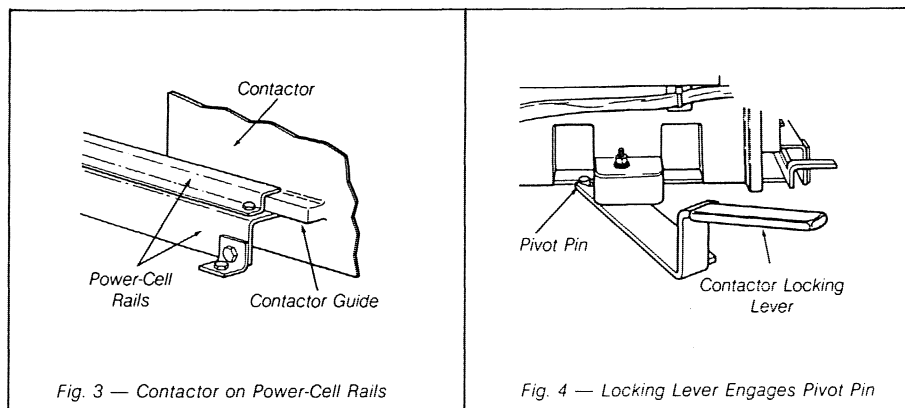
Note: Arc-chutes and interphase barriers may be removed for easier handling. Refer to "Service Instructions" in this manual. When moving the contactor by hand, use the "Handling Points" indicated in Fig. 6.

WARNING: DO NOT operate contactor UNLESS arc-chutes, interphase barriers, and arc-chute retaining bar are securely in place.

Installation of Contactor into Main Structure

Remove arc-chutes and interphase barriers when a double sling is used. Refer to Steps 9 to 13.

1. Place contactor guides in power-cell rails (see Fig. 3) and slide into power-cell until locking lever engages pivot pin (see Fig. 4).

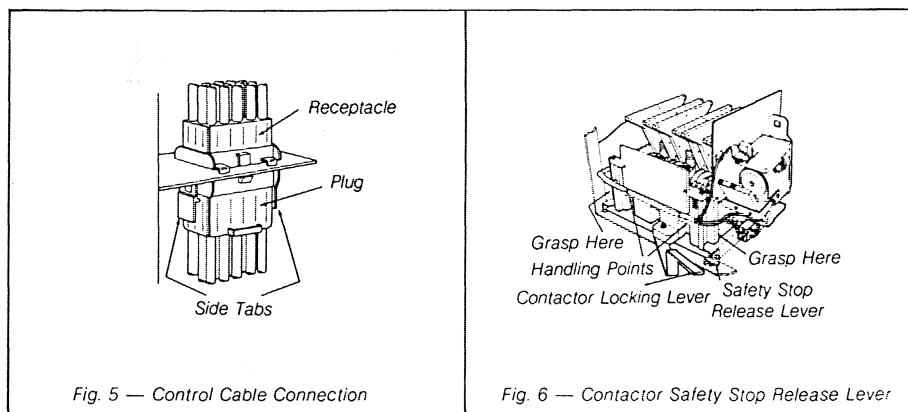


2. Swing locking lever to the right until contactor is locked in place.
3. Connect control cable plug to the keyed receptacle (see Fig. 5)
4. Replace arc-chutes and interphase barriers and secure retaining bar.

Removal of Contactor from Main Structure

Arc-chutes and interphase barriers may be removed for ease of handling. Refer to steps 9-13.

5. Disconnect contactor control cable plug (located to the left of the contactor in the power-cell) by depressing tabs on both sides of plug and pulling down (see Fig. 5).



6. Swing contactor locking lever out and to the left to release contactor from power receptacles.
7. Grasp contactor base molding on each side and slide out to safety stop position (see Fig. 6).
8. Lift up on safety stop release lever (see Fig. 6). Contactor can now be withdrawn directly onto a platform lift or can be drawn out with the aid of a double sling and spreader bar.

Incoming Cable Connections

The mechanical lugs for incoming cables, unless specified, are located at the rear of the enclosure and access can be made by removing the rear or end plate as shown in Figure 7. The mechanical lugs as standard are provided for top entry (figure 8) but can be field changed to allow for bottom entry.

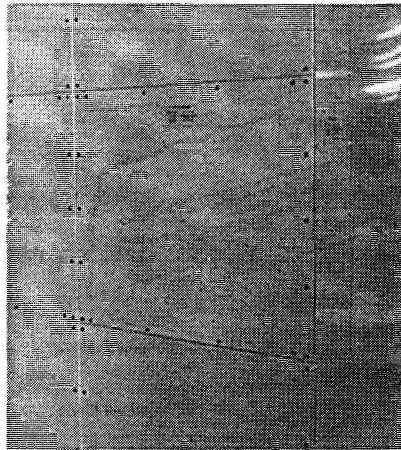


Figure 7 — Access Plate

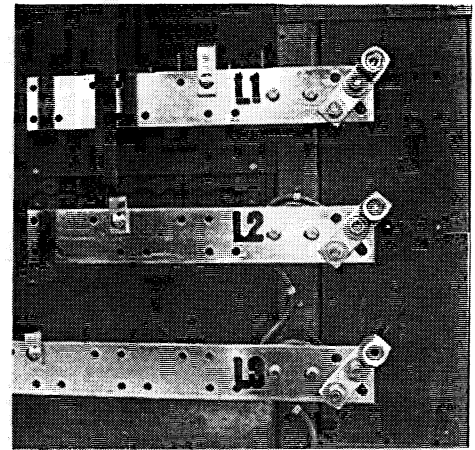


Figure 8 — Lugs arranged for top entry

Outgoing Cable Connections

Mechanical lugs for motor connections are in the power cells and are made to the current transformers. The connections can be positioned to allow ease of wiring from top or bottom. Figure 9 shows a typical bottom exit arrangement.

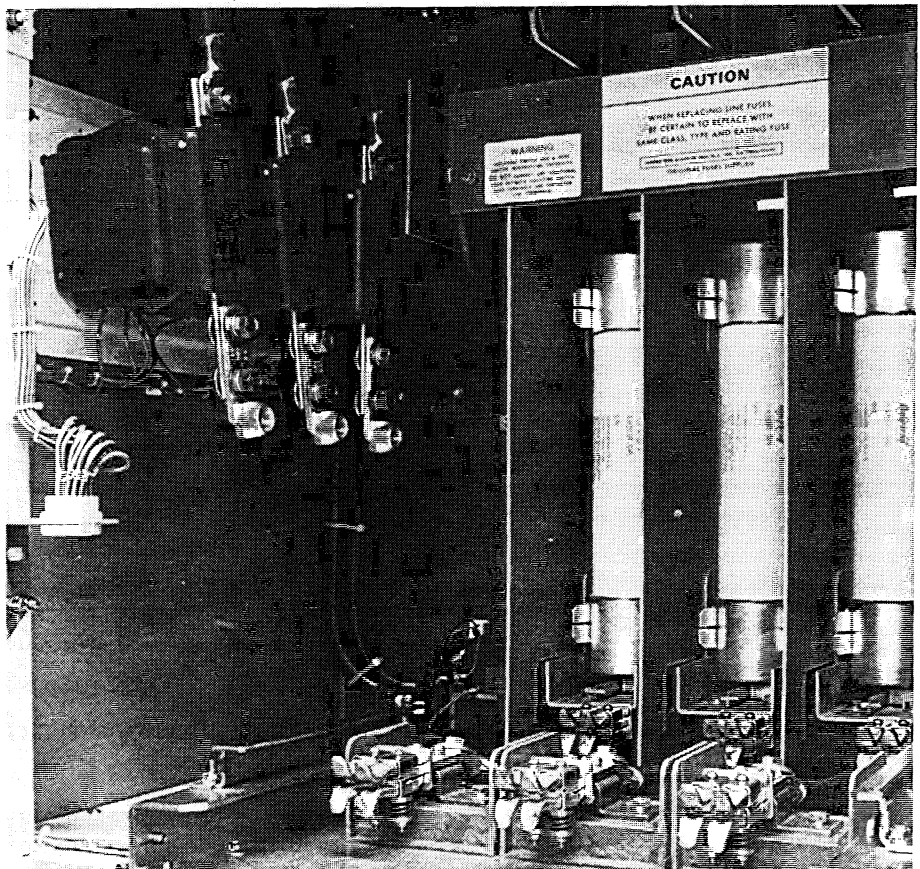


Figure 9 — Bottom exit of cables

Storage

If it is necessary to store the enclosure and contactor, be certain to store in a clean, dry, dust-free area. As a precaution, shroud the enclosure and contactor to prevent the accumulation of dust.

Start-Up Procedure

The contactors are mechanically and electrically tested before leaving the factory and do not normally require further testing.

Refer to "Final Check List" for further procedures regarding the Start-up tests.

Auxiliary contacts on the contactor have been adjusted and tested at the factory.

Service Instructions

Periodic inspection and service programs should be established by the user to avoid downtime. The frequency will vary depending on the severity of operating conditions.

The following pages deal with the inspection and adjustment of those parts which are subject to the most wear and/or are critical to the continued safe operation of the contactor. For identification of replacement parts, refer to the Replacement Parts Section.

Arc-Chute and Interphase Barrier Removal and Reassembly

Removal of the arc-chutes and interphase barriers is required for inspection and/or replacement of internal contactor parts. Removal is also suggested for easier handling. For convenience, these instructions are repeated on the arc-chute retaining bar of the contactor.

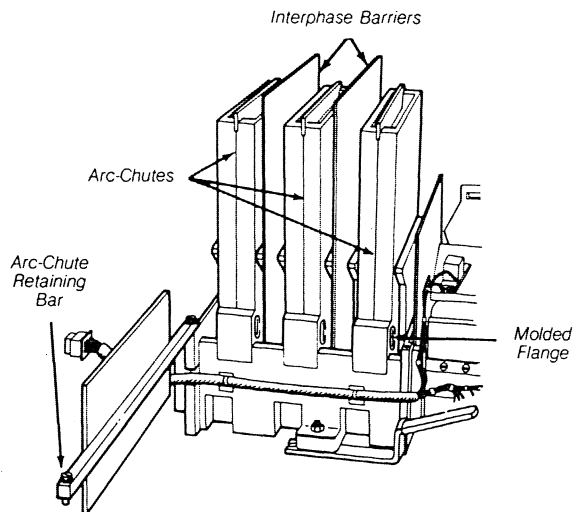


Figure 10 — Arc-Chute and Interphase Barrier Removal

Arc-Chute and Interphase Barrier Removal and Reassembly

Proceed as follows:

9. Loosen right hand retaining bar screw completely. (see Fig. 10).
Loosen left hand screw to allow the retainer to pivot.
10. Swing retainer to the left.
11. Remove interphase barriers by lifting straight up and out of the contactor.
12. Remove arc-chute by grasping the molded flange and pulling straight ahead and out.
13. Reassemble by reverse procedure.

WARNING: DO NOT operate the contactor with power poles energized **unless** arc-chutes, interphase barriers and retaining bar are securely in place.

Arc-Chute and Arc-Splitter Inspection

The arc-chutes are designed to efficiently cool and dissipate arcing. They should be inspected during normal servicing. Change in colour, glazing or minor erosion of arc-splitters and arc-shields, adjacent to the contacts, is normal. Broken parts should be replaced. Lubricate arc-runner stabs with special lubricant during normal servicing (see Lubrication Section).

Arc-Splitter Replacement

The molded arc-splitters can be replaced individually as follows. (Refer to Figure 16).

14. Remove two upper clamping bolts and insulation sleeves. (see Figure 16).
15. Loosen two lower bolts.
16. Remove arc-splitter retainer by pulling straight out. Care must be taken in separating the two halves of arc-chute as the splitter.
17. There are different styles of arc-splitters to suit the voltage level of the contactors. Observe locations in the arc-chute prior to disassembly. Remove questionable arc-splitters by pulling straight up. Be sure to remove and mark the orientation of the metal arc-coolers if the arc-splitters are being replaced.
18. Replace the necessary parts and re-assemble in reverse procedure.

Arc-Chute Replacement

If any parts of this assembly require replacement, other than arc-splitters and retainer the complete assembly must be replaced. Lubricate arc-runner stabs with special lubricant before installing new arc-chute assembly. Refer to Lubricant Section.

Auxiliary Contacts-Inspection and Replacement

2 N-O and 2 N-C auxiliaries are supplied as standard on all contactors. They operate as follows: As the contactor is closed, the N-C contacts open before the power contacts close and the N-O contacts close after the power contacts close. Minimum overtravel for both modes is .025" (.635 mm).

One set of N-C economizing contacts is supplied as standard on all contactors. Their function is to economize the DC circuit after the power contacts are closed. They should be closed when the armature is open and open when the armature is completely closed.

If replacement becomes necessary, check operation to verify the above.

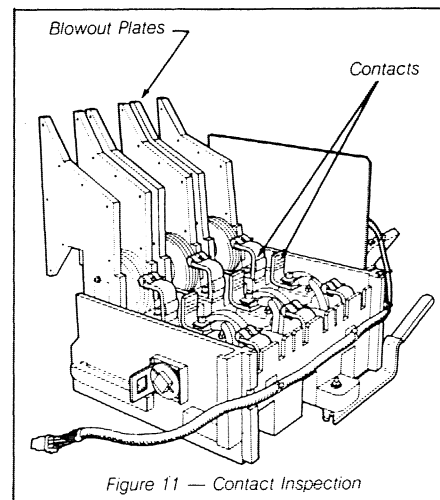
Power Contact Inspection

NOTE: Torque specifications in this instruction sheet are critical to proper functioning of the contactor.

The power contacts in Allen-Bradley CENTERLINE medium-voltage contactors are sintered silver tungsten carbide and should sustain long life under normal operation conditions. Pitted or roughened contacts are usable and **should not be dressed or adjusted**. A minimum of 1/16" (1.6 mm) contact material above the copper carrier is required for continued service. To inspect contacts, the following procedure should be followed.

WARNING: Remove all power from the controller being serviced.

19. Disconnect contactor control cable plug (located to the left of the contactor power cell) by depressing tabs on both sides of plug and pulling down.
 20. Swing contactor locking lever out and to the left to release contactor from power receptables.
 21. Grasp contactor base molding on each side and slide out to safety stop position.
 22. Remove arc-chutes and interphase barriers. Refer to Steps 9 to 13.
 23. Carefully swing blowout plates up and out of the way for inspection.
 24. Inspect contacts. If contact replacement is necessary, lower blowout plates then remove contactor from power cell by lifting up the safety stop release lever. Contactor, which weighs 165 lbs. (75 kg) without arc-chutes and interphase barriers, can be withdrawn directly onto a platform lift or can be drawn out with the aid of a double sling and spreader bar.
- If contacts are satisfactory, reassemble contactor by reverse procedure.



Power Contact Replacement

When replacing power contacts, the flexible cable and angled flat washers must also be replaced.

CAUTION: Proper operation of the contactor could be affected if the form of the replacement flexible cable is distorted during handling or installation. Carefully remove the kit parts from the packaging by cutting away the plastic envelope which secures the parts in place – DO NOT forcefully pull the flexible cable from the packaging.

Tools required are:

- A. 1/4" hex wrench.
- B. Torque wrench accurate in the 140 to 170 inch-pound (190-231 Newton-meters (N-m) range with a 3/8" square drive.
- C. Adapter for a 1/4" hex rod.
- D. 1/4" hex rod (which is equivalent to a hex socket wrench) 4" minimum in length.

CAUTION: Exercise care so as not to drop tools, hardware or other parts into the contactor or controller during any maintenance process. All materials **must** be retrieved before returning the equipment to service.

Power Contact Replacement - Continued

25. Before starting disassembly, observe the orientation of the flexible cables and also the position of the angled flat washer used with both the stationary and movable contacts. See Figure 12.

26. Remove stationary contacts, movable contacts, angled flat washer and flexible cables by removing hex socket head cap screws.

27. Install a new stationary contact and one new angled flat washer to each pole at the rear of the contactor, using the 5/16" - 18 x 1-1/4" hex socket head cap screw. **NOTE:** The 1-1/4" long screws **must** be used to install the stationary and are **not** to be used to retain the movable contacts or flexible cables.

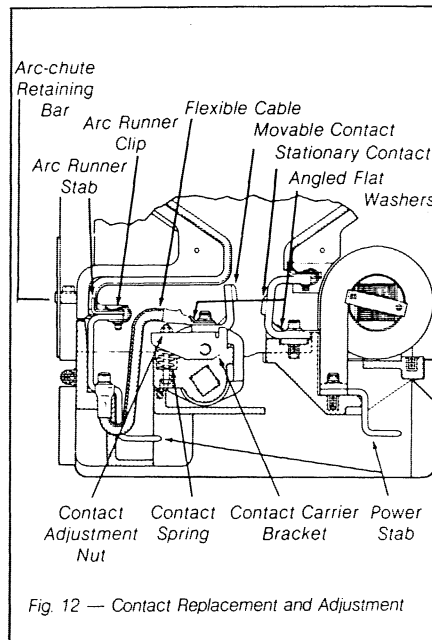


Fig. 12 — Contact Replacement and Adjustment

28. Make sure stationary contacts are properly aligned in the contactor molding. While tightening the hex socket head caps screws to 140 - 150 inch pounds (190-203 N-m) torque, press the stationary contacts fully toward the rear of the contactor (away from the movable contact support assembly).

CAUTION: While installing the new flexible cables, observe the following rules:
Never attempt to reform or change the pre-shape of the new flexible cables.
Always make sure that no other parts interfere with the flexible cables.

29. Install a new movable contact, new angled flat washer and the straight lug end of a new flexible cable to each movable contact support assembly, using a 5/16" - 18 x 1" hex socket head cap screw. See Fig. 12.

- A. The lug must be installed with the lug barrel pointing straight away from the stationary power contact.
- B. The movable contact and angled flat washer must be installed as shown in Figure 12.
- C. While tightening the hex socket head cap screws to 140-150 inch pounds (190-203 N-m) torque, press the movable contact toward the front of the contactor (away from the stationary contact).

30. Place each new preformed flexible cable in the same orientation as the previously removed cable, i.e. Straight along the movable contact support assembly, looped down toward the bottom of the contactor, right angle lug installed to the load stab assembly perpendicular to the load stab (see Figure 12, using the 5/16"-18 x 1" hex socket head cap screws tightened to 140-150 inch pounds (190-203 N-m) torque.

31. The thread end of the contact adjustment screw must not be in contact with the flexible cable lug on the movable contact. Use a minimal bending force upwards at the rear of the lug to obtain a clearance of 1/8" (3.2 mm) maximum.

32. After the installation, check for proper alignment of contacts, flexible cables and angled flat washers.

Power Contact Adjustment

Refer to Figures 12 and 13.

Tools required are:

- A. 6" (150 mm) scale or other suitable device to measure a 19/32" (15.1 mm) gap.
- B. 1/2" open-ended wrench.

Starting with the centre pole of the contactor, proceed with the following steps:

33. Close the armature manually to the point of contact touch. Measure the yolk to armature plate gap using a scale (see Figure 13). If the measurement is greater than 19/32" (15.1 mm) turn down the contact adjustment nuts, which will rotate the movable contacts away from the stationary contacts, until the gap is less than 19/32" (15.1 mm). It may be necessary to alternatively turn down the adjustments nuts on all power poles.
34. If the gap is less than 19/32" (15.1 mm) or has been adjusted less than 19/32" (15.2 mm), proceed as follows: While holding the armature plate 19/32" (15.1 mm) from the yolk, back off the centre pole contact adjustment nut, which will rotate the movable contact towards the stationary contact, until the movable contact touches the stationary contact.
35. While still holding the armature plate to the yolk gap at 19/32" (15.1 mm), back off the outer pole contact adjustment nuts to bring the contacts just to the point of contact touch (simultaneous closure).
36. Contact adjustment can be checked by closing the armature to the point where the contacts first touch. The armature plate to yolk gap should be 19/32" (15.1 mm) at the point of simultaneous touch of all contacts.

Lubrication

Lubricate the mating surfaces on the following parts with special lubricant during normal servicing.

- Arc-runner stabs
- Arc-runner clips
- Power stabs

DC Coil Replacement

The economized DC coil is designed to operate at a low power dissipation level and under normal operating conditions, should last for the life of the contactor. However, if replacement is necessary refer to the replacement parts section for the coil parts numbers. The contactor should be removed from the power cell. Disconnect the wiring and using a 5/16" allen wrench remove the 3/8" hex socket head screw at the rear of the magnet. Then slide the coil and core out. Observe position of rubber washer, fiber washer and removable core. Use "LOCTITE 271" when reinstalling the 3/8" hex socket head screw and tighten to 170 inch pounds, (231 N-m). Refer to final check list for test information before putting the starter back into service.

Final Check List

Tools required are:

- A. 6" (152 mm) scale or other suitable device to measure a $19/32$ " (15.1 mm) gap.
- B. $1/2$ " open-ended wrench.
- C. .031 (0.8 mm) feeler gauge.

35. Account for all tools, hardware, or other parts used in the maintenance procedures. All items "lost" **must** be recovered before putting this device into service.

36. Check the action of the movable contact support assembly. The assembly must return to the rubber stops in the contactor base when the armature is released from contact touch (see Figure 13).

37. With the contactor pulled out to the test position (against the safety stop) of the contactor support tray, connect an external 120 volt AC, 60 Hz supply to the test receptacle. Turn the selector switch in the control circuit to "test" position.

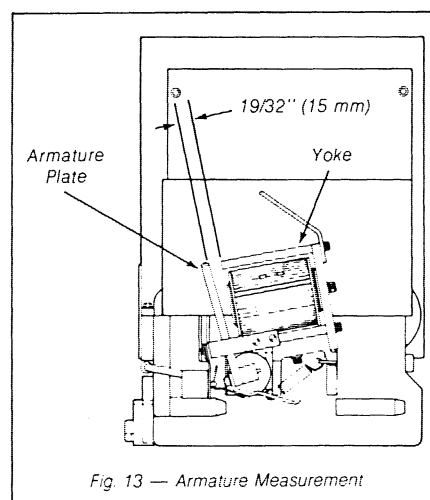


Fig. 13 — Armature Measurement

CAUTION: Low voltage components are now "live". Use normal precautions for working with energized electrical systems.

38. Electrically operate the contactor approximately 12 operations. The armature plate must seal cleanly against the magnet yoke.

39. Recheck the power contact adjustment. Close the armature to a gap of $19/32$ " (15.1 mm) between the armature plate and yoke. The contacts on all three poles should just touch or be within .031 (0.8 mm) of touching when checked with a feeler gauge. Readjust the movable contact by turning the adjustment nut, down to move contact away from the stationary contact or up to move it closer.

40. Swing blowout plates down into position.

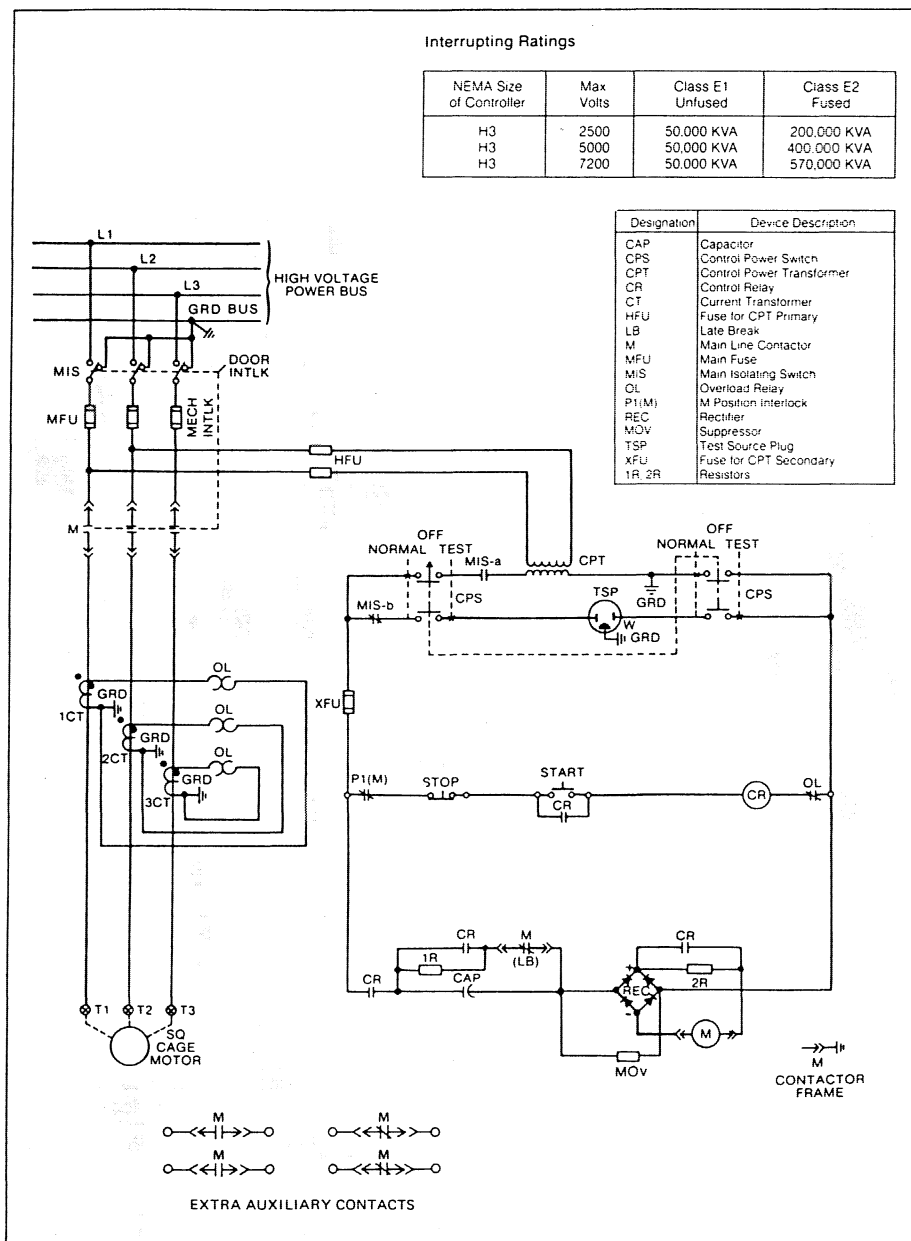
41. Replace arc-chutes and interphase barriers, using the instructions in steps 9 to 13.

42. Check contactor operation several times with test supply voltage (120V control circuit only).

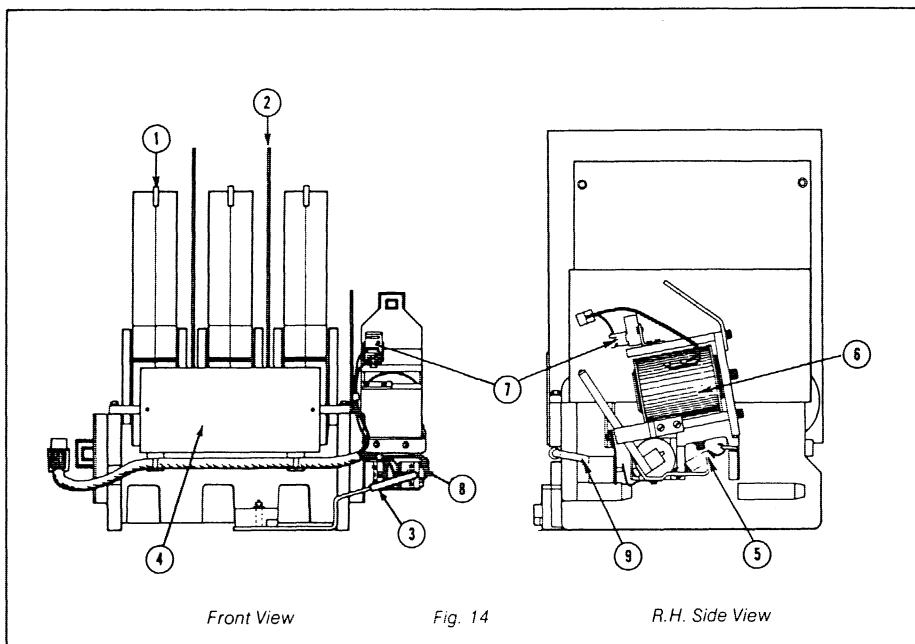
43. Return contactor to service.

WARNING: Do not operate the contactor with power poles energized **unless** arc-chutes, interphase barriers, and arc-chute retaining bar are securely in place.

Typical Schematic
Diagrams
(See Applicable Codes and Laws)



Renewal Parts



Item	Description of Parts	Part No.
1	Arc-Chute Assembly 5000V See next page for details 7200V	40357-309-51 40357-311-51
2	Interphase Barrier Assembly	80149-238-01
3	Locking Lever	40195-314-51
4	Arc-Chute Retaining Bar Assembly	40357-347-51
	Warning Label	40050-995-01
5	Armature Plate Spring	40026-025-02
6	DC Coil	40195-900-01
	Flat Hex Socket Head Screw (Secures coil to core at front)	28020-503-11
7	Normally Closed Economizing Auxiliary Contact Block	X-408282
8	Auxiliary Contact (IN-O/IN-C) ¹	Z-22820
9	Wire Harness (for standard 2N-O/2N-C) 5000V 7200V	40357-363-51 40357-363-54

¹ Standard configuration of 2 N-O/2 N-C requires two of the part numbers listed.

Item	Description of Parts	Part No.
10	Stationary Contact	40195-300-51
11	Movable Contact	40195-301-51
12	Contact Spring	40026-058-02
13	Adjustment Nut	M-4313
14	Movable Contact Support Assembly (Does not include items 11, 12, 13, 15)	40257-314-51
15	Flexible Cable	40257-313-51
16	Arc-Runner Clip	40195-015-03
17	Front Stab Assembly 5000V 7200V	40196-304-51 40196-304-52
18	Rear Stab Assembly 5000/7200V	40195-030-02
19	Blowout Coil	40196-301-51
2	Special Lubricant (approximately 1 oz)	40025-198-01

2 Lubricant is required on items 16, 17 and 18

Arc-Chute Components

Description of Parts	Part No.	Qty. 1
5KV Contactor. Catalog Number 1502-A4C3D1, D2, D3 or D4		
Arc-Splitter "V" ending	40259-127-01	10
Arc-Splitter. Each requires an Arc-Cooler		
9-3/4" (248 mm)	40259-283-01	9
9-1/4" (235 mm)	40259-283-05	2
Arc-Coolers	40195-172-01	11
7.2KV Contactor. Catalog Number 1502-A4D3D1, D2, D3 or D4		
Arc-Splitter "V" ending		
9-1/4" (235 mm)	40259-127-01	10
8-3/4" (222 mm)	40259-127-02	2
8-1/4" (210 mm)	40259-127-03	2
Arc-Splitter. Each requires an Arc-Cooler		
9-3/4" (248 mm)	40259-283-01	9
9-1/2" (235 mm)	40259-283-02	2
9" (229 mm)	40259-283-03	2
8-1/2" (216 mm)	40259-283-04	2
Arc-Coolers	40195-172-01	15
Arc-Splitter Retainer	40295-125-01	1

1 Quantity per Arc-Hood.

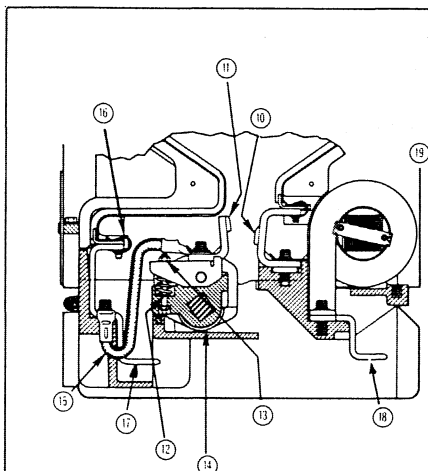


Fig. 15

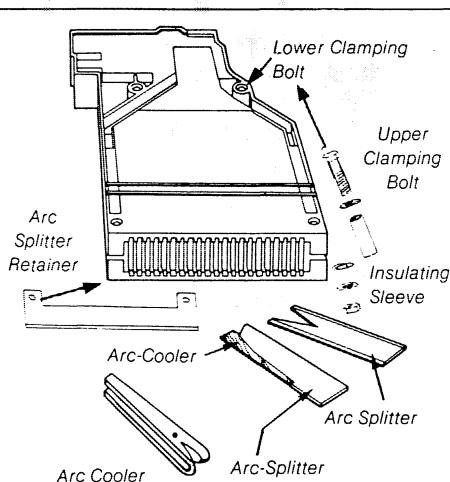


Fig. 16

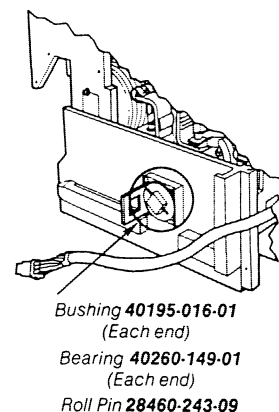


Fig. 17

**'Isolating Switch Service'
Instructions, 200, 400 & 600 Amp.
General Maintenance**

- 1A. Disconnect controller from supply lines by opening feeder switch ahead of controller and **lock** in open position.
- 2A. Open medium-voltage compartment door.
- 3A. Check for tight mounting screws, locknuts (5) on operating rod (2) and interlock lever. (See Figure 4).
- 4A. The isolating switch handle (1) may be difficult to operate if not well lubricated. Grease all bearing surfaces and linkage points with Aeroshell 7 or equivalent.
- 5A. Make certain the mating blade surfaces of the isolator switch are clean, smooth and well greased. Operate and grease periodically with Aeroshell 7 or equivalent, especially in corrosive areas.
- 6A. General maintenance of the contactor should include checking the condition of the contacts, free movement of crossbar, removal of excess dirt, condition of arc chutes, condition of auxiliary contacts and accessories and tightness of connections.
- 7A. Close and secure all doors.

Interlock Mechanism Adjustment

The mechanical interlock system incorporated in Allen-Bradley medium-voltage controllers with air-break contactors is designed to prevent:

- (1) opening of the medium-voltage compartment door when the line isolating switch is closed.
- (2) operating of the isolating switch with medium-voltage compartment door open.
- (3) opening of the isolating switch under load when the medium-voltage contactor is closed.

The mechanical interlock system is correctly adjusted at the factory prior to shipment. No further adjustment should be necessary in the field. However, if there is reason to believe the interlock system is not functioning properly, we recommend the following procedures for checking out the control.

- 1B. De-energize controller by opening the control circuit.
- 2B. Turn isolating switch handle (1) to the "OFF" position.
- 3B. DISCONNECT CONTROLLER FROM SUPPLY LINES BY OPENING FEEDER SWITCH AHEAD OF CONTROLLER AND **LOCK** IN OPEN POSITION.
- 4B. Open medium-voltage compartment door. It is suggested that a "Hot Stick" be used to insure that equipment is dead.
- 5B. Remove the air break contactor from the main structure as described on Page 3 or remove the arc-chutes and interphase barriers.
- 6B. Visually inspect grounding of isolating switch blades Fig. 19 (4). Blades should be making good contact with grounding contacts (3). Adjust lock nuts (5), if required, so that when handle (1) is in "OFF" position the isolating switch blade should touch or be within 1/16" of touching angle bracket (3).
- 7B. Adjust stop bracket (6) to have clearance of .045"-.06" (1.14-1.5 mm) between interlock lever (7) and lever (8). Apply Loctite 290 or equivalent to stop bracket (6) and screws. Torque screws to 75 in/lbs.
- 8B. Nut (9) should be turned down to the bottom of the threads. Spacer and washer (10) should be held firmly in place by nut (11). **Note:** Nylon insert of both nuts is to be at the top.

**'Interlock Mechanism'
Adjustment - Continued**

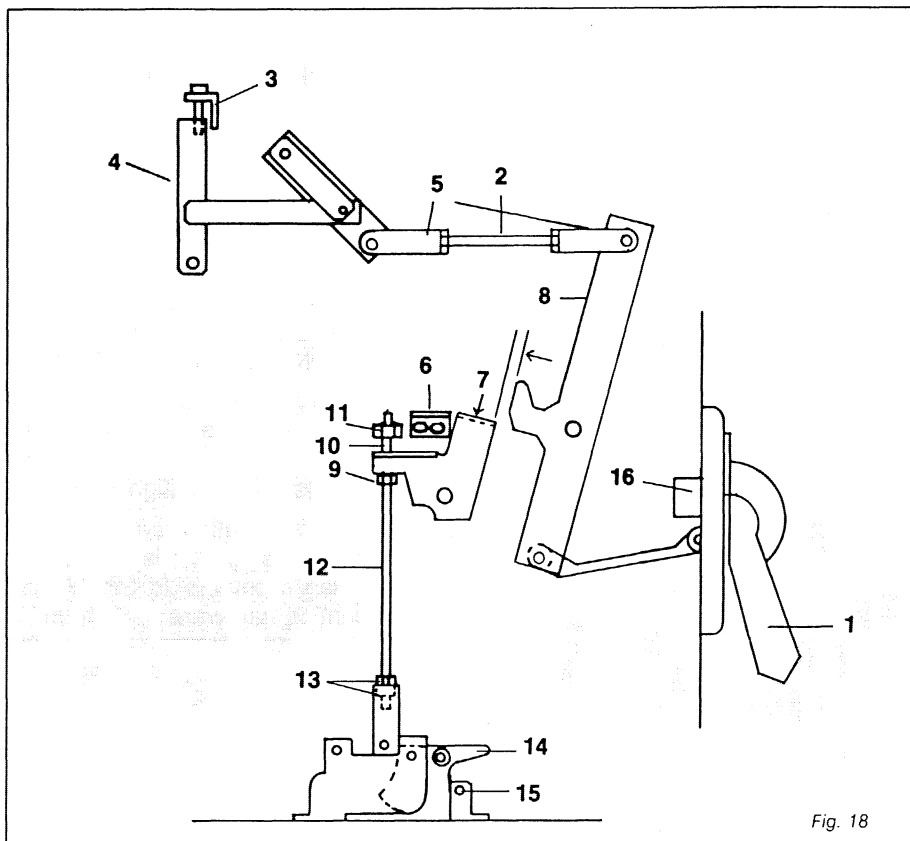


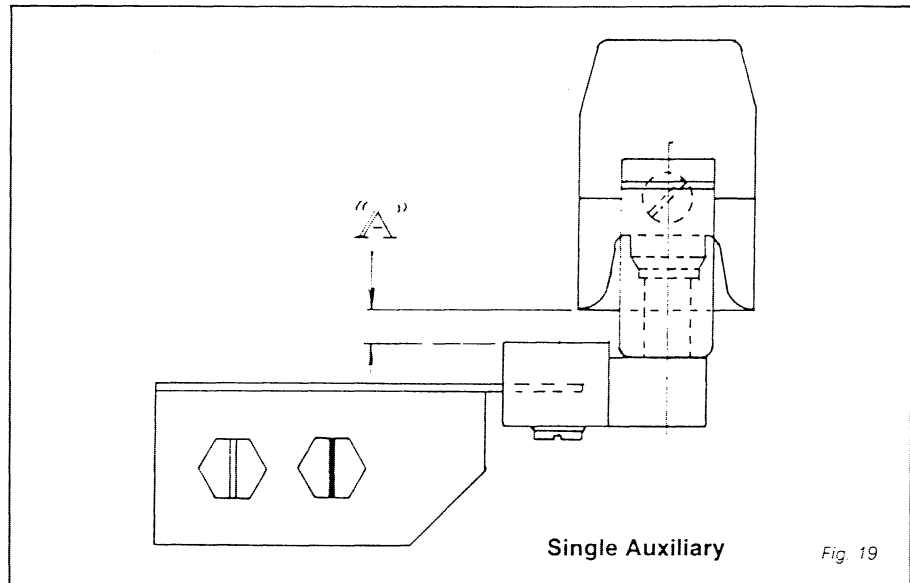
Fig. 18

- 9B. Adjust nuts (13) so that interlock cam (14) rests against stop (15) while maintaining the necessary clearance between interlock lever (7) and lever (8). (See Step 7)
- 10B. Operate isolating switch handle (1) after inserting screwdriver in the front opening of the mechanical door interlock (16) and pushing in to operate interlock. The operating linkage should be over center. The adjustment of the rod (2) may have to be changed slightly to optimize operation when handle (1) is moved from "OFF" to "ON" and "ON" to "OFF"
- 11B. If auxiliary contacts require adjustment, proceed to next section for instructions.
- 12B. Replace contactor in power-cell following instruction in Steps 1 to 4.

'Auxiliary Contacts Inspection and Replacement'

The following procedure should be used only after the main power is removed from the controller as the isolating switch has to be moved to the ON position during the adjustments. Refer to instructions 1B to 5B in Interlock Mechanism Adjustment section.

- 1C. Each isolating switch is supplied with an N-O auxiliary contact which can be checked with the contactor in the power cell but the arc chutes and interphase barriers removed.
- 2C. N-O auxiliary is mounted on the left side of the isolator. With the isolating switch in the "ON" position (this can be done by inserting a screwdriver into the front opening of the mechanical door interlock (16) and pushing in to operate the mechanical interlock and allow handle (1) to be turned to the "ON" position) move interlock lever (7) to the blocking position.
 - 2.1C Pull the handle open until the mechanical interlock prevents any further motion. With the switch and mechanism in this position, set the auxiliary contact so that dimension "A" in figure 5 is 0.4" (10.2 mm) minimum. The contacts must be slightly open.
 - 2.2C Move the isolating switch handle back to extreme "ON" position. Dimension "A" in figure 5 is .08" (2.03 mm). After adjustment, torque screws of auxiliary contacts to 32 in/lbs. Apply Loctite 290 or equivalent to the mounting hardware and mounting plates.



- 3C. N-C auxiliary is mounted on the right side of the isolator. Isolating switch should be in the "OFF" position. Dimension "A" is .25" (6.35 mm). After adjustment, torque screws of auxiliary contacts to 32 in/lbs. Apply Loctite 290 or equivalent to the mounting hardware and mounting plates.
- 4C. If contactor has been removed, refer to Step 1 for replacement instructions.



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