



M AINTENANCE I NSTRUCTION

FRACTIONAL HORSEPOWER MOTORS MODELS A-731, A-9385 AND A-732

DESCRIPTION

The Model A-731 fuel pump motor, Fig. 1, is a 1/4 HP, 4.3 amperes, 64 volt DC, 1100 RPM motor with a double end shaft. The Model A-9385 fuel pump motor is identical to the A-731 with the exception of having a single end shaft.

The Model A-732 cab heater motor, Fig. 2, is a 1/6 HP, 2.5 amperes, 72 volt DC, 1350 RPM motor with a single end shaft.

All three models are assembled with shielded, sealed grease packed ball bearings, requiring no additional lubrication. Their rotation is counterclockwise when viewed from the commutator end.

Two brushes are mounted at angles with the surface of the commutator and are held under pressure by coil springs.

Due to their similarity, the maintenance instructions which follow will apply to all three models of motors. Any exceptions will be specifically identified.

MAINTENANCE

Motors of this type perform important functions and should be kept in good working condition. Besides the specific inspection intervals outlined in the Scheduled Maintenance Program, Maintenance Instruction 1704, these motors should be given additional attention as necessary to insure the continuous trouble free operation expected of them.

INSPECTION

The motor and device it drives should be inspected for tightness of the



Fig. 1 - Model A-731 Fuel Pump Motor



Fig. 2 - Model A-732 Cab Heater Motor

coupling or connection and for freedom of rotation. Circuit connections to the motor should be tight with voltage drop at terminals not to exceed 10% of rated voltage. Using a megohmmeter, check for

* THIS BULLETIN IS COMPLETELY REVISED AND SUPERSEDES M.I. 806.

grounded armature and frame. A reading of less than one megohm will necessitate removing the motor from service for further inspection and overhaul if necessary to determine and correct the difficulty.

CLEANING

The motor exterior should be wiped to keep it free of oil and dirt accumulations. Remove the inspection covers and occasionally blow out the motor interior with clean, dry, low pressure air to remove carbon dust and dirt.

In severe cases of dirt and oil accumulations, the use of a cloth, dampened with solvent may be necessary to properly clean the motor. When using solvents take care to prevent it from coming in contact with the commutator. Also allow the motor to dry thoroughly before returning it to service.

BRUSHES

The brushes should be free to move in the brush holder slots. If they bind or stick, remove the brushes and correct the cause. If the brushes are chipped or worn shorter than 3/4" they should be replaced. Replacement brushes should be the same grade as those removed.

When new brushes are installed, they should be sanded-in by placing a strip of #00 grade sandpaper, sand side up, on the commutator under the brushes and rotate the armature by hand in the direction of normal rotation. Rotate until brush is seated to the contour of the commutator. Remove the sandpaper and blow out carbon dust. If the brushes squeal during operation they should be sanded-in to remove the squeal. Never lubricate the commutator.

Brush spring pressure should be checked and meet the requirement listed in the Maintenance Data section. Replace the springs when pressure is low.

COMMUTATOR

The commutator should be inspected to see that the slots between the bars are free of dirt. Surface of the commutator should present a polished appearance free from pitting, burning or raised bars. Check the section where the armature windings connect to the commutator for evidence of loose connection or thrown solder. If any of these conditions exist, the motor should be removed from service and repaired.

If there is only slight pitting from arcing of the brushes, the surface should be cleaned with fine sandpaper. Never use emery or carborundum paper.

BEARINGS

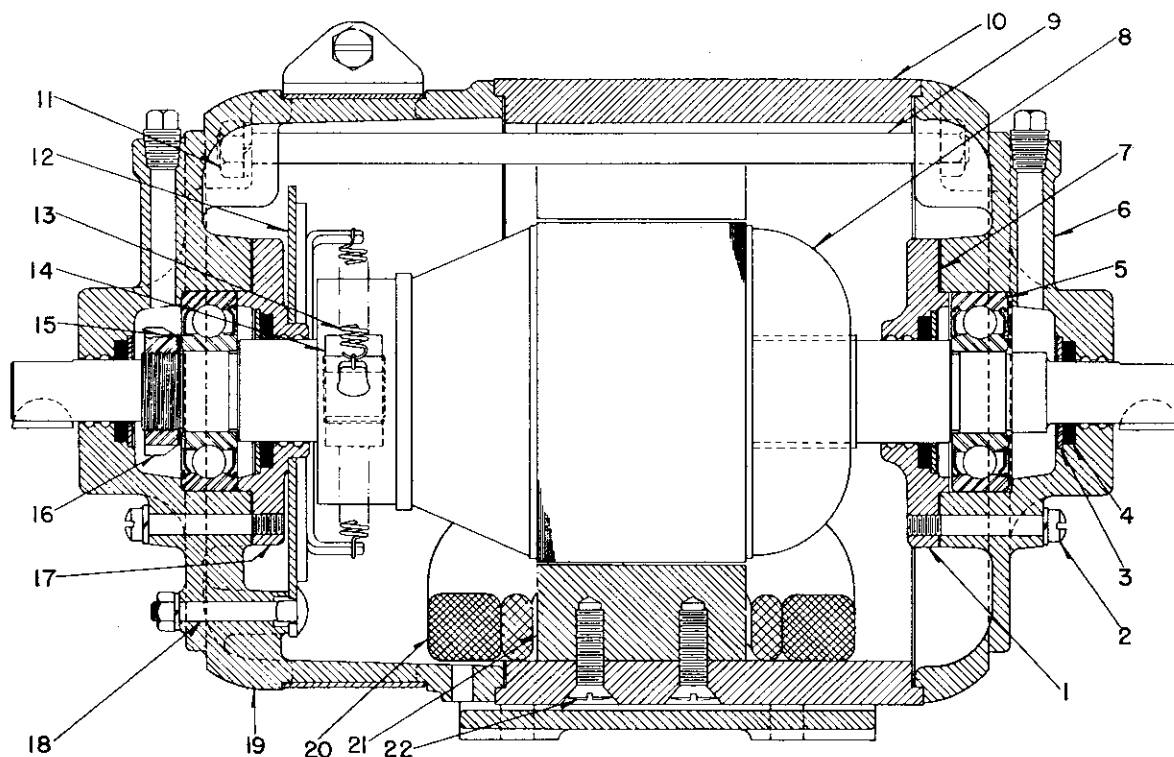
The ball bearings are of the sealed grease type and require no further lubricating during operation. When the motors are overhauled, the used bearings should be scrapped. Always reassemble the motors using new sealed bearings.

NOTE: Some of the early motors of these models were constructed to be lubricated during operation. These motors, when overhauled, should be reassembled using sealed bearings. The lube holes should be plugged to prevent the addition of unnecessary grease.

Bearings should be checked during operation by listening or feeling for roughness. Any suspicious noise or vibrations should warrant the motor's removal to prevent complete bearing failure and severe damage to the motor components.

OVERHAUL

When it becomes necessary to overhaul the motors either for defects found during inspection or because of the overhaul period as outlined in Scheduled Maintenance Program 1704, refer to Fig. 3 or Fig. 4 and follow the suggested procedure below.



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|-------------------------------|----------------------|----------------------------|------------------------|
| 1. Bearing Cover | 6. End Frame | 12. Brush Bracket | 17. Bearing Cover |
| 2. Bearing Cover
Cap Screw | 7. Gasket | 13. Brush Spring | 18. Brush Bracket Bolt |
| 3. Expansion Plug | 8. Armature | 14. Brush With Hook | 19. End Frame |
| 4. Felt Seal | 9. Through Bolt | 15. Bearing Lock
Washer | 20. Field Coil |
| 5. Ball Bearing | 10. Motor Frame | 16. Bearing Lock Nut | 21. Pole Piece |
| | 11. Through Bolt Nut | | 22. Pole Piece Screw |

Fig. 3 - Cross-Section Fuel Pump Motor

NOTE: Because of the similarity of the motors, information given below applies to all models except where otherwise noted.

DISASSEMBLY OF MOTOR

1. Remove cover band or cover plates.
2. Disconnect the brush leads and field leads. Remove the brushes.
3. Remove the screws from both ends of the motor holding the bearing caps to the end frames.
4. Remove the key from the shafts.
5. Remove the two through bolts.
6. Tap gently on the shaft extension opposite the commutator end to free

the armature and commutator end housing assembly from the frame.

7. Remove this assembly and place on a suitable stand to remove the bearings.

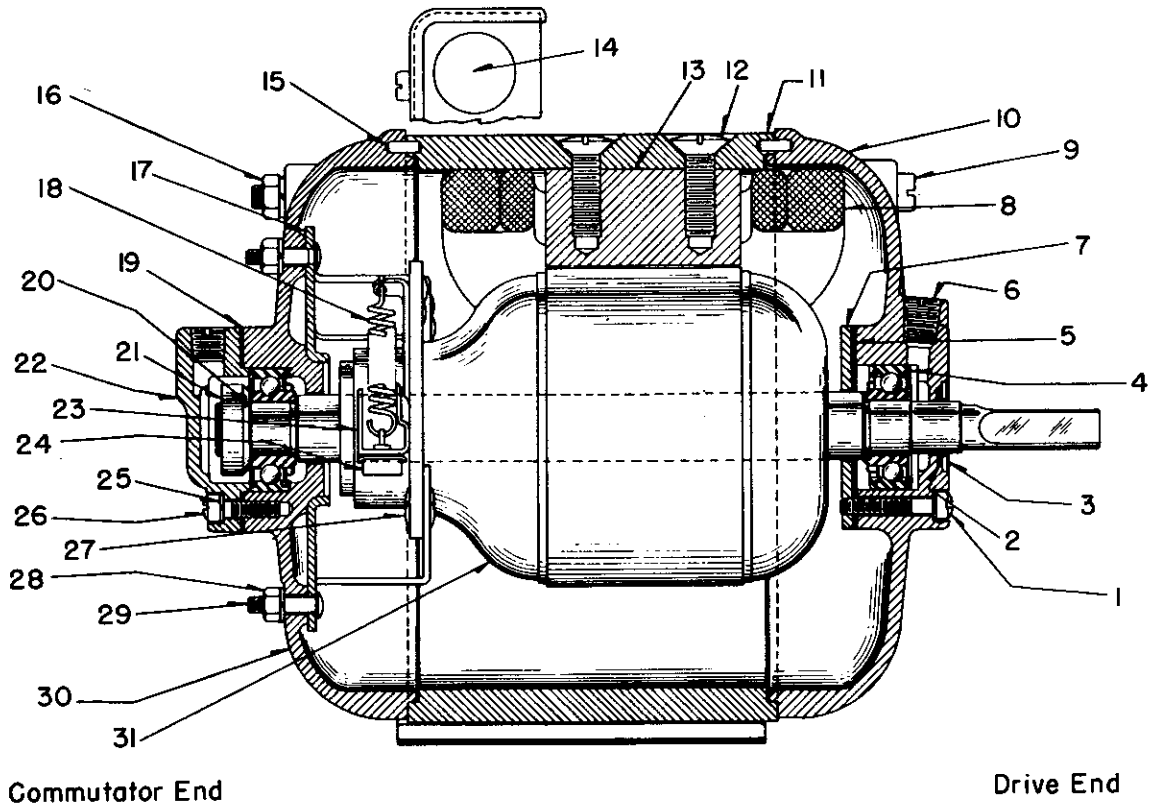
8. Remove the commutator end housing.

NOTE: On the fuel pump motor it will be necessary to remove the brush bracket screws to allow the commutator end housing to move off the bearing.

9. Remove the drive end housing from the frame.

10. Remove the bearing lock washer and nut from one end or both ends depending on type being dismantled.

11. Remove bearings and bearing caps from armature using puller or one



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|-------------------------------|---------------------------|----------------------------|-----------------------------------|
| 1. Bearing Cover
Cap Screw | 9. End Frame Bolt | 17. Brush Bracket Plate | 25. Lock Washer |
| 2. Felt Seal | 10. End Frame | 18. Brush Spring | 26. Bearing Cover
Cap Screw |
| 3. Expansion Plug | 11. Motor Frame | 19. Gasket | 27. Brush Holder
Bracket Rivet |
| 4. Ball Bearing | 12. Pole Piece Screw | 20. Bearing Lock
Washer | 28. Brush Holder Nut |
| 5. Gasket | 13. Pole Piece | 21. Bearing Lock Nut | 29. Brush Bracket Bolt |
| 6. Pipe Plug | 14. Conduit Box | 22. Bearing Cover | 30. End Frame |
| 7. Bearing Cover | 15. Locating Dowel
Pin | 23. Brush Holder | 31. Armature |
| 8. Field Coil | 16. End Frame Nut | 24. Brush With Hook | |

Fig. 4 - Cross-Section Cab Heater Motor

similar to that illustrated in Service Tools Catalog 91B, Section G.

off excess solvent with low pressure high volume air. No electrical inspection should be made while armature is still wet from the solvent.

12. Discard old bearings and gaskets.
13. Clean out grease cavities in bearing cap and end frames.
14. Remove old felt seals and expansion rings.
15. Clean and check all parts. Replace any parts showing wear or damage.

When the armature is clean and dry perform the following checks:

ARMATURE

The armature should be cleaned before any electrical inspections are made. Stoddard solvent may be used, blowing

1. Using a megohmmeter check the armature insulation to ground. If less than one megohm, armature may be wet. Place in a convection oven set at 160° C. and dry armature for 3 hours, then remove and cool to room temperature. If reading is still low, armature should be repaired or replaced. If the reading has come up, proceed with the inspection.

2. Visually check shaft diameters to see that they are in good condition.
3. Check the commutator for all defects listed under "Commutator."

If there is evidence of raised or loose bars, armature should be replaced. Should there be signs of solder thrown out of the connection area between the armature windings and the commutator, they should be resoldered. When the commutator is badly worn or burned, the armature should be placed in a lathe and the commutator turned just enough to give a uniform surface. See Maintenance Data section for limits on commutator while turning. The peripheral speed of the commutator surface should be about 300 ft./min. Round off the ends of the commutator bars to break the sharp edges.

The area between the commutator bars should then be undercut $1/32''$ deep and $.030''$ wide.

After undercutting, polish the commutator surfaces with #00 sandpaper. Remove all mica fins and see that no copper chips remain in the slots.

With a dial indicator, check the out-of-round of the commutator. It should be within $.001''$ total indicator reading.

4. Armature should be given a test for shorts and open circuits.
5. Hy-pot at 500 volts for 10 seconds. If the armature passes the above check it should be given a varnish treatment as follows:
 - a. Place armature in a convection oven set at $120-130^{\circ}\text{C}$. for 2 hours.
 - b. Remove from the oven and while hot, dip the armature into clear baking varnish 8136692 for 3 minutes. Be careful not to get varnish on the commutator.

NOTE: Varnish viscosity should be maintained between 40 and 55 seconds at 21.1°C . using a #4 Ford cup. Average varnish temperature should be maintained between 20° and 50°C .

- c. Remove the armature from the varnish. Clean varnish off the shaft using Xylol 8089758.
- d. Place the armature in the oven now set for 160°C . and bake for 4 hours.
- e. Remove and cool.

FIELD COILS

The field coils should be clean and free from all dirt and oil. The field coils may be cleaned using Stoddard solvent. Blow off the excess solvent and let coils dry before any electrical checks are made. Proceed with inspection as follows:

1. Using a megohmmeter check the insulation to ground as outlined under "Armature."
2. Coil leads and connections must be secure and all taping intact.
3. Check resistance of field coils using data outlined in the Maintenance Data section.

Whenever resistance is out of tolerance, connection between coils should be examined for possible cause before replacing coils.

4. If insulation on the coils is charred or brittle and the coil checks within limits, the insulation should be replaced.
5. To remove the field coils disconnect the leads that join them together. Remove the bolts which hold the pole and coil through the end of the frame. The field coil can readily be slipped off the pole.

6. Reconnect replaced coils as indicated in connection diagram, Fig. 5.
7. When the field coil and frame assembly has been repaired, recheck resistances and megger check. If satisfactory, varnish treat assembly as outlined under "Armature." Protect leads and connections from varnish.

5. Place bearing cover and a new gasket on drive end of shaft. Place a new factory-packed bearing on shaft and tap in place up to the shoulder of the shaft with the aid of a brass tube. Tapping should be done around the inner race only. Do not strike the outer race of ball bearings when driving bearing on shaft.

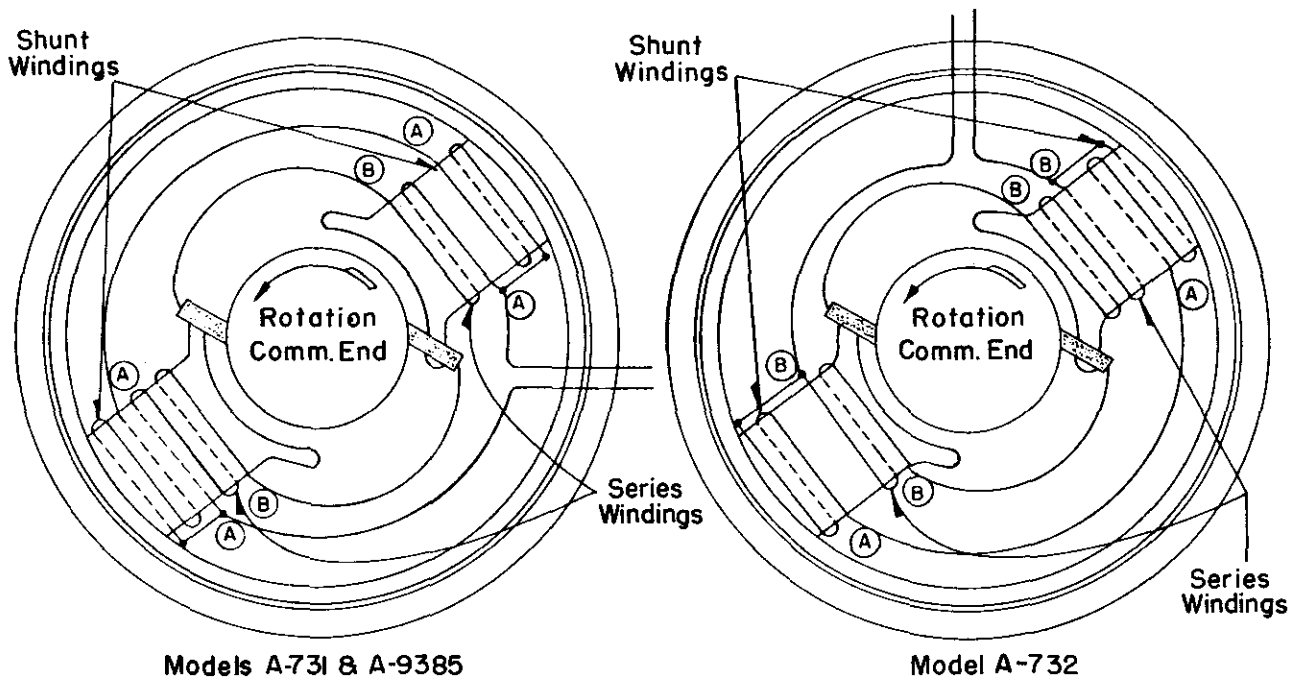
ASSEMBLY OF MOTOR

1. Place new felt seals and expansion rings in caps and end frames.
2. Place armature in motor frame.
3. On A-731 and A-9385 motors, apply 1/2 oz. of Calol OHT grease 8190451 on each side of the double shielded bearings and in the cavity surrounding the bearing.
4. On the A-732 motor, apply 1/2 oz. of Calol OHT grease on the shielded side of the bearing toward the end of the shaft, and in the cavity surrounding the shielded side of the bearing.

NOTE: Install new double shielded bearings in Model A-731 and A-9385 motors. In Model A-732 motors, install new sealed-shielded bearings with the sealed side toward center of motor.

On A-731 type, place bearing cover on commutator end of shaft and a new gasket on this cover. Place a new factory-packed bearing on shaft and tap bearing in place. Place lock washer and lock nut on shaft. Tighten lock nut and secure nut with lock washer.

On the A-732 type, insert the bearing into the commutator end frame and



Note-Leads marked (A) leave coils on coupling end.
 Leads marked (B) leave coils on commutator end.

Fig. 5 - Connection Diagrams

place this assembly on the shaft. The armature should be out far enough to prevent the endframe from striking the motor frame. Place lock washer and lock nut on shaft and tighten nut against inner race of bearing. Secure nut with lock washer.

CAUTION: Do not force the outer race of bearing into its housing by blows on the inner race.

Apply end frames over ball bearings and line up bearing covers to end frames and secure with cap screws.

Permanently seal bearing housing by installing a pipe plug in threaded opening.

Hy-pot assembly using 440 volts AC for 1 second.

BRUSH SETTING (KICK NEUTRAL)

Having reassembled the motor and before it is put into service, it is of the utmost importance that the brushes are placed in the proper location with respect to electrical neutral. When it is necessary to check this position the following instructions should be used:

1. Lift all brushes off the commutator.
2. Count the number of commutator bars and main field poles. Divide the number of commutator bars by the number of main field poles.
3. Locate the center of one bar and count off bars to equal the number found in Item 2. This will be the span. Mark the center of the last bar in the span.
4. Position the center of a brush and its holder on the center of the first bar.

The center of the last bar in the span should now be near the other brush.

5. Apply current from a 6 volt storage battery to the main field. Include a switch in the field circuit.
 6. Use a 50 millivolt center reading voltmeter. With the leads and prods from the meter, place the prods on the first and last bar of the span. Kick the field by opening and closing the field circuit switch. Note the deflection on the meter. Rotate the armature about one commutator bar and kick the field by opening and closing the field circuit switch. Note the deflection on the meter. If the second reading is greater than the first and of the same polarity, the armature was rotated in the wrong direction. If the meter shows a deflection of the opposite polarity, the neutral point has been passed. Follow the above pattern of rotating the armature until the deflection of the meter is zero or as near zero as possible.
 7. Hold the armature in this position and rotate the brush bracket so that the center line of the first brush lines up with the first bar center and the second bar center lines up with the other brush center. Work to $\pm 1/64''$ of location setting.
 8. A recheck should be made of kick neutral after moving the brush bracket to make certain the armature did not move.
- Motorize to check for proper rotation of armature; should be counterclockwise when viewed from the commutator end.

MAINTENANCE DATA

	Model A-731 & A-9385 Motor	Model A-732 Motor
Brush Pressure		
New brush	14.5 ozs.	9.5 ozs.
Worn brush	7.5 ozs.	4.0 ozs.
Brush wear	5/8" off new brush (3/4" minimum length)	5/8" off new brush (3/4" minimum length)
Resistance		
Shunt field	69-76 ohms each	392-436 ohms total
Series field	.071-.079 ohms each	.31-.344 ohms each
Armature	1.19-1.31 ohms between opposite bars	2.5-2.75 ohms between opposite bars
Air gap	.032"-.036"	.027"-.031"

NOTE: All resistance values are given at 25° Centigrade or 77° Fahrenheit.

Commutator Limits

Commutator diameter condemning limit	2-21/32"	1-23/32"
Neck width condemning limit	7/64"	7/64"
Maximum runout	.001" total indicator reading	.001" total indicator reading