ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT
MAINTENANCE INSTRUCTION

# TRACTION MOTOR STATOR INSPECTION AND ELECTRICAL RECONDITIONING

## INTRODUCTION

During any periodic traction motor overhaul, the stator should be cleaned and inspected to make certain its electrical quality will ensure satisfactory performance during subsequent operation. Visual and electrical inspections of the cables, coil connectors, and ties are necessary to determine what type of repair, if any, is needed.

Usually all that is required to put a stator in satisfactory operating condition is to perform what is referred to as a "basic." This consists of a thorough cleaning and drying, a resistance and high potential check of the circuits, the replacement of any loose or broken ties supporting the cables, replacing motor cable connectors where necessary, reconditioning brush holders, and painting the inside of the stator.

Other types of repairs that may be needed will also be discussed in these instructions.

## CLEANING

Before any visual and electrical inspections are made, the brush holders should be removed and the stator thoroughly cleaned inside and out. The stator should then be dried to remove all moisture from around the field coils and connections.

After blowing out dirt and dust with clean dry compressed air, Stoddard's solvent (ASTM-D474-40) may be used to clean the stator. Generally this is done by wiping the frame and insulation with a cloth dampened with the solvent.

The solvent is nontoxic and has a flash point of 115° F. Most solvents require some time to evaporate, so no electrical tests should be attempted immediately after cleaning.

CAUTION: The usual precautions that apply to inflammable fluids should be used. Provide adequate ventilation when any type of solvent is being used.

In the event the inside of the stator is extremely dirty and oily, it is permissible to wash the stator with hot water to which a small amount of caustic solution has been added. The hot water and caustic solution may be applied with a hose and pump using a pressure of 45 — 50 lbs. After this method of cleaning, the stator should be rinsed well with clear water to remove any trace of the caustic.

## INSPECTION

After the stator is properly cleaned and rinsed, it should be dried by placing it in a hot oven set at 125° C. for 4 hours. When the drying time is up, the stator should be removed and allowed to cool to ambient temperature. When the stator has cooled, an insulation resistance test should be given to the field coils and brush holder cables, using megger 8174880. Each circuit should check 2 megohms minimum. If the readings are less than 2 megohms, the stator may need more drying time. In that case repeat the drying cycle. If after the second drying attempt the megger readings are still below 2 megohms, the cause for the low readings will have to be determined. This can be done by isolating each coil to determine which one is defective.

The field coils should be visually inspected for damaged insulation. Special attention should be given to the insulation at the pinion end of the coils for spongy or loose insulation. When this condition exists, the coils should be replaced. See "Stator Overhaul" in this maintenance instruction.

Check the motor external cables. If the insulation is damaged or was cut to the wire any place beyond 3" from the connector at the end of the cable, the cable should be replaced. See "Motor Cable Leads."

Check the external and internal lead ties. Replace if loose, making certain the insulation between the tie eyes and cables on the inside of the stator is not worn due to rubbing action caused by the loose ties. Just replacing the twine could result in a ground at the point where the insulation is worn.

When all necessary repairs are completed to the stator field coil circuits, or in the event no repairs were necessary, the stator should be heated to 50° ± 10° C. and while at this temperature given an 1800 volt high potential test to ground for one minute. After a satisfactory high potential test, the stator should be cooled to room temperature and given a resistance and polarity check.

## RESISTANCE AND POLARITY CHECK

Install the brush holders making certain that the contact areas between the brush holders and terminals are clean and tight.

NOTE: When installing brush holders, position them in their holding blocks as far back as possible. This is necessary to give all the clearance possible between the holders and commutator when assembling the armature into the stator.

The resistance of the main field and interpole coil circuits can be measured with a Kelvin bridge and a thermometer by following the sequence outlined in the next 6 steps.

1. Place the thermometer in the stator alongside one of the coils.
2. Connect the current and potential leads of the bridge set to the "FF" and "F" cables of the stator.
3. Take the resistance reading of the main field circuit and record reading obtained from the bridge.
4. Move the bridge leads to the "AA" cable and the axle side brush holder.
5. Take the resistance of the interpole circuit and record the readings obtained.
6. Remove the thermometer and observe the temperature indicated.

The resistance values of the circuits when the readings are converted to 75° C. should be as follows:

| | | |
|---|---|---|
| D37 | Main field | .00975 ohms ± 2% |
| | Interpole field | .00745 ohms ± 2% |
| D47, D57, D67, D75 & D77 | Main field | .00876 ohms ± 2% |
| | Interpole field | .00652 ohms ± 2% |

If the readings are high, all connections should be inspected and the faulty ones corrected. It will be necessary in most cases to remove the insulation over the connections to see evidence of high resistance. This evidence is usually in the form of overheating, or a broken brazed connection.

If the readings are low, a short is indicated. In this case it will be necessary to check each individual coil to determine which is defective. This can best be done by first splitting the circuit to check for one side before opening all connections between the coils.

The defective coil or coils will have to be replaced. See "Coil Replacement."

If the resistance check is satisfactory, a polarity check should be made to determine if the coils are properly located in their magnetic position. By referring to Fig. 1, and using a low voltage DC power supply and a compass, the polarity can be checked as follows:

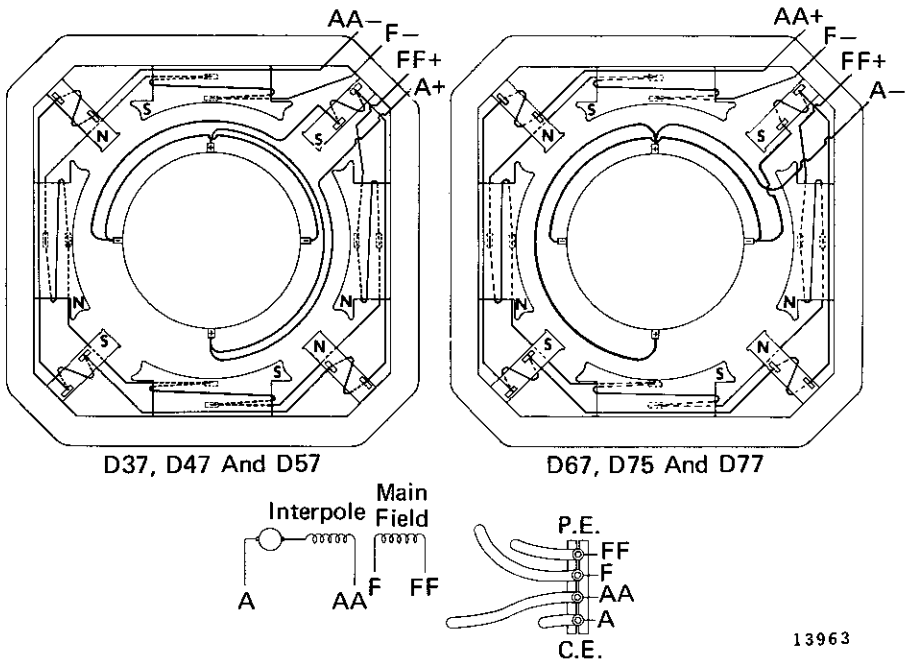


Fig. 1 — Wiring Diagrams

1. Connect the DC current to external cables "F" and "FF."
2. Holding the compass at the center of the top main field coil, the compass should indicate a south pole reading. Moving the compass from pole to pole should give a definite change in polarity. If the compass does not show a definite change in polarity position, this will indicate coils of the same polarity are next to each other. This wrong polarity could be caused by two coils of the same polarity being installed next to each other, or wrong connections of the coil leads to the connector bars.
3. Check the interpole coils in the same manner connecting DC current to the "AA" cable and the brush holder at the axle side of the stator.
4. If there is evidence of a wrong polarity in either the main or interpole circuits, the defective coils or connections will have to be corrected in order to obtain proper motor performance.

When satisfactory resistance and polarity checks have been obtained, the inside of the stator should be painted using red enamel 8061130. When painting the entire inside of the stator, protect the housing bores and faces as well as the brush holder terminals from paint.

## MOTOR CABLE LEADS AND CONNECTORS

The cable leads should not be damaged or worn especially where they are clamped or are subjected to abrasion. When cable insulation is found damaged, the cable should be replaced by disconnecting it from the coil at the interior of the stator, removing the cable and replacing it with a new cable.

Check the contact area of the connectors. They should be free of nicks and burrs, and should have a smooth, bright surface. Remove any nicks or burrs with a smooth cut file, being careful not to damage the contact surfaces. If the connectors are damaged beyond repair, they should be replaced.

The condemning limit of the external cable length is 49-5/16" measured from the outside edge of the cable clamp to the tip of the connector with a total variation of 1-1/2" between lead lengths.

### Soldering Connectors To Motor Cable Leads

Connector halves are secured to motor cable leads by a soldered joint using 50-50 solder 8225761 or pure tin 8069984, and flux 8004638.

When it is necessary to replace the connectors, they can be removed by using thermo grip pliers 8064918 to heat the connector to a point where the solder melts to free the connector.

When replacing the connectors, there should be a 3/16" ± 1/16" gap between the insulation on the cable and the edge of the connector.

The interior of the connector must be tinned and heated before attempting to solder it to the cable.

This can be accomplished by fluxing the inner portion of the connector and slowly pouring hot solder from a ladle into the connector. Then by pouring the solder back and forth between the connectors and the ladle, the barrel of the connector can be tinned and heated.

When the connector is properly tinned, insert the connector into a holding fixture and apply heat to the connector with the tongs and fill the connector barrel 1/2 to 3/4 full of hot solder.

Apply flux lightly to the stripped end of the cable and dip it into the hot solder to be heated and tinned.

Remove the cable and insert tinned end slowly into the barrel of the connector and remove heating tongs. Using a ladle pour solder around the top of the connector to fill to top edge of the connector, so as to maintain an even temperature and compensate for shrinkage as the solder cools. Allow cable and connector to cool in air. DO NOT QUENCH.

## STATOR OVERHAUL

### COIL REMOVAL

When it becomes necessary to remove the coils, it is advisable to place the stator in a fixture that can be rotated to position the coils for removal. A fixture similar to 8285821 shown in Fig. 2 is recommended. It is also advisable to have lifting fixtures 8285823 and 8285824 to handle the coils. These fixtures can be used for coil installation as well.

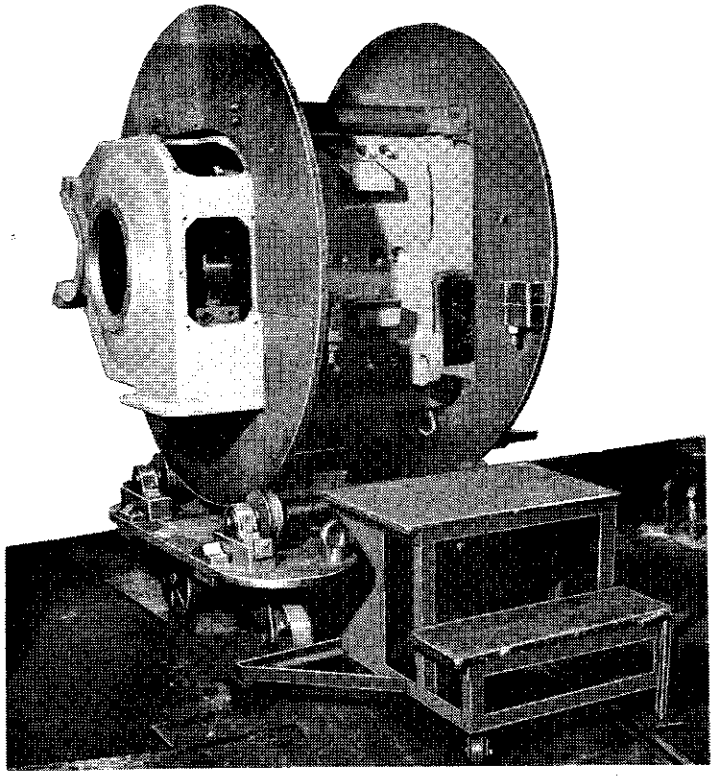

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Fig. 2 – Stator Holding Fixture

Heating equipment will be needed to loosen the brazed connections between the coils before they can be removed. Brazing equipment 8261812 can be used for this operation and also for reconnecting the coils when the stator is rewired.

Before the main field coils can be removed, it will be necessary to break the weld holding the number four main pole bolts. The tack weld should be removed carefully to prevent damaging the frame. All weld must be removed to give clearance for the socket to remove the bolts.

With the necessary tools proceed to remove the field coils as follows:

1. Position and lock the stator in a holding fixture.

NOTE: If the external leads are not to be reused they should be cut flush with the rubber grommets. If they are to be reused they should be positioned to prevent damage during coil removal.

2. Starting at the commutator end remove the insulation from the connections between coils to be removed. Cut all ties holding leads and connectors.

3. Using brazing equipment 8261812, disconnect interpole connection. Position stator as necessary to disconnect all interpole coil connections.

NOTE: Use caution when heating connection to prevent burning or damaging the connectors between the interpole coils as they may be satisfactory for reuse. Apply heat gradually until connection is loose.

4. When the connectors between the interpoles are removed, position the stator so an interpole coil is located at the top.

5. Using lifting fixture 8285823 and a hoist, position the fixture under and up against the interpole coil to be removed, Fig. 3. Loosen and remove the bolts holding the coil in the frame.

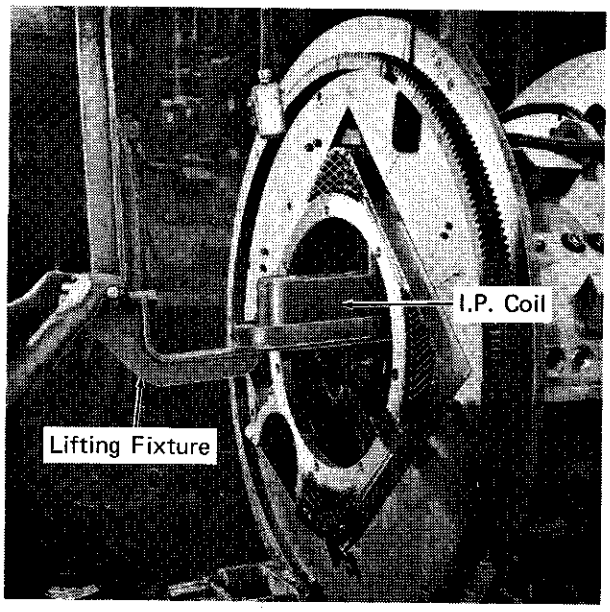


Fig. 3 — Interpole Coil Being Removed

6. Lower the lifting fixture and coil to a point where it can be removed from the frame, see Fig. 4, and the coil set aside.

7. Position the frame for the next interpole to be removed and repeat the operation until all defective coils are removed.

NOTE: Any shims that were positioned between the frame and the interpole piece must be saved. These shims are reused to maintain the proper air gap between opposite poles.

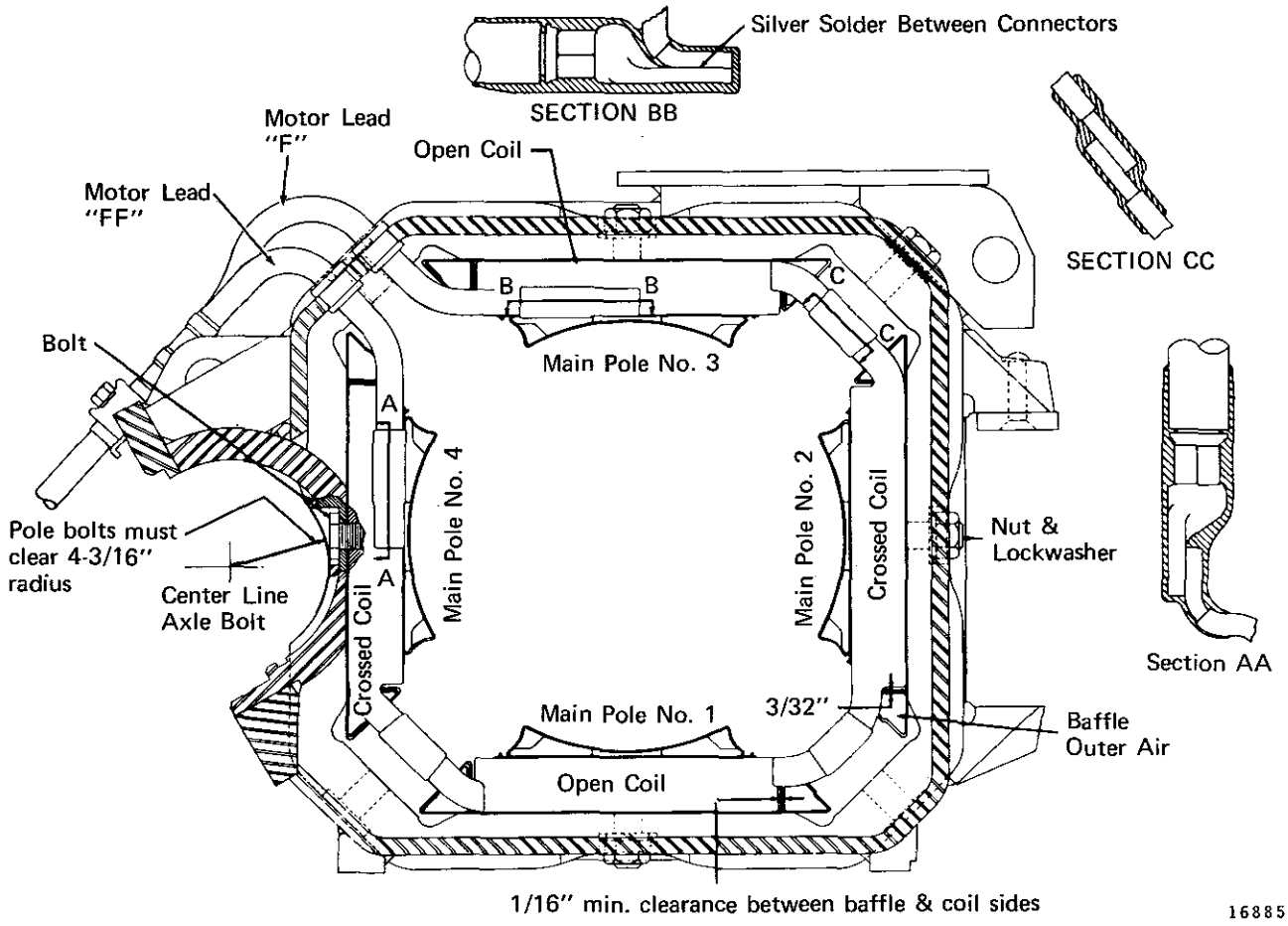


Fig. 4 – Coil Location From P.E.

8. When necessary perform similar operations to remove the main field coils, using lifting fixture 8285824 to remove the coils.

Main field pole pieces can be removed from the field coils and reused providing they have not been damaged. The interpole coil and pole piece should be replaced as an assembly.

NOTE: Coil baffles removed from D37 stators can only be used with D37 type coils. This is also true for D47 and later type baffles.

If it is necessary to remove all the coils, the frame should be cleaned inside and out to remove all grease and dirt. If the four rubber grommets that protect the outside leads where they go through the frame are damaged, they should be removed.

When the frame is properly cleaned, the inside of the frame should be checked for any burrs or burnt spots that might interfere with coil replacement. The air gap between the main pole and interpole coil pads should also be checked.

The distance between the interpole pads when measured at the center of the pads (at equal distance from each end) should be 30.000" ± .005". The main pole pads dimension should be 23.844" + .004" – .002" when measured in the same manner.

These dimensions should be maintained in order to obtain the proper air gap when the coils are assembled into the frame.

After the frame has been cleaned and checked, the inside should be painted, using red enamel 30E13C after which the frame should be positioned for rewire.

When painting the inside of the frame, keep the enamel off the pole and coil pad areas, the housing bores and faces, and out of the portion of the brush holder block that holds the insulated studs of the brush holders.

## COIL REPLACEMENT

When replacing coils it must be remembered that D37 traction motor coils cannot be mixed with later model coils. This is due to the difference in coil design and resistance.

When it is necessary to replace coils of either type stator, replace with the same type coil as removed. When it is necessary to replace all the coils always make the replacement with the latest type coils to obtain the advantage of the improved coils.

Although D47 and later model frames are of the fabricated type, most D37 frames were of the cast type; therefore, when replacing it will be necessary to use the proper type lead grommets to properly protect the leads and rubber spacer blocks for the interpole connector supports.

When an older frame has been assembled with current model coils, it is advisable to change model designation on the nameplate to the current model.

## INSTALLING MAIN FIELD COILS

For ease of identification, the coil locations have been numbered as to position in the frame, see Fig. 4. When facing the pinion end of the frame, the No. 1 main field coil is located at the bottom of the frame and counting counterclockwise, the other three main coil positions are No. 2 opposite axle, No. 3 top and No. 4 axle side.

When replacing the coils in the frame, the No. 4 coil is installed and positioned using lineup gauge 8285829. The No. 4 coil then becomes the reference point when spacing the other coils.

### Coil Installation

Referring to Fig. 4, proceed to install the main field coils as follows:

1. If the rubber grommets were removed from the four lead holes, install new grommets using the proper grommets for type frame having coils installed. Keep the large edge of the grommet to the outside of the frame.

2. Position frame so an interpole pad is located at the bottom. Then using positioning fixture 8285828, place the locating knobs on the bottom of the fixture into the interpole bolt holes and tighten the two top hand screws. Position the fixture in the frame so the end locking screw handle is facing the commutator end.

   Place one outer air baffle on either side of this fixture into the location provided, Fig. 5, making certain the baffles are flat on the coil pads of frame. With the baffle properly positioned, tighten lock screw handle on end of fixture to lock baffle in place. Check tightness of the two top hand screws to make certain positioning fixture is held securely in frame.

   Repeat this operation at the three other interpole locations installing two baffles and one positioning fixture at each location.

3. Before placing the main field coils into the frame, it will be necessary to assemble the coils on their pole pieces. When assembling the coils to the pole, the No. 4 main coil is always assembled on the pole without studs, the other three coils are assembled to poles having studs. To assemble coils to pole, proceed as follows:

   a. Obtain new main field coil and place on suitable work bench.

   b. Place steel washer on coil.

   c. Place coil and washer assembly on qualified pole pipe, being careful not to damage the insulation on the coil.

NOTE: Coil should be assembled on the washer and pole piece so when assembly is placed in the frame, the leads will be turned toward center of the frame, see Fig. 6.

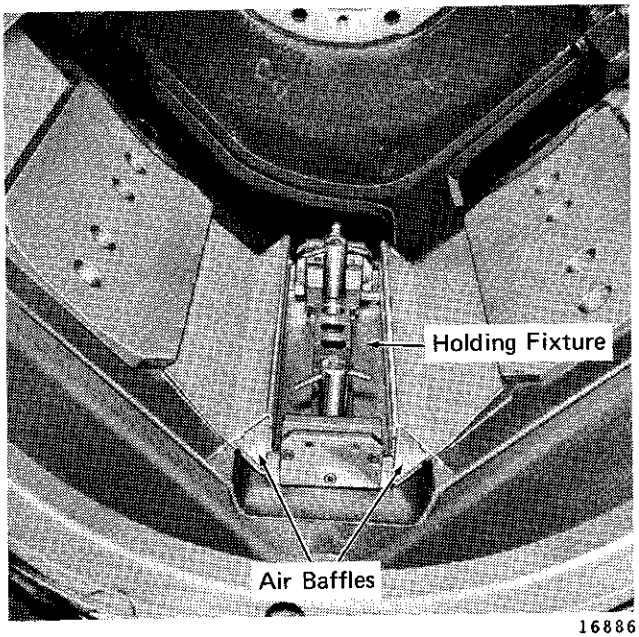


Fig. 5 – Air Baffle Holding Fixture In Position

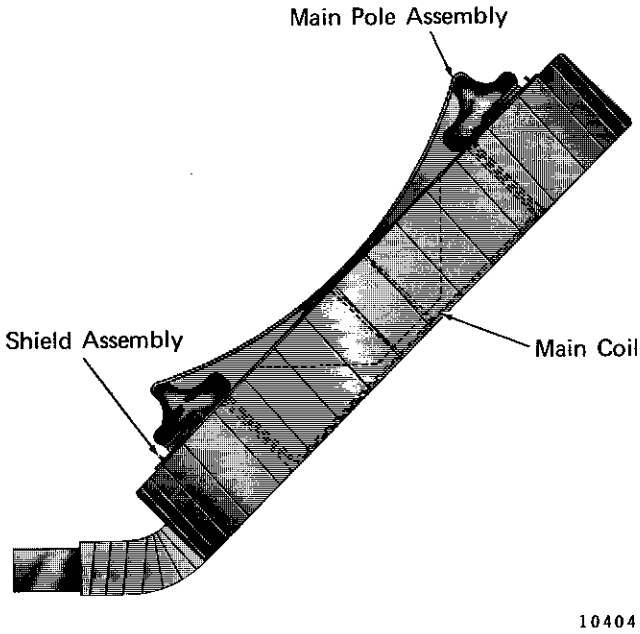


Fig. 6 – Main Coil Position On Pole And Shield

d. Check to see that pole is centered in coil. Coil should be snug and not move. If the coil can shift on the pole, place shims 8210639 at each end of long side of the pole to prevent coil movement. It may be necessary to use more than one shim in each location. When coils are properly assembled to pole piece, proceed to place coil in frame.

4. Index frame fixture so that location for No. 1 coil assembly is at top position. Using lifting fixture 8285824, position No. 1 coil on fixture and move assembly into frame with coil leads facing the pinion end, see Fig. 7. Align studs of coil assembly with holes in frame and raise coil. Apply nuts and lockwasher to pole studs and tighten nuts in sequence 1, 4, 2, 3, starting from commutator end stud. Remove lifting fixture.

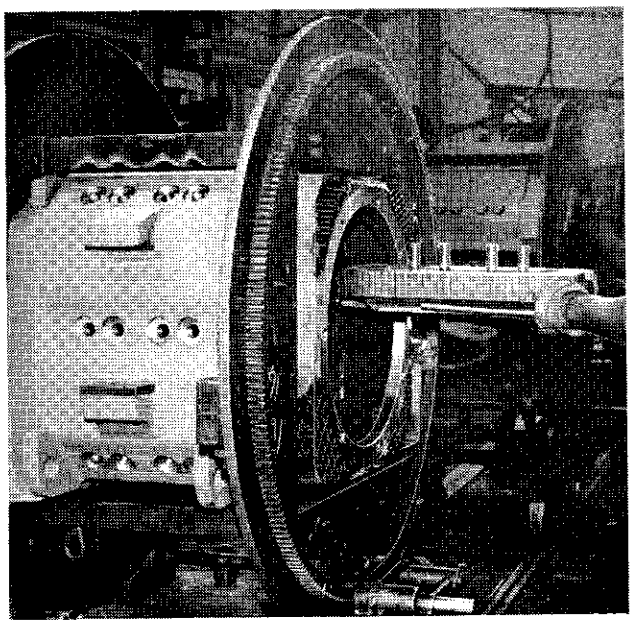


Fig. 7 – Main Coil Being Placed Into Frame

5. Index frame fixture so that location for No. 2 coil assembly is in top position. Repeat operation given for No. 1 coil assembly.

6. Repeat the operation for No. 3 and No. 4 coils using lineup pins 8287283 for No. 4 coil assembly. When No. 4 coil assembly is in position, remove the two lineup pins and install four bolts. Tighten up on 1 and 4 bolts to hold coil in frame. Bolts will be properly tightened after No. 4 coil is aligned.

NOTE: When applying No. 3 lockwashers and nuts, place a small amount of caulking compound 8133954 in the gap in lockwasher. The compound will provide a seal against moisture.

The No. 4 main pole bolts should be tack welded after the motor has been assembled and tested. This tack weld is necessary as no lockwashers are used with the bolts of the No. 4 coil assembly.

### Alignment Of No. 4 Main Field Coil

Before proceeding to connect the coils and install leads, it will be necessary to align the No. 4 main coil assembly. This can be accomplished by using adjusting screws 8285830 in conjunction with lineup gauge 8285829, see Fig. 8.

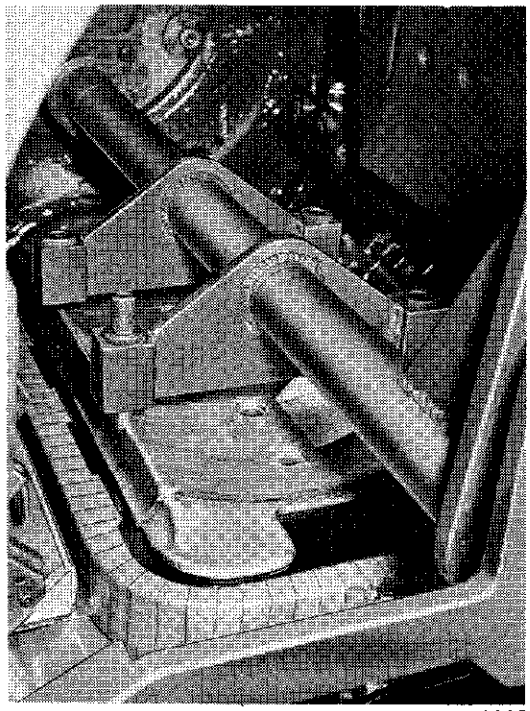

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Fig. 8 — Aligning Fixture In Position

The aligning fixture is inserted through the pinion end housing bore over the No. 4 coil assembly and secured at the commutator end by three lock screws. The fixture is positioned by locating it in the axle side brush holder block and the pinion end housing bore. Make certain mating surfaces of fixture and frame are clean and free of nicks to ensure alignment will be correct. Install fixture with the No. 4 position at the bottom.

When the alignment fixture is properly installed, check alignment of coil by inserting checking pin through lineup holes located at four corners of the main pole pieces. Shift pole piece as necessary using adjusting screws 8285830, between the No. 4 pole and adjacent pole piece.

When the pole has been properly aligned to the fixture, rotate No. 4 position to top and tighten all four bolts in sequence 1, 4, 2, 3. Remove adjusting screws and check alignment of coil. If still satisfactory, rotate frame fixture 90° and torque the four bolts. Tighten bolts in sequence 1, 4, 2, 3 in the following manner. Starting with the commutator end bolt, tighten to 600 ft-lbs. minimum, loosen to below 300 ft-lbs. and retorque to 300 — 325 ft-lbs.

Check alignment of coil once again and if still satisfactory, rotate No. 4 coil to bottom position and remove the lineup fixture.

Before proceeding to permanently connect coils, a ground test should be made to determine if coils are satisfactory, and the coils should be spaced to obtain proper commutation during operation.

### High Potential Test

Make temporary connections between the main coils using battery clips or similar clamps to hold coil leads together.

Apply positive electrode of high potential tester to external coil lead connection of either No. 3 or No. 4 coil and the negative electrode to the frame.

Ground test the coils at 4200 volts for 10 seconds. Discharge coils to ground after testing. Remove electrodes and clamps.

### Spacing Main Field Coils

Using gauge 8285831 and jack 8285832, Fig. 9, space main field coil assemblies No. 3, 2 and 1 in relation to No. 4 main coil. Space between edges of main pole assemblies, measured 2-1/2" in from the end of the laminations, is to have .030" maximum allowable variation between all poles.

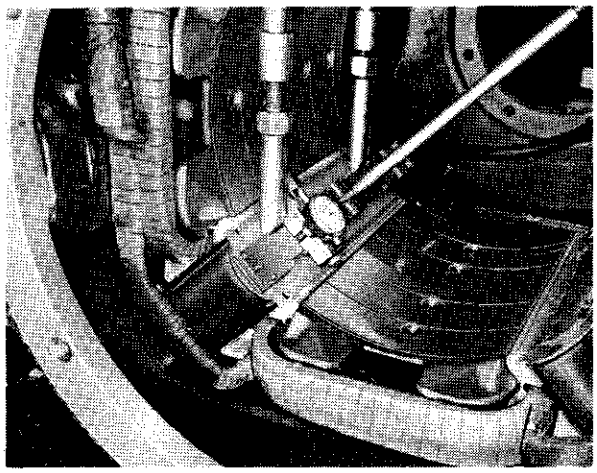

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Fig. 9 – Spacing Main Field Coil

CAUTION: DO NOT MOVE NO. 4 MAIN FIELD COIL ASSEMBLY during spacing operation. No. 4 coil has been positioned using linup gauge 8285829. All other spacing is done using the No. 4 as a starting point.

Check 1/16" minimum inner air baffle clearance between main coil and baffle, see Fig. 4.

Remove adjusting screws and baffle locating fixtures and torque the No. 1, 2, and 3 main pole bolts to 60C ft-lbs. in two passes. Tighten in sequence 1, 4, 2 and 3 starting from the commutator end stud.

Check air gap of main field coils using gauge 8285833.

### Brazing And Insulating Main Coil Connections

Brazing Connections

1. Index frame fixture so that No. 3 coil is in the bottom position. Fit "F" lead assembly through back grommet and locate 1-1/2" flat surface of terminal lug of "F" lead against bare copper at top end of No. 3 coil, see Fig. 4, Sec. B-B.

2. Apply flux 8116442 to lead and lug and insert a piece of silver brazing solder 8140503 between lead and lug.

3. Position brazing equipment over surface to be brazed and clamp the joint together. Wrap wet asbestos cloth around coil and lead insulation to protect insulation from heat.

4. Actuate the transformer to braze the joint together, being sure joint gets hot enough so silver solder will flow to obtain a good joint. Add silver brazing alloy to the edges as required as a filler.

5. When braze is completed, wait until solder has definitely solidified and then remove brazing equipment. Remove wet asbestos and brush joint clean.

6. Index frame fixture to position No. 4 coil, install and lineup "FF" lead to the No. 4 coil assembly and perform brazing operation as instructed for "F" lead. See Fig. 4, Sec. A-A, for "FF" lead position to No. 4 coil.

7. Index frame fixture so that the location where the lead ends of the No. 1 and No. 4 main coil overlap is at the bottom position. Align bottom lead of No. 4 main coil and bottom lead of No. 1 main coil so that lead ends are parallel and as close as possible with an overlap of 1". Be sure leads are clear of the frame.

8. Apply flux to surfaces to be brazed. Insert silver brazing pieces between leads and position equipment and braze connection as instructed. When brazing alloy has solidified, remove brazing equipment.

9. Index frame fixture so leads between No. 1 and No. 2 coils are at the bottom. Align top lead of No. 1 main coil to top lead of No. 2 main coil so that lead ends are as close as possible with an overlap of 1". Braze connection as previously instructed.

10. Index frame fixture so leads between No. 2 and No. 3 main field coils are at the bottom. Align bottom lead of No. 2 coil and bottom lead of No. 3 coil so that lead ends are as close as possible with an overlap of 1". Braze connection as previously instructed.

Insulating Connections

Insulate all brazed connections as follows:

1. Apply one layer of silicone rubber tape 8355873 half lapped over brazed connections. Make sure at least one width of tape covers the insulation on the coil leads on either side of the brazed connection.

2. On top of the silicone rubber tape, apply one layer of glass adhesive tape 8395904 half lapped and extending slightly beyond both ends of the glass and mica tape.

3. Apply air dry red enamel to all taped areas.

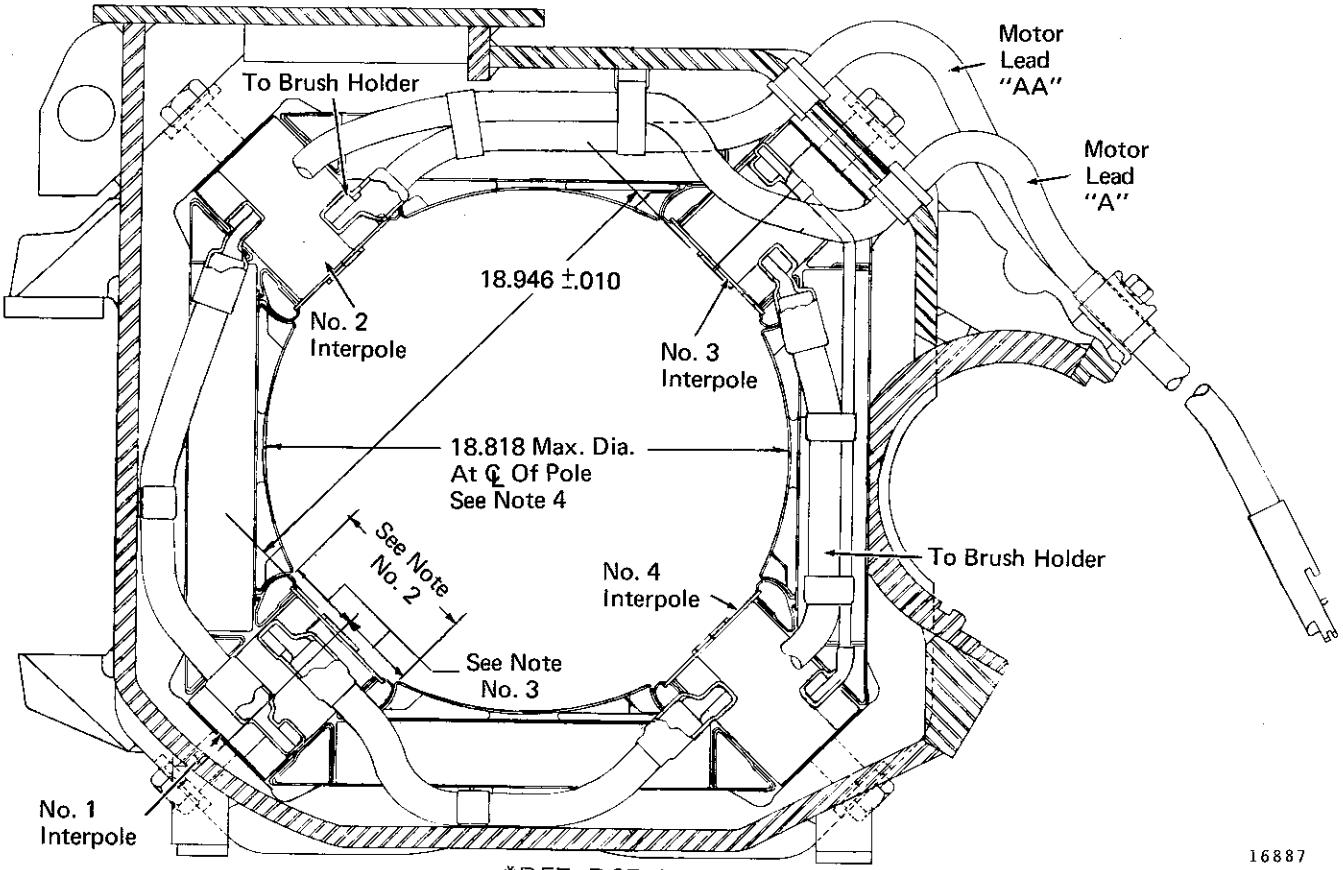
## INSTALLING INTERPOLE COILS

The installing of the interpole coils is accomplished in much the same manner as the main field coils, using lifting fixture 8285823 and guide pins to position the coil. The coils are then spaced between main field coils using spacing gauge 8285835 and 8285842. Air gap is then checked to make certain proper clearance exists between the armature and poles.

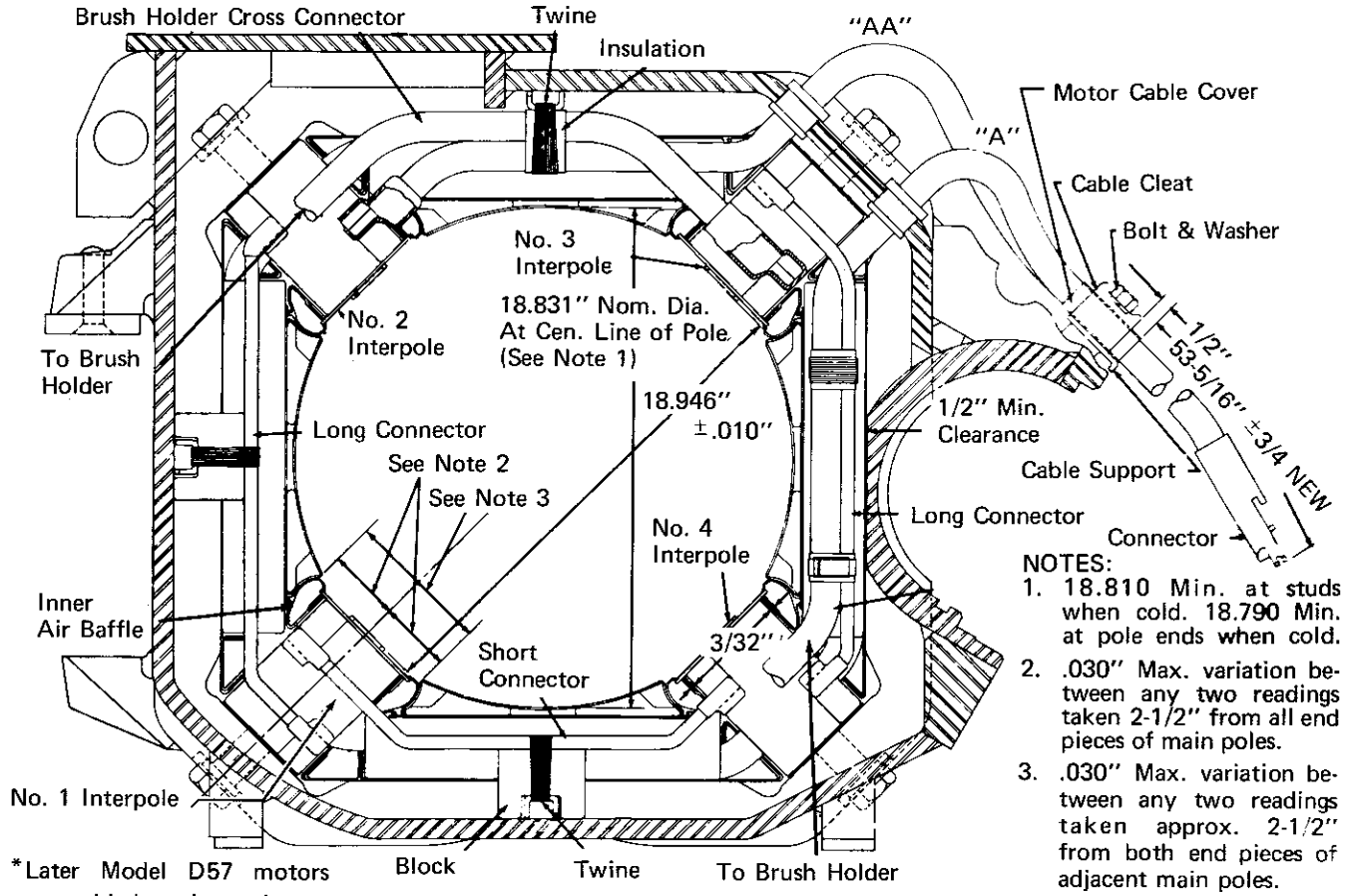
The interpole coil assemblies are identical and may be placed in any interpole position. Connections between the four coils determine their proper polarity.

By referring to Fig. 10, it will be noted that interpole positions are identified as 1, 2, 3 and 4. Then proceed as follows:

1. Index frame fixture so the location for No. 2 interpole assembly is at top position.




*D57, D67, D77, D75




*Later Model D57 motors were cabled as shown in top illustration.

D37, D47, D57*

NOTES:

1. 18.810 Min. at studs when cold. 18.790 Min. at pole ends when cold.
2. .030" Max. variation between any two readings taken 2-1/2" from all end pieces of main poles.
3. .030" Max. variation between any two readings taken approx. 2-1/2" from both end pieces of adjacent main poles.
4. 18.790 Min. at studs when cold. 18.775 Min. at pole ends when cold.

Fig. 10 — Coil Position And Connection From C.E.

2. Position interpole coil on lifting fixture 8285823, placing coil leads toward the commutator end of the frame and the bolt holes up.

3. On the end of the coil opposite from its leads will be noted vertical paint marks. These marks indicate the number of steel shims 8206527 that must be assembled with the coil as it is placed into the frame. These shims are necessary to maintain a tight coil. Add only amount specified, making certain that all shims are aligned centrally on top of the coil and do not overlap onto the pole piece.

NOTE: If the shims are permitted to get between the pole piece and the frame, the air gap between opposite interpole will be too small.

4. Install two temporary aligning studs into pole piece holes 1 and 4. Insert coil assembly into the frame through the pinion end housing bore. Align studs to frame and raise coil within approximately 1/4" of pole pad of frame.

5. Make sure all shims are properly aligned on top of the coil. Position inner air baffle centrally located with respect to projections on the interpole washer.

6. Insert coil bolts and washers into pole bolt holes 2 and 3 and tighten. Remove lifting fixture from the frame and remove the temporary aligning studs from coil holes 1 and 4.

NOTE: Be sure inner air baffles are not distorted when bolts are tightened.

Index the frame fixture as necessary and install the three remaining interpole coils making certain coil leads face the commutator end of the frame, the proper amount of steel washers has been properly applied, and the inner air baffles are properly installed.

### Spacing Interpole Coils

To be assured of proper motor performance, it will be necessary to space each interpole coil in relation to its adjacent main field coils. This can be accomplished by:

1. Using gauge 8285835 and adapter 8285842 to check the spacing.

2. Use interpole jack 8285843 to move the interpole as necessary to obtain a maximum allowable variation of .030" between all the poles. Take measurements approximately 2-1/2" from both end pieces of adjacent main field poles. Loosen or tighten 2nd and 3rd bolts of coil assembly when applying jacks to move coil assembly to desired position.

NOTE: Do not move the main field coils when spacing the interpole coils.

3. When the coils are properly spaced, check the space between the interpole coils and baffles, see Fig. 10. Minimum allowable clearance is 1/16".

4. Check air gap between opposite interpoles using gauge 8285840. Install 2 and 3 bolts to interpole coil and tighten. Tighten interpole coil bolts to 600 to 700 ft-lbs. torque. Tighten in seqence 2, 3, 1, 4 starting from the commutator end bolt.

### High Potential Test

Before proceeding to connect coils, a ground test should be made to the interpole coils to determine if coils are satisfactory to proceed. Use coil connector assemblies and temporary clamps to make connections between the coils, connecting bottom coil leads of No. 3 and No. 4, the top leads of No. 4 and No. 1, and the bottom leads of No. 1 and No. 2 coils together.

Apply positive electrode of high potential tester to the external lead connection of No. 2 coil and the negative electrode to the frame. Ground test the coils at 4200 volts for 10 seconds. Discharge coils to ground after testing and remove high potential test equipment, clamps and connectors.

## BRAZING AND INSULATING INTERPOLE COIL CONNECTIONS

Brazing Connections

1. Index frame fixture so No. 2 interpole is at the bottom position.

2. Position one long connector assembly between frame side leads of the No. 2 and No. 1 interpole coil so the short bent end of the connector rests under the frame side lead of the No. 2 interpole coil, see Fig. 10. Temporarily clamp the other end of the connector assembly to the bottom lead of No. 1 interpole.

3. Apply flux to lead and connector at No. 2 interpole coil and insert silver brazing piece between lead and connector. Place wet asbestos cloth around lead and connector insulation and move brazing equipment into position from the commutator end of frame.

4. Braze connection as instructed for main field connections.

While frame is still in this position, install "AA" lead through grommet in frame and locate the 1" flat surface of lead terminal lug against bottom armature side of the coil lead for the No. 2 interpole coil. Braze connection as previously instructed.

Remove brazing equipment and index frame so No. 1 interpole coil is in the bottom position.

Remove the temporary clamp holding connector to the No. 1 interpole coil and proceed to braze the connection as previously instructed.

While the frame is still in this position, install a short connector assembly between the No. 1 and No. 4 interpole coils. Place the long bent end on top of the top coil lead of No. 1 coil and the short bent end on the top lead of No. 4 coil, see Fig. 10. Apply a temporary clamp at No. 4 coil connection, position connector at No. 1 coil and braze connection as previously instructed.

After the silver solder has solidified, remove the brazing equipment and index the frame so No. 4 interpole coil is at the bottom position.

In the same manner install a long connector assembly between bottom leads of the No. 4 and No. 3 interpole and place this connector on the bottom side of the leads. Position frame as necessary and braze end of the connector assembly to the coils.

Locate the remaining interpole coil connecting cables at each interpole and braze as previously described.

Insulating Connections

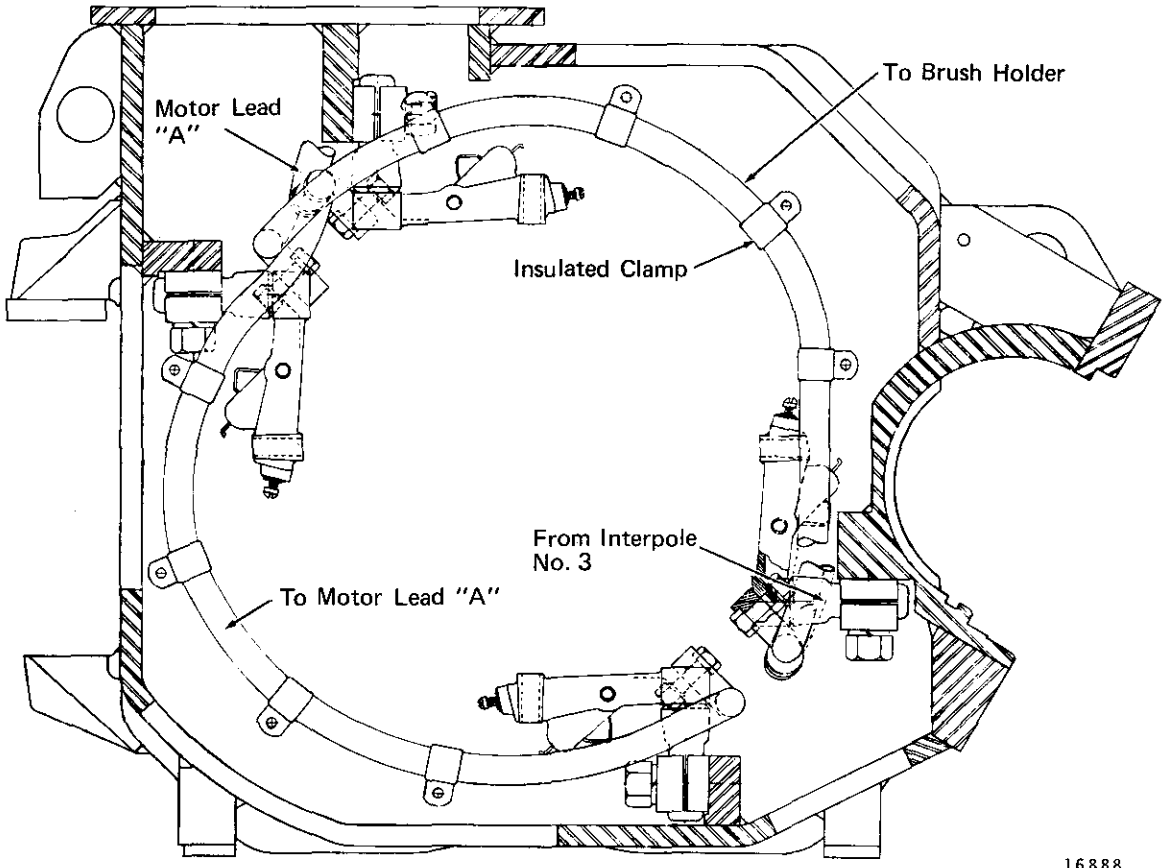
1. Apply two layers of silicone rubber tape 8355873 half lapped to brazed connections. Start taping two tape widths before joint over original insulation and finish taping two tape widths beyond joint over original insulation.

NOTE: On some models a vibration damping block was used between the No. 1 interpole coil connectors and between the No. 2 interpole coil leads. Be sure to install this damping block where used.

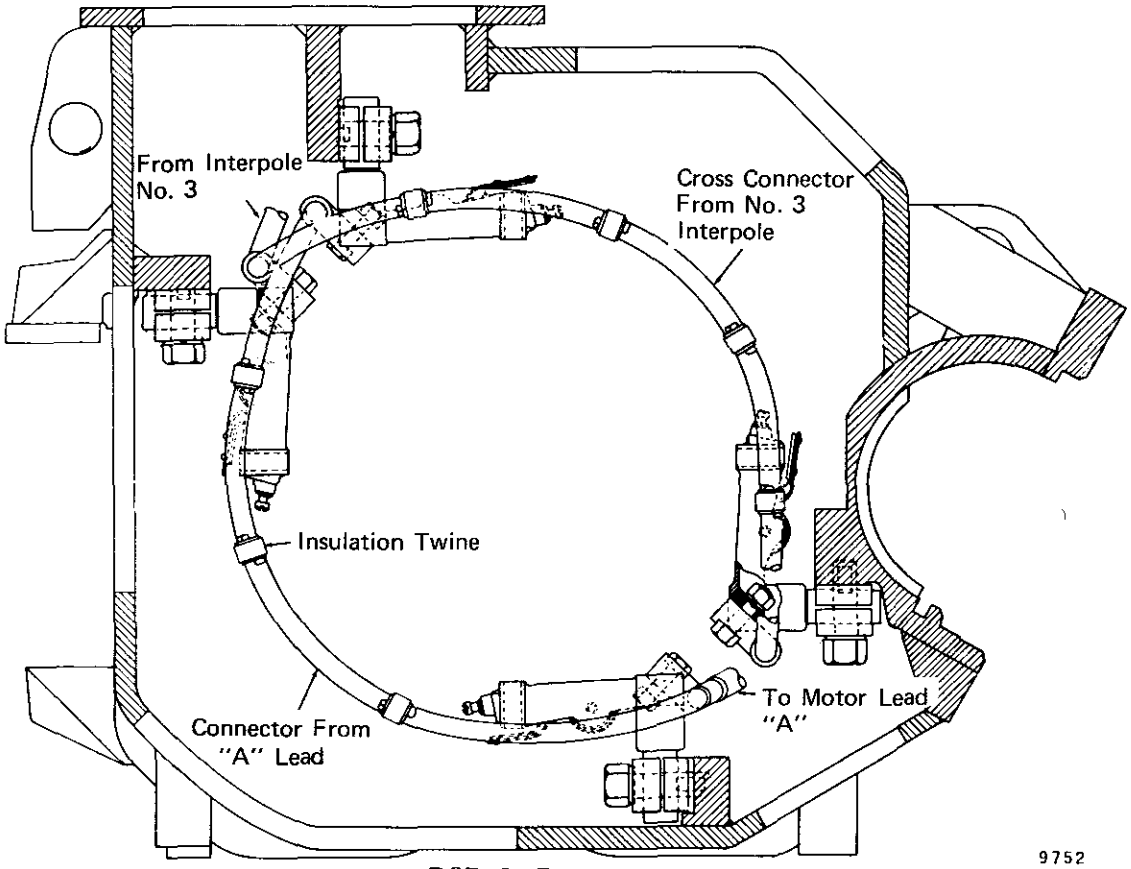
2. Tape over the silicone rubber tape with one layer of glass adhesive tape 8395904 half lapped. Extend the start and finish tape one half the tape width beyond the rubber tape.

## INSTALLING AND TYING BRUSH HOLDER CROSS CONNECTORS AND MOTOR LEADS

Install dummy brush holders 8285845 in their proper position as shown in Fig. 11. Connect the brush holder cross connector leading from the No. 3 interpole coil to the vertical brush holders as shown in Fig. 11 for the specific model. Secure the cross connector with metal tie eyes and torpedo twine for the older models and with insulated clamps for the later models as shown in Fig. 11.




D67, D77, D75




D37, D47, D57

Fig. 11 — Securing Brush Holder Cross Connectors

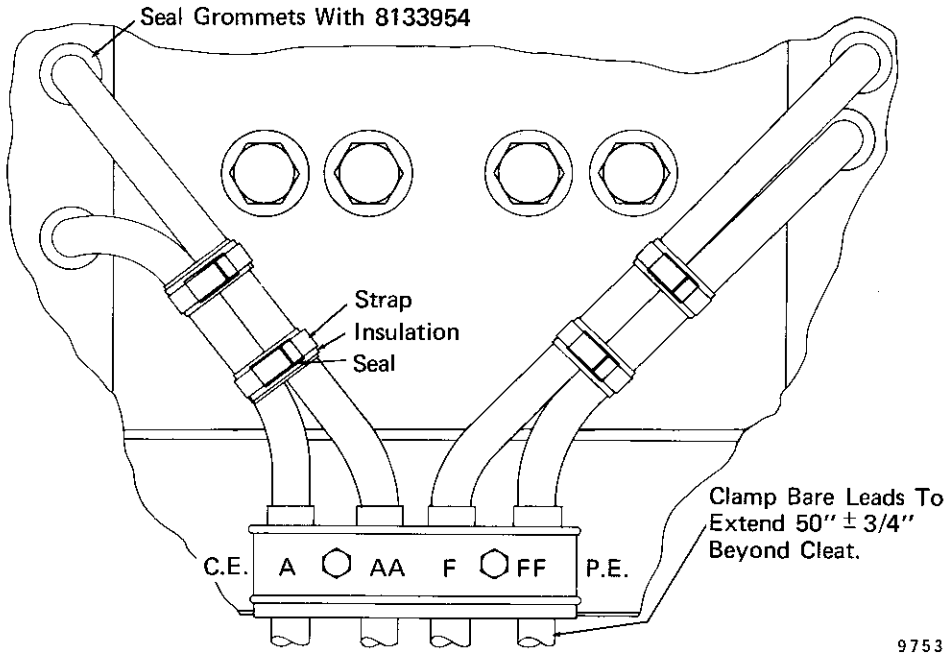



Fig. 12 – Exterior Cable And Tie Arrangement

On older model motors install the interpole connector support blocks, one between the No. 1 and No. 4 interpole coils and the other between No. 1 and No. 2 interpole coils, as shown in Fig. 10.

Install motor lead "A" through the frame grommet and to the horizontal brush holder and then the cross connector from one horizontal brush holder to the other horizontal brush holder as shown in Fig. 11 for the specific model. Secure the motor lead and cross connector as it was originally secured, see Fig. 11. Remove dummy brush holders.

Where insulation at lead areas of field and interpole coils is cracked or damaged during alignment of leads for brazing, repair cracks with silicone rubber compound 8305837 (tube) or 8345495 (cartridge).

The next operation will be to position the external cables as shown in Fig. 12, using cable cover 8195959 between the cleat and cable. Use insulation 8171966, strap 8171967, and seal 8164478 to make the four external ties on the cables.

Seal the joint between the cable and grommets with compound 8133954.

With all operations of the stator overhaul completed, the interior should be painted using red enamel 8061130, protecting the housing bores and face, brush holder terminals, and brush holder blocks from the enamel.

After the enamel has been given time to dry, install brush holder and take polarity and resistance test of the stator as previously instructed.

Apply a high potential test of 4200 volts for 10 seconds to the completed stator at ambient temperature.

## MAINTENANCE DATA

### EQUIPMENT LIST

| | |
|---|---|
| Frame positioning fixture | 8285821 |
| Lifting device for frame fixture | 8285822 |
| Interpole coil lifting fixture | 8285823 |
| Main field coil lifting fixture | 8285824 |
| Brazing equipment | 8261812 |
| Sockets | 8287282 |
| Sockets | 8287281 |
| Positioning fixture (outer air baffle) (4 needed) | 8285828 |
| No. 4 main field lineup gauge | 8285829 |
| Main field lineup pins | 8287283 |
| Adjusting screws No. 4 main coil (2 needed) | 8285830 |
| Main field spacing gauge | 8285831 |
| Main field spacing jacks (2 needed) | 8285832 |
| Main field air gap gauge | 8285833 |
| Interpole coil spacing gauge | 8285835 |
| Interpole coil spacing gauge adapter | 8285842 |
| Interpole coil jacking screw (2 needed) | 8285843 |
| Interpole air gap gauge | 8285840 |
| Dummy brush holder (2 needed) | 8285845 |
| Steel binder set | 8285846 |
| Thermo grip pliers | 8064918 |
| Torpedo twine | 8133163 |
| Strap | 8171967 |
| Cable cover | 8195959 |
| Seal | 8164478 |
| Caulking compound | 8133954 |
| Red enamel | 8061130 |
| Insulator piece | 8094998 |
| Insulation | 8148779 |
| Insulation | 8171966 |
| Shims | 8210639 |
| Steel shims | 8206581 |
| Flux | 8122570 |
| Flux | 8116442 |
| Solder — 50-50 | 8225761 |
| Solder — Pure tin | 8069984 |
| Solder — Silver brazing | 8140503 |
| Silicon compound (tube) | 8305837 |
| Silicone compound (cartridge) | 8345495 |
| Silicone rubber tape | 8355873 |
| Glass adhesive tape | 8395904 |

Litho in U.S.A.