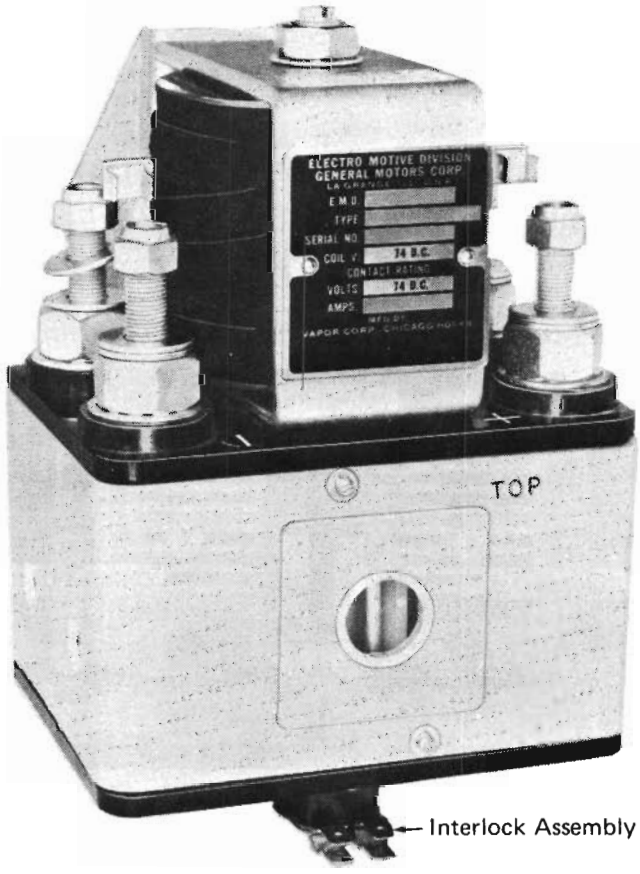
ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

MAINTENANCE INSTRUCTION

ENGINE STARTING AND GENERATOR FIELD DECAY CONTACTORS

DESCRIPTION

The engine starting (ST) contactor shown in Fig. 1, is a 1000 Ampere model equipped with an interlock assembly. A larger 2000 Ampere ST contactor (not shown) is basically constructed the same. The generator field decay (GFD) contactor is shown in Fig. 2. Both the ST and GFD contactors are heavy duty, two-pole bridge-type contactors. The main contact assembly consists of four movable and four stationary contacts. The movable contacts close against the mating stationary contacts, and through bridge connectors, establish two series circuits.



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NOTE: Starting contactor 9315518 does not have interlock assembly.

Fig. 1 – Starting Contactor

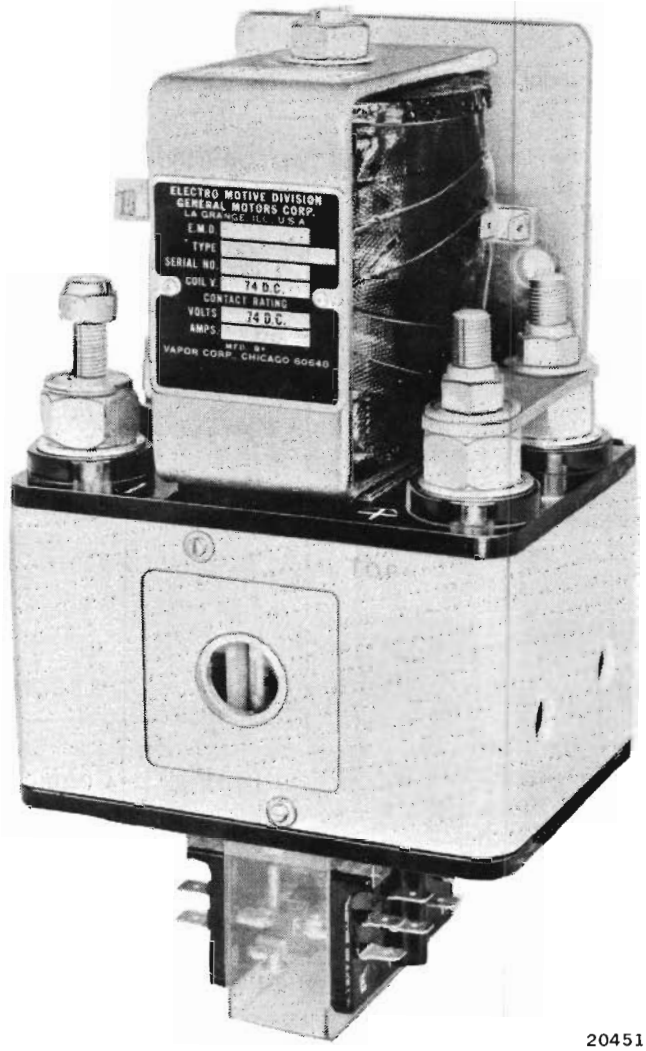

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Fig. 2 – Generator Field Decay Contactor

The main contacts are protected with a dust cover containing a small glass aperture for viewing the energized or de-energized condition of the contactor. When the contactor is de-energized, the three yellow dots visible through the aperture are aligned horizontally.

An interlock assembly is mounted to the bottom of ST contactor 8415485, and to the bottom of the GFD contactor. These contactors have different types of interlocks. The electrical differences are detailed on contactor schematic diagram, Fig. 3.

*This bulletin is revised and supersedes previous issues of this number.

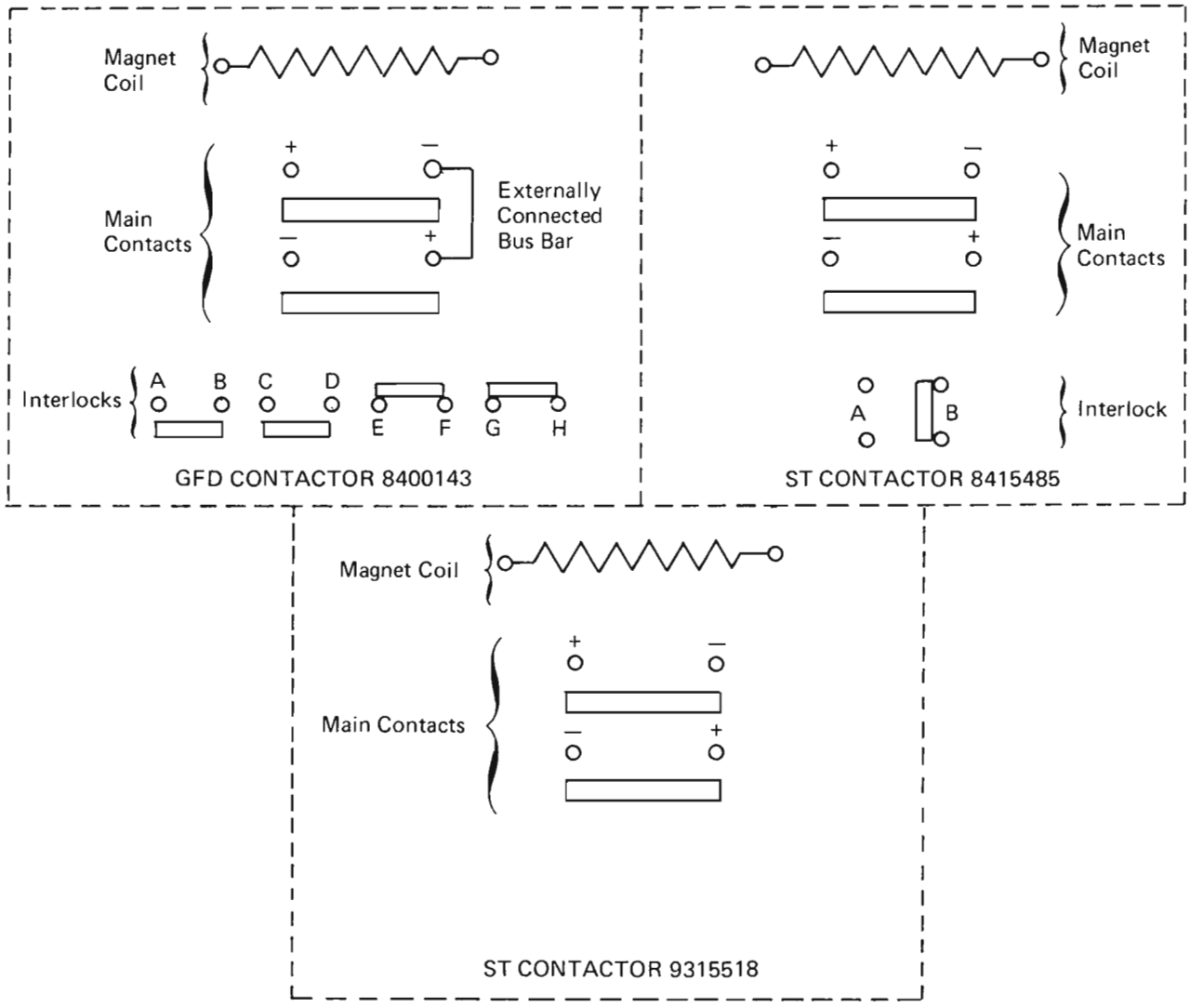
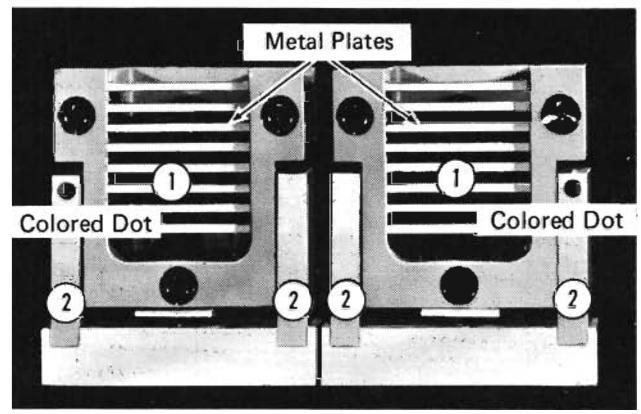


Fig. 3 - Contactor Schematic Diagram

The contactors are designed with an arc suppression assembly using a magnetic field to speed arc interruption when the contacts are open, breaking the circuit. The arc suppression assembly, Fig. 4, consists of a separate blowout magnet and an arc box for each of the four main contacts. To further quench the arc, each arc box contains laminations of metal plates with air gaps between.

MAINTENANCE

The dust free enclosure and use of silver alloy contacts result in minimum maintenance required to keep the ST and GFD contactors in serviceable condition. The silver alloy main contacts will operate satisfactorily even though blackened, pitted, or eroded. Contact surfaces should not be cleaned, dressed, or filed, to ensure against the possibility of abrasive particles becoming imbedded in the contact surface causing poor electrical contact and decreased contact life.



1. Arc Boxes
2. Blowout Magnets

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Fig. 4 - Arc Suppression Assembly

The plunger override compensates for allowable contact wear, eliminating the need for contact adjustment due to wear.

The bearing surfaces are designed to operate without lubrication. Do NOT oil or grease at any time.

INSPECTION

1. Remove dust and dirt with a brush or air hose.

2. Check molded parts for breaks and cracks.

3. Check for damaged and loose terminals. Coil terminals may be burnished with a piece of fine sandpaper. Do NOT use emery cloth or file.

4. Check coil for damaged insulation.

MAIN CONTACT INSPECTION

1. Remove two screws and washers (12, Fig. 5) holding front cover (13) in place.

2. Remove front cover by sliding forward.

NOTE: *If repairing 9315518 contactor,* remove four screws (14) and washers from upper rear cover plate (15), and remove cover plate.

If repairing GFD contactor, remove only the two lower screws and lockwashers in Step 3, and do NOT remove rear cover and insulator (6).

3. Remove four screws (8) and lockwashers holding rear cover (7) in place, and remove rear cover and insulator (6).

4. Remove two screws (9) and washers holding lower base assembly (1) to guide spacers (5).

5. Separate lower base assembly (1) from upper base assembly (2), and slide out four arc boxes (3).

6. Check main contact surfaces for wear. New contacts have about 3 mm (1/8") thickness of alloy material. For best results, both the stationary and mating movable contacts should be replaced if either alloy tip is worn so that 0.80 mm (1/32") of alloy material remains.

STATIONARY CONTACT REPLACEMENT

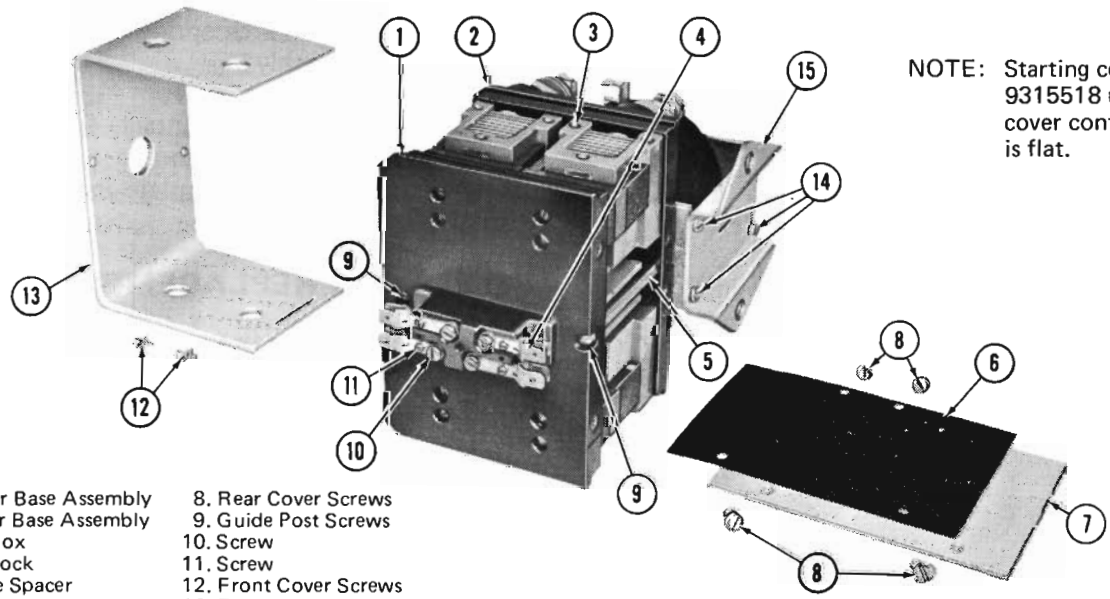
1. Remove worn contacts by unscrewing from upper base assembly.

2. Install new contacts by screwing them into upper base assembly.

MOVABLE CONTACT REPLACEMENT

NOTE: Omit Steps 1 through 4 for ST contactors.

1. Remove the interlock plastic cover by loosening the cover screw (1, Fig. 6) at the front, and lifting the catch spring at the back of the interlock assembly.



NOTE: Starting contactor 9315518 upper rear cover configuration is flat.

1. Lower Base Assembly
2. Upper Base Assembly
3. Arc Box
4. Interlock
5. Guide Spacer
6. Insulator
7. Rear Cover
8. Rear Cover Screws
9. Guide Post Screws
10. Screw
11. Screw
12. Front Cover Screws
13. Front
14. Upper Rear Cover Screws
15. Upper Rear Cover

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Fig. 5 – Contactor Disassembly

The bearing surfaces are designed to operate without lubrication. Do NOT oil or grease at any time.

INSPECTION

1. Remove dust and dirt with a brush or air hose.

2. Check molded parts for breaks and cracks.

3. Check for damaged and loose terminals. Coil terminals may be burnished with a piece of fine sandpaper. Do NOT use emery cloth or file.

4. Check coil for damaged insulation.

MAIN CONTACT INSPECTION

1. Remove two screws and washers (12, Fig. 5) holding front cover (13) in place.

2. Remove front cover by sliding forward.

NOTE: *If repairing 9315518 contactor,* remove four screws (14) and washers from upper rear cover plate (15), and remove cover plate.

If repairing GFD contactor, remove only the two lower screws and lockwashers in Step 3, and do NOT remove rear cover and insulator (6).

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5. Separate lower base assembly (1) from upper base assembly (2), and slide out four arc boxes (3).

6. Check main contact surfaces for wear. New contacts have about 3 mm (1/8") thickness of alloy material. For best results, both the stationary and mating movable contacts should be replaced if either alloy tip is worn so that 0.80 mm (1/32") of alloy material remains.

STATIONARY CONTACT REPLACEMENT

1. Remove worn contacts by unscrewing from upper base assembly.

2. Install new contacts by screwing them into upper base assembly.

MOVABLE CONTACT REPLACEMENT

NOTE: Omit Steps 1 through 4 for ST contactors.

1. Remove the interlock plastic cover by loosening the cover screw (1, Fig. 6) at the front, and lifting the catch spring at the back of the interlock assembly.

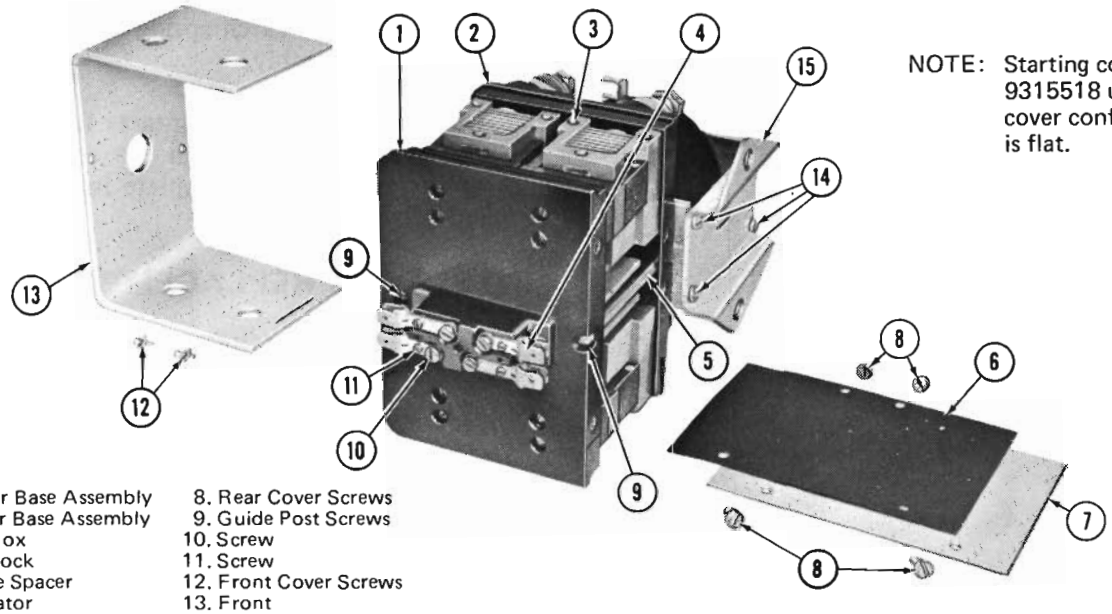
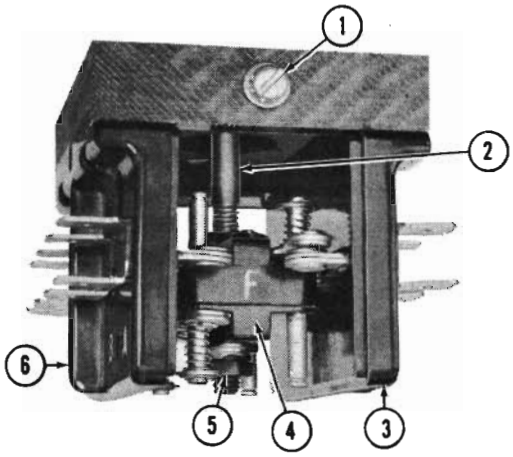


Fig. 5 – Contactor Disassembly



1. Cover Screw
2. Actuator Stem
3. Right Stationary Contact Block
4. Interlock Carrier
5. Lower Hex-Nut
6. Left Stationary Contact Block

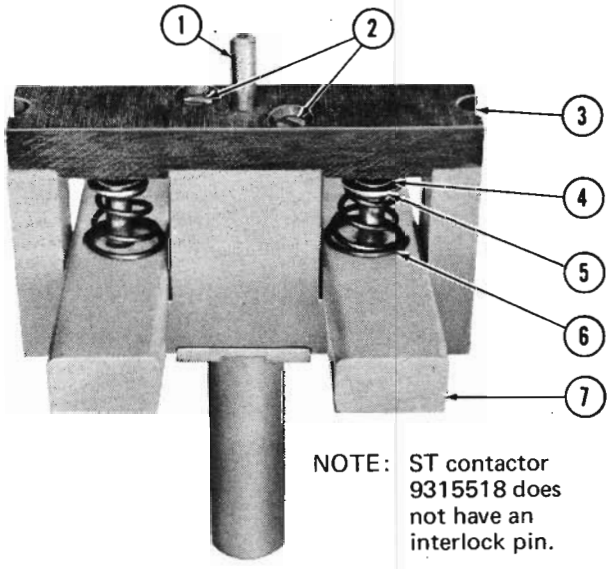
Fig. 6 – GFD Contactor Interlock

2. Remove the two screws holding the interlock right side stationary contact block (3) (labeled "E-F, G-H") and remove the stationary contact block.

3. Unscrew the lower hex-nut (5) from the actuator stem (2). It is necessary to break the glyptol seal. Do NOT turn upper hex-nut.

4. Remove the interlock carrier (4) from the actuator stem (2). Retain the two flat washers and one lockwasher for reinstallation.

5. Remove return spring from plunger and remove plunger and carrier assembly (Fig. 7) from lower base assembly.



1. Interlock Pin
2. Flat-Head Screws
3. Stop Bar
4. Retaining Ring
5. Washer
6. Carrier Spring
7. Movable Contact

Fig. 7 – Plunger And Carrier Assembly

6. Remove two flat-head screws (2) and lockwashers holding stop bar (3) to carrier assembly.

NOTE: Retain interlock pin (1) (if applicable) and override spring for reinstallation.

7. Remove retaining ring (4), washer (5), and carrier spring (6). Slide movable contact (7) off post.

8. Install new movable contact by sliding on post, and reinstall carrier spring (6), washer (5), and retaining ring (4).

9. Reassemble stop bar (3) to carrier assembly with two flat-head screws (2) and lockwashers.

NOTE: Ensure that interlock pin (1) (if applicable) and override spring are in place when reassembling.

INTERLOCK CONTACT INSPECTION

ST CONTACTOR 8415485

This interlock (snap switch) is replaceable as an assembly. Manually operate interlock, while checking for proper contact opening and closing with an ohmmeter.

GFD CONTACTOR 8400143

1. Remove the interlock plastic cover by loosening the cover screw (1, Fig. 6) at the front, and lifting the catch spring at the back of the interlock assembly.

2. Inspect the interlock contacts for wear. If any contact is worn through the contact material to the base metal, complete interlock replacement is recommended.

INTERLOCK REPLACEMENT

ST CONTACTOR 8415485

NOTE: For ease of removal and installation, the quick disconnect terminals on the interlock (4, Fig. 5) can be moved aside to reach the mounting screws by removing the smaller screws (11) and loosening the larger screws (10).

1. Remove interlock (4) from lower base assembly (1) by removing screws and washers from both sides of interlock.

2. Install new interlock or lower base assembly. Ensure that when viewed from front of contactor the interlock "A" contacts are on the left.

GFD CONTACTOR 8400143

1. Disassemble the right stationary contact block (3, Fig. 6) and the left stationary contact block (6) from the lower base assembly by removing the two mounting screws from each block.

2. Unscrew the lower hex-nut (5) from the actuator stem (2). It is necessary to break the glyptol seal. Do NOT turn upper hex-nut.

3. Remove the interlock carrier (4) from the actuator stem (2). Retain flat washers and lockwashers for reinstallation.

4. Install new interlock carrier (4) on actuator stem with flat washers, lockwasher, and hex-nut (5). Do NOT turn upper hex-nut at this time as this will change contact gap and wipe values. Ensure that carrier surface marked with an "F" faces the front of the contactor.

5. Install new interlock stationary contact blocks on lower base assembly with two screws and lockwashers. Ensure that when viewed from front of contactor, the block labeled "A-B, C-D" is on the left.

6. Manually operate interlock carrier to verify that the normally closed contacts open before the normally open contacts close. Also verify that contact gap and wipe values are as specified in Service Data. If the contact operating sequence, contact gap, or contact wipe is improper, adjust the position of the carrier on the actuator stem by repositioning the hex-nuts as necessary to obtain proper indications.

7. Seal the hex-nuts to the actuator stem with glyptol.

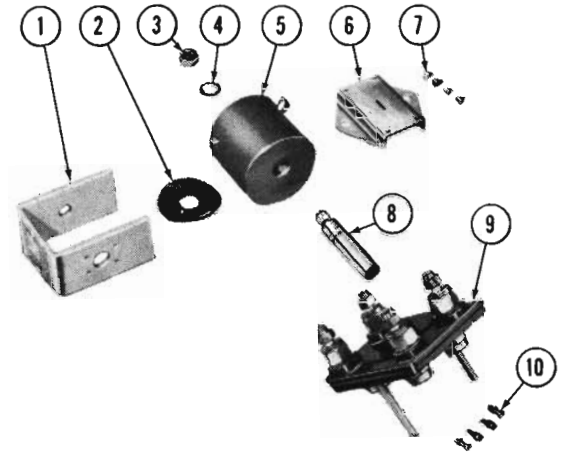
COIL RESISTANCE TEST

Using ohmmeter, measure resistance of magnet coil winding. Resistance should be as specified in Service Data. Replace coil if resistance is not as specified.

MAGNET COIL REPLACEMENT

1. If contactor is not already disassembled, separate lower base assembly (1, Fig. 5) from upper base assembly (2) by performing Steps 1 through 5 under "Main Contact Inspection."

2. Separate magnet coil frame (1, Fig. 8) from upper base assembly by removing the four screws (10) from the bottom. The frame insulator and guide bushing may drop free as the two assemblies are separated.



1. Magnet Coil Frame
2. Cup Washer
3. Jam Nut
4. Lockwasher
5. Magnet Coil
6. Mounting Plate
7. Mounting Plate Screws
8. Core Stop
9. Upper Base Assembly
10. Coil Frame Screws

Fig. 8 – Magnet Coil Assembly, Exploded View

3. Remove the core stop jam nut (3) and lockwasher (4).

4. By turning clockwise, remove the core stop (8) down and out of the frame (1) and coil (5).

5. Slide coil (5) and cup washer (2) out of frame.

6. Install new coil by sliding into frame, ensuring that:

   a. Cup washer (2) is installed at the coil bottom with the concave side toward the coil. (Raised rim of washer touching coil.)

   b. Coil terminals are in the top half and face the contactor nameplate.

   c. Tab at rear of coil fits into slot in mounting plate (6).

7. Insert core stop (8) through bottom of frame (1) and up into coil by turning clockwise from bottom. By using screwdriver and turning counterclockwise from top, tighten core

stop to frame. Fasten with lockwasher (4) and jam nut (3).

8. Assemble frame (1) to upper base assembly (9) by installing four screws (10) through bottom of base. Ensure that frame insulator and guide bushing are in place.

CONTACTOR REASSEMBLY

1. Clean all parts before reassembly. Do NOT use solvents. Parts may be cleaned with a cloth, dusting brush, or dry compressed air.

CAUTION: The arc blowout magnets, if removed, must be replaced in a specific orientation. Each magnet has the north magnetic pole marked with a yellow or red dot. The magnets must be installed with the north magnetic poles at the outside of the contactor. Refer to Fig. 4. Contactor failure may result from improper installation of the magnets. If the identifying dot has been removed from the north pole, the magnet should be checked with a compass and remarked.

NOTE: Steps 2 through 7 apply to GFD contactor. Perform only those steps necessary to complete reassembly based on the amount of disassembly performed during inspection and replacement.

2. Position plunger assembly into lower base assembly inserting interlock actuator stem through center hole. Ensure that the yellow markings on the plunger face the front of the contactor.

3. Install interlock carrier (4, Fig. 6) on actuator stem (2) using flat washers, lockwasher, and hex-nut (5). Do NOT turn upper hex-nut at this time as this will change contact gap and wipe values. Ensure that carrier surface marked with an "F" faces the front of the contactor.

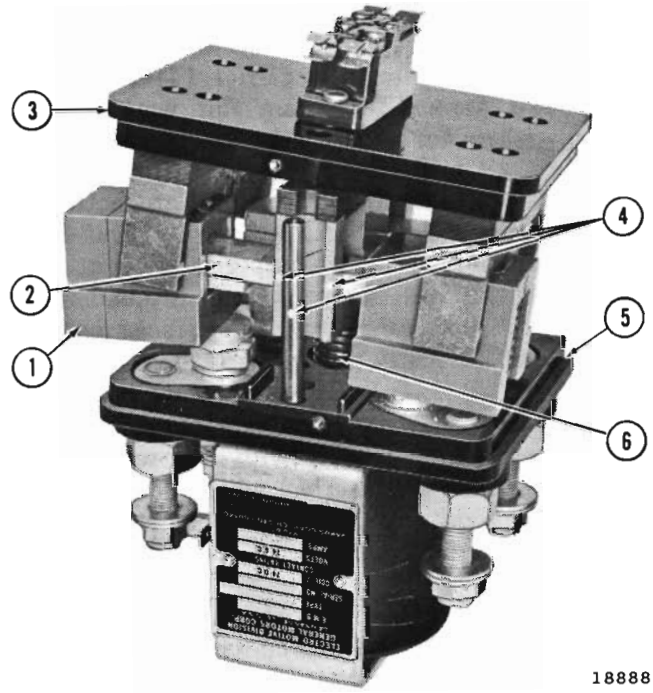
4. Install interlock stationary contact blocks (3 and 6) on lower base assembly with two screws and lockwashers. Ensure that when viewed from front of contactor, the block labeled "A-B, C-D" is on the left.

5. Manually operate interlock carrier to verify that the normally closed contacts open before the normally open contacts close. Also verify that contact gap and wipe values are as specified in Service Data. If the contact operating sequence, contact gap, or contact wipe is improper, adjust the position of the carrier (4) on the actuator stem (2) by repositioning the hex-nuts as necessary to obtain proper indications.

6. Seal the hex-nuts to the actuator stem (2) with glyptol.

7. Install plastic interlock cover and tighten screw (1) at front.

8. Stand upper base assembly (5, Fig. 9) upside down.



1. Arc Chute
2. Movable Contact
3. Lower Base Assembly
4. Yellow Guide Dots
5. Upper Base Assembly
6. Return Spring

Fig. 9 - Contactor Reassembly

9. Install return spring (6) on plunger and partially insert plunger magnet into magnet core.

10. Slide the four arc chutes (1) over movable contacts (2) into approximately final position.

11. Press plunger assembly down into core and hold while positioning are chutes (1) into final position. Continue to hold plunger assembly and position lower base (3) in place. Install and tighten two screws and washers holding lower base to guide posts.

12. Install contactor rear cover (7, Fig. 5) and insulator (6), if removed, and fasten with four screws (8) and lockwashers. If rear cover (7)

was not removed, replace the two screws and lockwashers holding rear cover to lower base assembly.

NOTE: If reassembling 9315518 contactor, install upper rear cover plate. Replace washers and four screws.

13. Install front cover (13) on contactor and fasten with two screws (12) and washers.

OPERATIONAL TEST

NOTE: Magnet coils of starting contactors are designed for intermittent duty only. To avoid excessive heating, do NOT energize coil for more than two minutes at any one time.

Using a variable DC voltage supply, verify contactor pickup and dropout voltage levels are as specified in Service Data. If values are not as specified, adjust the core stop position by loosening the jam nut (3, Fig. 8) and turning the core stop (8) screw at the top of the magnet frame. After final adjustment of the core stop, retighten the jam nut.

HI-POT TEST

Perform hi-pot test as indicated in Service Data.

SERVICE DATA

SPECIFICATIONS

STARTING CONTACTOR (ST) 8415485

MAIN CONTACTS (2 normally open)

Contact Rating	1000 Ampere
Contact Gap - Min.	3.97 mm (5/32")
Contact Wipe	2.38 mm (3/32")

INTERLOCK CONTACTS

Contacts	
A	Normally open
B	Normally closed
Contact Rating (Continuous, Resistive Load)	3 Ampere

MAGNET COIL

Resistance (at 20° C [68° F])	23.3 ohms (± 10%)

OPERATION

Working Voltage	74 V DC
(Intermittent Duty - 2 minutes ON, 2 minutes OFF)	
Pickup (at 20° C [68° F]) - Max.	36 V DC
Dropout (at 20° C [68° F])	3-16 V DC

STARTING CONTACTOR (ST) 9315518

MAIN CONTACTS (2 normally open)

Contact Rating	2000 Ampere
Contact Gap - Min.	3.97 mm (5/32")
Contact Wipe	2.38 mm (3/32")

was not removed, replace the two screws and lockwashers holding rear cover to lower base assembly.

NOTE: If reassembling 9315518 contactor, install upper rear cover plate. Replace washers and four screws.

13. Install front cover (13) on contactor and fasten with two screws (12) and washers.

OPERATIONAL TEST

NOTE: Magnet coils of starting contactors are designed for intermittent duty only. To avoid excessive heating, do NOT energize coil for more than two minutes at any one time.

Using a variable DC voltage supply, verify contactor pickup and dropout voltage levels are as specified in Service Data. If values are not as specified, adjust the core stop position by loosening the jam nut (3, Fig. 8) and turning the core stop (8) screw at the top of the magnet frame. After final adjustment of the core stop, retighten the jam nut.

HI-POT TEST

Perform hi-pot test as indicated in Service Data.

SERVICE DATA

SPECIFICATIONS

STARTING CONTACTOR (ST) 8415485

MAIN CONTACTS (2 normally open)

Contact Rating	1000 Ampere
Contact Gap - Min.	3.97 mm (5/32")
Contact Wipe	2.38 mm (3/32")

INTERLOCK CONTACTS

Contacts	
A	Normally open
B	Normally closed
Contact Rating (Continuous, Resistive Load)	3 Ampere

MAGNET COIL

Resistance (at 20° C [68° F])	23.3 ohms (± 10%)

OPERATION

Working Voltage	74 V DC
(Intermittent Duty - 2 minutes ON, 2 minutes OFF)	
Pickup (at 20° C [68° F]) - Max.	36 V DC
Dropout (at 20° C [68° F])	3-16 V DC

STARTING CONTACTOR (ST) 9315518

MAIN CONTACTS (2 normally open)

Contact Rating	2000 Ampere
Contact Gap - Min.	3.97 mm (5/32")
Contact Wipe	2.38 mm (3/32")

MAGNET COIL

Resistance (at 20° C [68° F]) . . . . . 34 ohms (± 5%)

OPERATION

Working Voltage . . . . . 74 V DC
(Intermittent Duty - 2 minutes ON, 2 minutes OFF)
Pickup (at 20° C [68° F]) - Max. . . . . 32 V DC
Dropout (at 20° C [68° F]) . . . . . 3-16 V DC

GENERATOR FIELD DECAY CONTACTOR (GFD) 8400143

MAIN CONTACTS (2 Normally Open)

Contact Rating . . . . . 300 Ampere
Contact Gap - Min. . . . . 3.97 mm (5/32")
Contact Wipe - Min. . . . . 2.38 mm (3/32")

INTERLOCK CONTACTS

Contacts
A-B, C-D . . . . . Normally open
E-F, G-H . . . . . Normally closed
Contact Rating (Continuous, Resistive Load) . . . . . 10 Ampere
Contact Gap - Min. . . . . 3.97 mm (5/32")
Contact Wipe - Min. . . . . 2.38 mm (3/32")

MAGNET COIL

Resistance (at 20° C [68° F]) . . . . . 140 ohms (± 5%)

OPERATION

Working Voltage . . . . . 74 V DC
Pickup (at 20° C [68° F]) - Max. . . . . 48 V DC
Dropout (at 20° C [68° F]) . . . . . 5-28 V DC
Dropout Time - Max. . . . . 10 Milliseconds

HI-POT

60 Hz, 1 Minute:

	ST 8415485	ST 9315518	GFD 8400143
Magnet Coil To Ground	600 V RMS	1200 V RMS	600 V RMS
Magnet Coil To Main Contacts	2400 V RMS	2800 V RMS	2400 V RMS
Main Contacts To Ground	2400 V RMS	2800 V RMS	2400 V RMS
Auxiliary Contacts To Ground	2400 V RMS	—	2400 V RMS
Interlock To Interlock	2400 V RMS	—	2400 V RMS
Contact To Contact	—	2800 V RMS	—

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