



Maintenance Instruction

TRACTION MOTOR OVERHAUL

Traction motor overhaul instructions are presented in seven sections, each under separate cover, and contain detailed instructions to completely disassemble, inspect, overhaul, assemble, and test the traction motor. Refer to Maintenance Instruction 3900 for general or "running" maintenance of the traction motor and also for procedures to remove the traction motor from the locomotive truck. These instructions apply to Models D37, D47, D57, D67, D75, and D77 traction motors unless specifically identified.

<u>Section No.</u>	<u>Title</u>
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2	Bearing Component Inspection
3	Stator Inspection And Reconditioning - Mechanical
4	Stator Inspection And Reconditioning - Electrical
5	Armature Inspection And Reconditioning
6	Armature Overhaul
7	Motor Assembly

SECTION 1 DISASSEMBLY

INTRODUCTION

All of the models are similar in appearance and are the same general size, Fig. 1. The differences are internal improvements to later models which have progressed from the original Model D37 to improve service life and to increase motor output.

The later model motors are similar to the Model D37 with the following differences:

- D47 Increased copper size in stator field.
- D57 Application of a modified silicone varnish to armature coils to improve heat resistance, improved commutator seasoning, and the use of constant pressure brush holders.
- D67 New armature coil construction to reduce temperature and moisture.

New type brush holders with longer brushes for extended brush life.

NOTE: The longer brushes can not be used on Models D37, D47, or D57 unless brush holders are changed or modified.

Nylon grease retaining insert in pinion end bearing cover to prevent grease purging.

A new axle cap oil overflow arrangement to prevent overfilling.

A manganese-steel wear plate to the motor nose support to obtain longer wear plate service life.

A new high temperature varnish.

Commutator end recabbling to reduce temperature of commutator end bearing under high speed, high current, dynamic braking.

- D77 A thinner armature insulation (polyimide film) which allows an approximate 20% increase in armature coil copper.

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

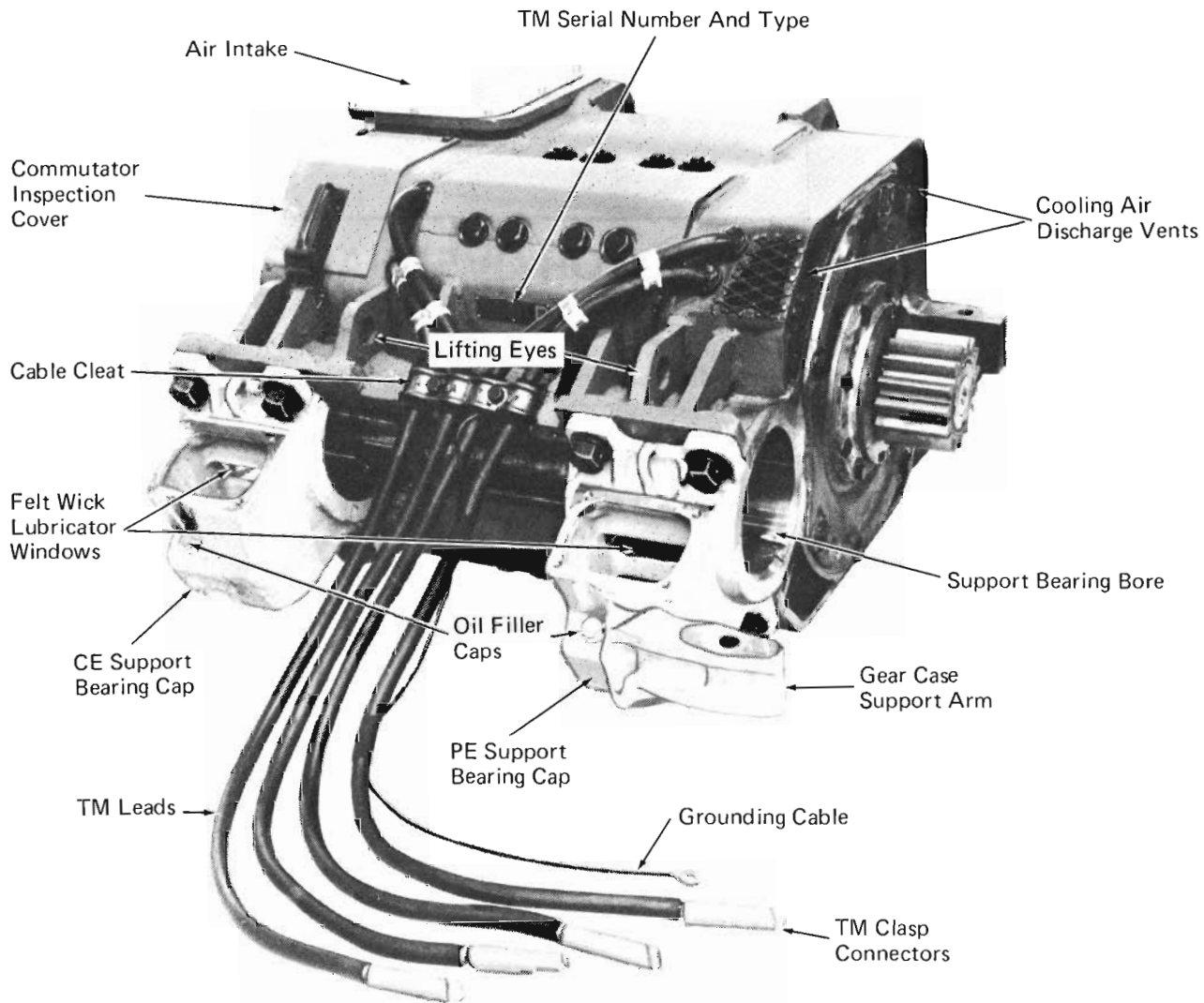


Fig. 1 - D77 Traction Motor

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TIG (tungsten inert gas) welded joint between armature coil and commutator to ensure a more positive electrical connection.

Three-wafer resilient pad brushes to provide improved commutation and increase brush life.

Nomex V-rings in the commutator to improve commutator stability and performance.

CLEANING

Prior to disassembly, the exterior of the traction motor should be thoroughly cleaned to remove all dirt, oil, and grease to prevent dirt from entering the traction motor during disassembly. In cases where dry wiping cloths are incapable of removing caked grease and dirt, a stiff brush or soft wood or fibre scraper may be used. In severe

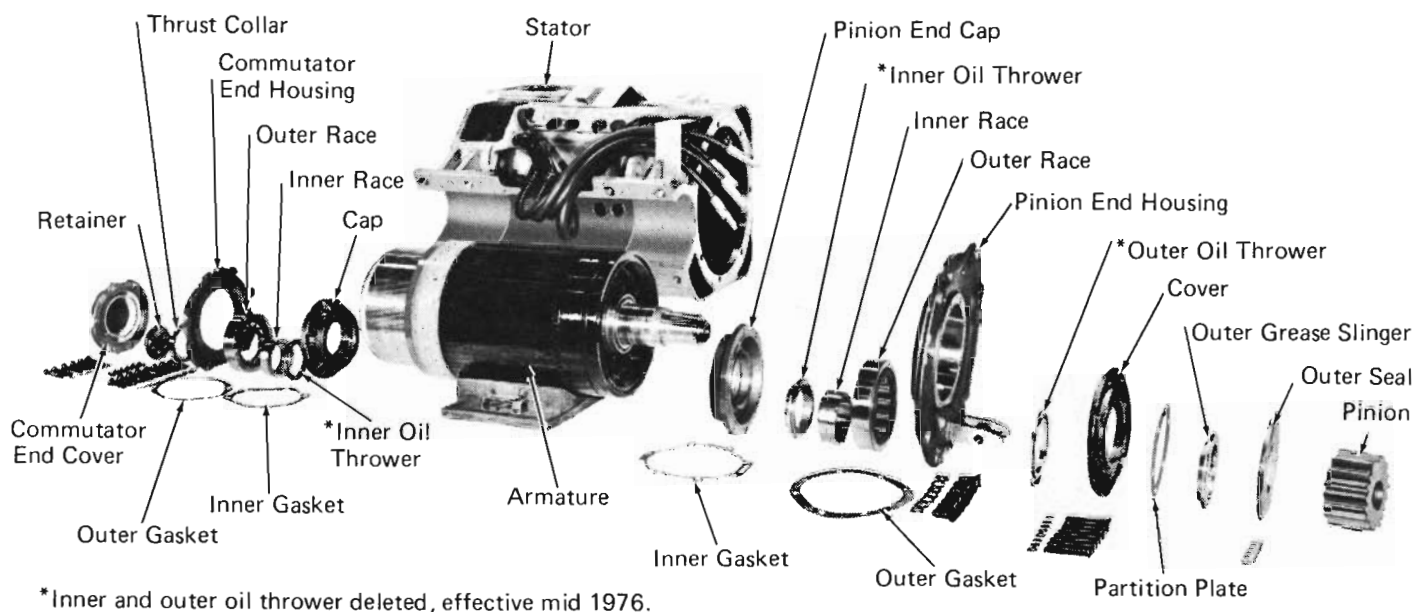
cases it may be necessary to dampen a cloth in solvent such as Stoddards Solvent to loosen and remove imbedded deposits.

CAUTION: Ensure there is adequate ventilation and safety precautions are observed when handling inflammable fluids such as Stoddards Solvent, which has a flash point of 46° C (115° F).

DISASSEMBLY

Perform the following procedure to disassemble the traction motor. Refer to exploded view, Fig. 2, during disassembly.

1. Place traction motor in its normal position on a suitable stand that will provide a convenient working height.
2. Remove commutator inspection covers, Fig. 1.



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Fig. 2 - Exploded View Of Traction Motor

3. Remove commutator brushes from brush holders.
4. Protect commutator by wrapping with a strip of paper measuring 1.5 mm x 180 mm x 1 372 mm (1/16") x 7" x 54"). Hold paper in place with tape.

PINIONS

The pinion mounted on the traction motor armature shaft is carburized, which provides an extremely hard outer surface yet retains a desired soft core. The number of teeth on the pinion and mating axle gear determine the locomotive gear ratio. Various gear ratios are available to suit specific locomotive service requirements. Pinions will vary from 12 teeth to 25 teeth depending upon installation. The traction motor with a 12 tooth pinion is referred to as an "E" model. Since the diameter of 12 tooth pinion is small, it is made integral with the armature shaft; all other pinions are removable.

PINION REMOVAL

Pinions are heated and shrunk onto the shaft to provide the fit necessary to withstand the strain imposed in operation. The pinion is either removed by pulling off with a hydraulic puller or by "floating-off" by means of hydraulic pressure.

Refer to Service Data for special equipment required for pinion removal. The pinion is removed as follows:

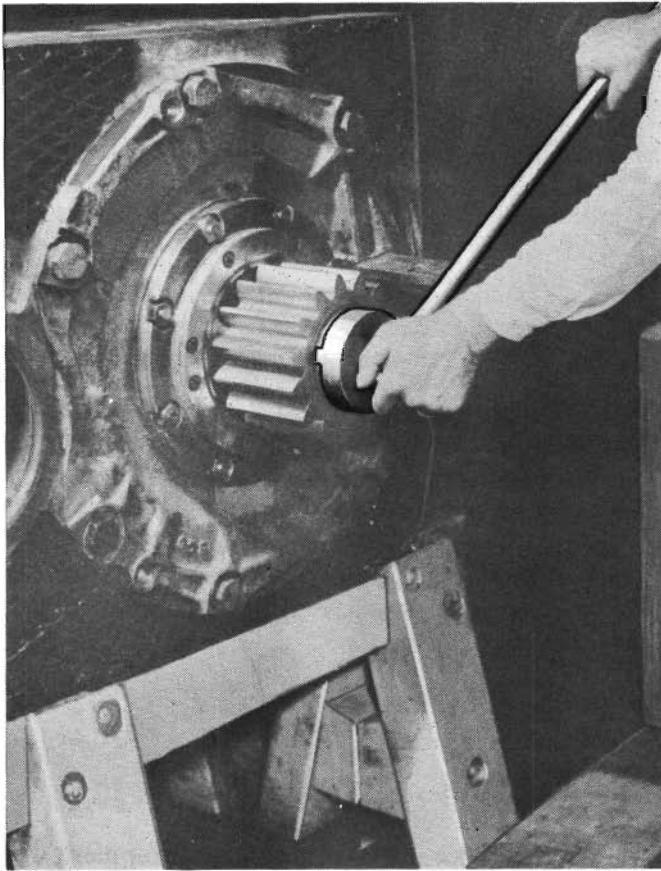
PINION REMOVAL WITH HYDRAULIC PULLER

1. Remove the nut from end of armature shaft with a retaining nut wrench and handle, Fig. 3, or with an air impact wrench.
2. Clean threads in pinion and in pulling pilot.
3. Apply spacer between the end of the armature shaft and the ram of the puller to protect the shaft from possible damage.
4. Install threaded pilot and hydraulic puller assembly, Fig. 4, using a suitable hoist. The threaded pilot should enter the threaded portion of the pinion to its complete depth so threads will not strip.

WARNING: Remove hoist before attempting to pull pinion. Pinion releases suddenly and if left suspended on hoist, can swing violently.

Clear area in line with pinion to avoid damage to equipment or injury to personnel when drive pinion releases.

5. Pump hydraulic puller to build up pressure and remove pinion from shaft.

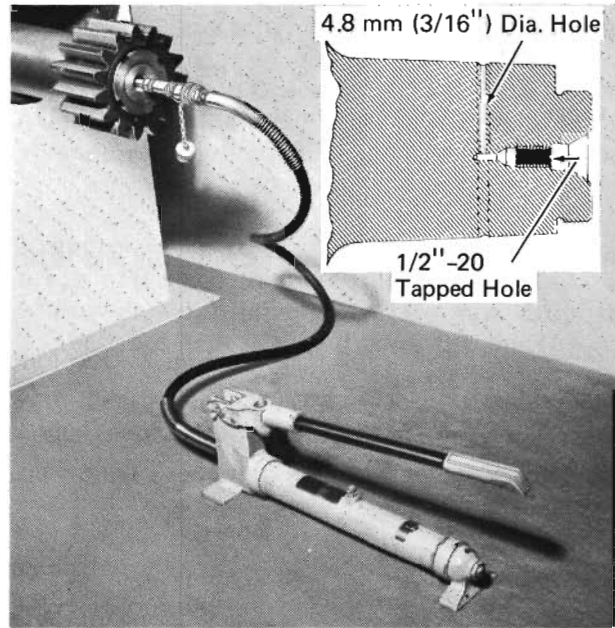


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Fig. 3 - Removing Pinion Retaining Nut

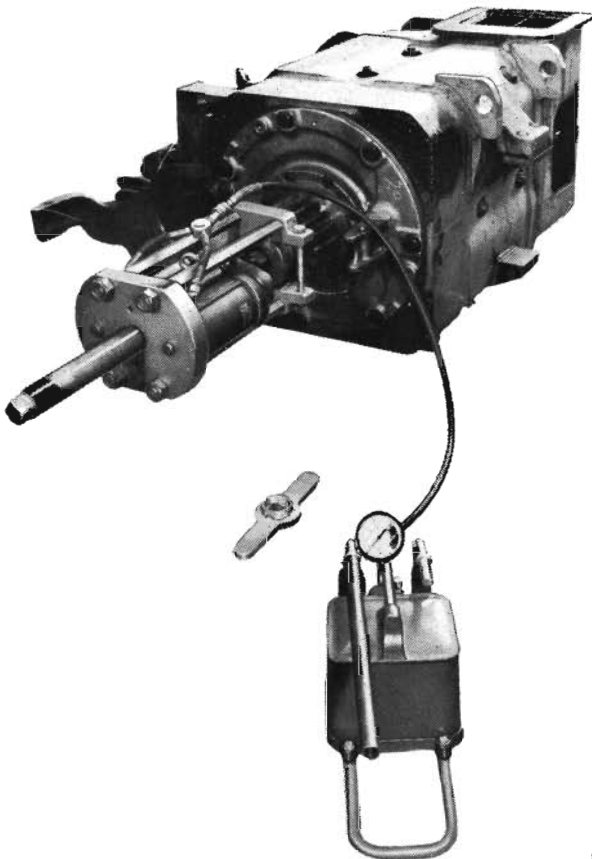
PINION REMOVAL BY FLOAT-OFF METHOD

The float-off method of pinion removal can be used on armature shafts which are manufactured with a groove around the shaft taper which is connected by drilled passages to a 1/2"-20 tapped hole in the center of the shaft, as shown in Fig. 5. The pinion is removed by applying high pressure oil through the drilled passages to the inside of the pinion bore, which results in the pinion being released from the shaft.



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Fig. 5 - Float-Off Pinion Removal



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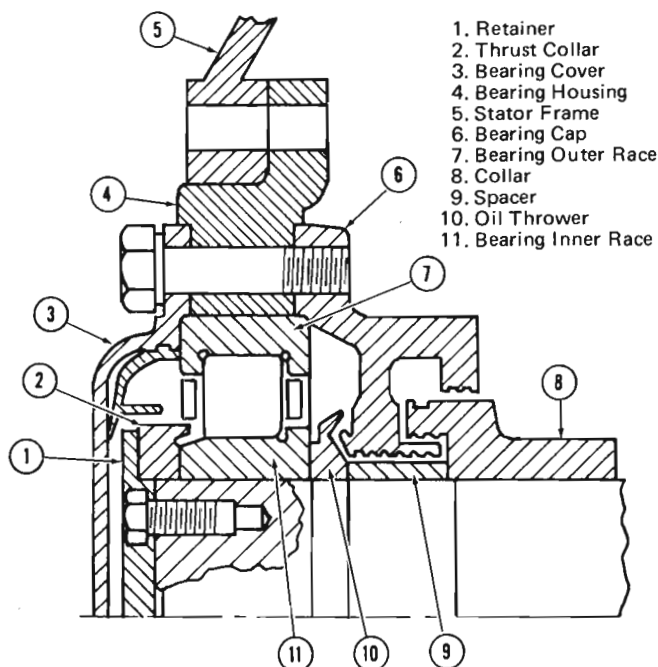
Fig. 4 - Hydraulic Pinion Puller

1. Loosen the nut on the end of the armature shaft with a retaining nut wrench and handle, Fig. 3, or with an air impact wrench approximately one turn, but do not remove.
2. Clean the center of the armature shaft and remove 1/2"-20 socket head setscrew. Ensure the threads and pressure fitting seat are clean.
3. Screw adapter nipple into shaft and tighten to 35-40 N·m (25-30 ft-lbs). Do not overtighten as this will damage the shaft seat.
4. Connect adapter nipple to the hydraulic pump with high pressure hose assembly. Close screw on pump and operate lever to build up pressure. When pressure becomes great enough, pinion will be released from armature shaft and will move off against the retaining nut.
5. Remove equipment and replace setscrew in end of armature shaft.

END HOUSING AND ARMATURE REMOVAL

NOTE: Refer to Service Data for tools or fixtures required to remove end housing and armature.

1. Remove 1"-8 bolts holding the commutator end bearing housing to the stator frame, Fig. 6. Clean out 5/8"-11 NC jack bolt holes in the stator frame with a tap.
2. Loosen pinion end housing bolts so that they protrude from stator housing 19 mm (3/4"). Do not remove these bolts at this time. Clean out 7/8"-9 NC jack bolt holes in the end housing with a tap. Insert three 7/8"-9 jack bolts.
3. Remove commutator end bearing cover, bearing retainer, and thrust collar, Fig. 6.



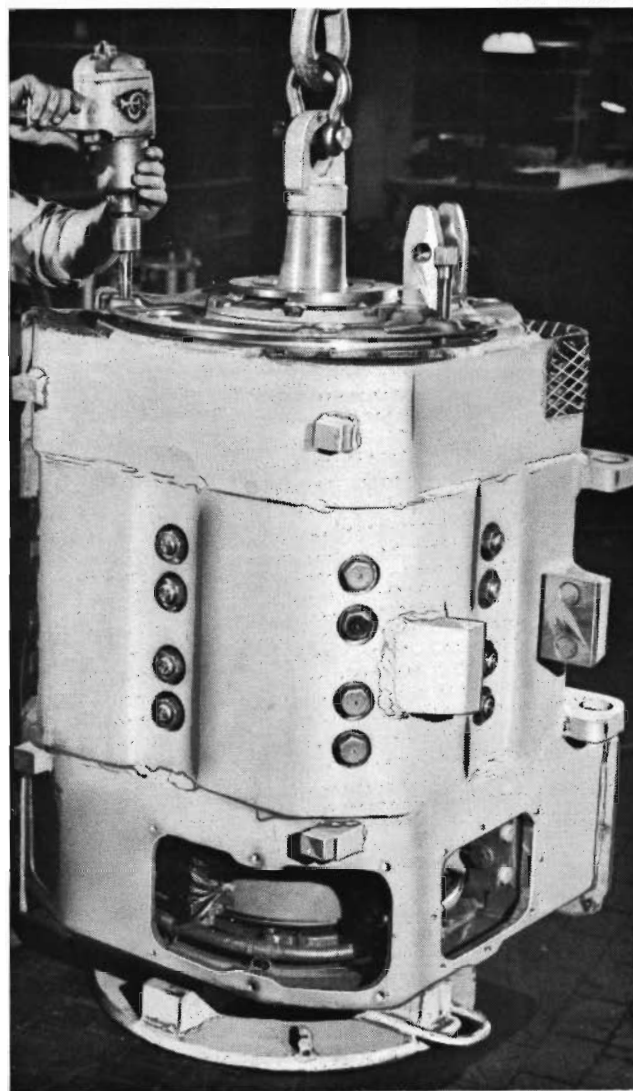
NOTE: On current model D77 motors, the commutator end oil slinger and spacer are replaced by one wider spacer. The commutator end collar and bearing cap are replaced with a new configuration.

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Fig. 6 - Commutator End Bearing Arrangement

4. Apply lifting eye bolt to pinion end of the shaft. Lift traction motor with a crane from stand and place in a vertical position, commutator end down, on frame stand, Fig. 7. Frame stand will support the stator frame in the proper position for removing armature.
5. Remove the pinion end housing bolts. Raise armature slightly with the aid of a hoist, Fig. 7. Keep hoist hook centered over the armature shaft to prevent armature damage.

CAUTION: In Step 6, do not tighten jacking bolts more than one half turn at a time. Tightening the bolts more can

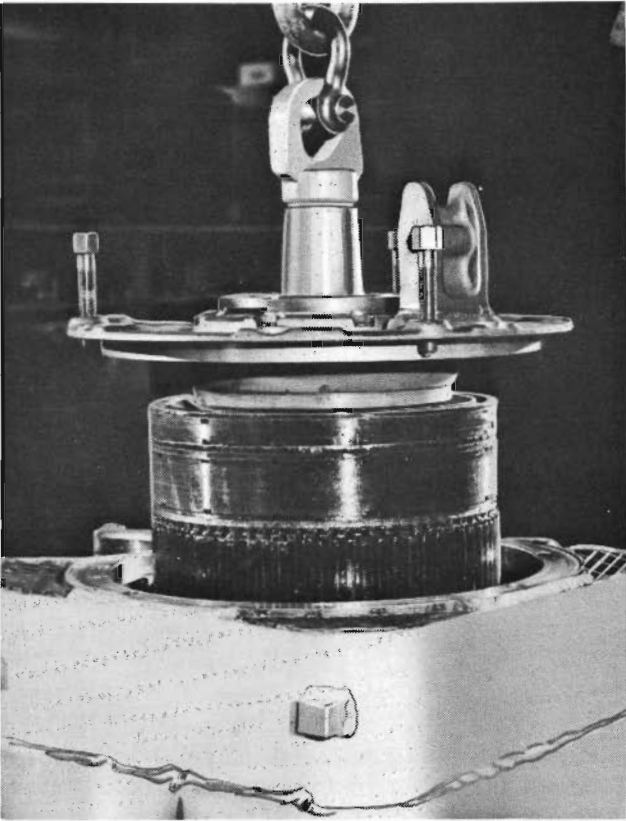


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Fig. 7 - Preparing For Armature Removal

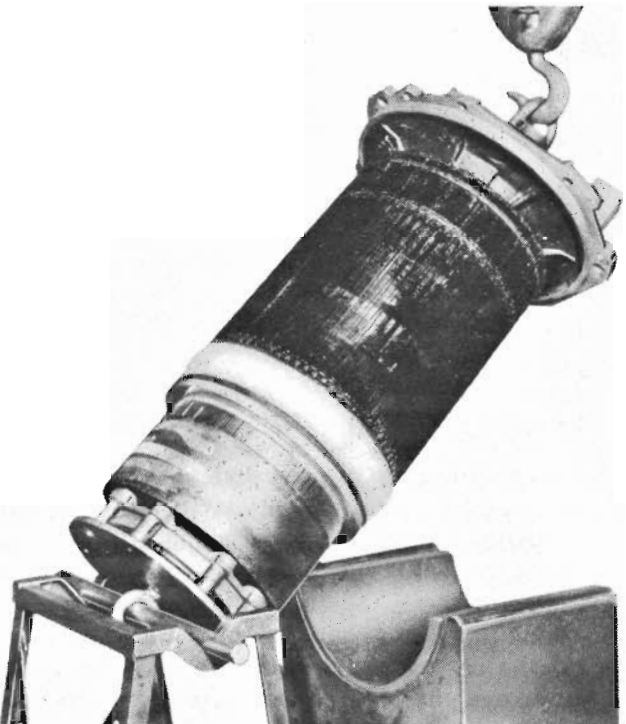
cock the bearing housing and damage the bearing.

6. If housing is still held by frame, tighten pinion end jacking bolts only one half turn alternately until housing is free. After housing is released from the frame, remove pinion end jacking bolts. Lift the armature out of the frame, Fig. 8. Use care to prevent contact between the armature and the frame.
7. Apply armature turning plate to the commutator end housing and insert bar through eye in plate, Fig. 9. Use steel stand to pivot the armature while setting the armature into a saddle or rack. Do not set armature on the commutator or bands. Support the armature on the core sections only. Remove the armature eye bolt or lifting fixture from the pinion end housing. Remove the turning fixture from the commutator end housing and lifting eye bolt from pinion end of shaft.
8. Remove brush holders from stator.



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Fig. 8 - Removing Armature Assembly



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Fig. 9 - Lowering Armature Into Saddle

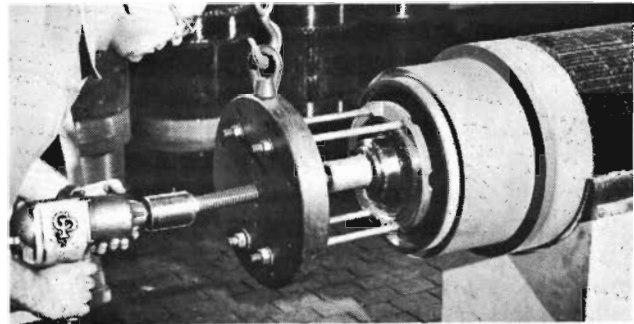
COMMUTATOR END BEARING ASSEMBLY REMOVAL FROM STATOR AND ARMATURE

NOTE: Refer to Service Data for tools or fixtures required to remove commutator end bearing.

1. Insert three 5/8"-11 NC jack bolts in commutator end of stator frame and jack out bearing housing along with bearing outer race and rollers, Fig. 6. Use caution to prevent damage to housing. Do not cock or force the housing.

CAUTION: In Step 2, ensure pulling plate is pulling equally on all studs to prevent damage to the bearing cap.

2. Apply puller plate and studs to bearing cap, Fig. 10, and remove the bearing cap, oil thrower, and inner race. Do not drop the inner race as it is pulled from the shaft.
3. If bearing collar and spacer, remaining on shaft are in good condition, do not remove.



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Fig. 10 - Removing Commutator End Bearing Cap, Oil Thrower, And Inner Race

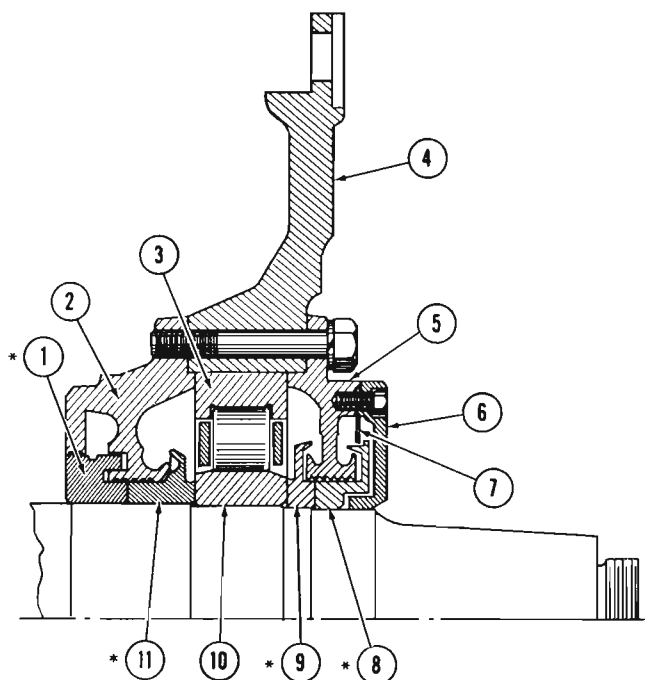
4. Remove bearing outer race from bearing housing by completely supporting the face of the bearing race, and pressing the bearing housing off the bearing race with a bearing press.

NOTE: If bearing parts are not to be used immediately, they should be coated with Shell Cyprina RA Grade 3 to prevent corrosion.

PINION END BEARING ASSEMBLY REMOVAL

NOTE: Refer to Service Data for tools or fixtures required to remove pinion end bearing assembly.

1. Clean pinion end bearing housing, bearing cover, grease seals, and oil ring so that no dirt will enter bearing.
2. Remove six 3/8"-11 bolts from pinion end outer seal, Fig. 11 and remove seal.



NOTE: Actual pinion end bearing arrangement will vary between traction motor models. Illustration presented to show disassembly sequence only. Refer to Section 7 of this Maintenance Instruction for different pinion end bearing arrangements.

- | | |
|---------------------|---------------------------|
| * 1. Inner Oil Ring | 7. Partition Plate |
| 2. Bearing Cap | * 8. Outer Grease Slinger |
| 3. Outer Race | * 9. Outer Oil Thrower |
| 4. Bearing Housing | 10. Inner Race |
| 5. Bearing Cover | * 11. Inner Oil Thrower |
| 6. Outer Oil Seal | |

*Effective mid 1976, Item 1 Inner Oil Ring is wider, eliminating Item 11 Inner Oil Thrower. Item 8 Outer Grease Slinger is wider, eliminating Item 9 Outer Oil Thrower.

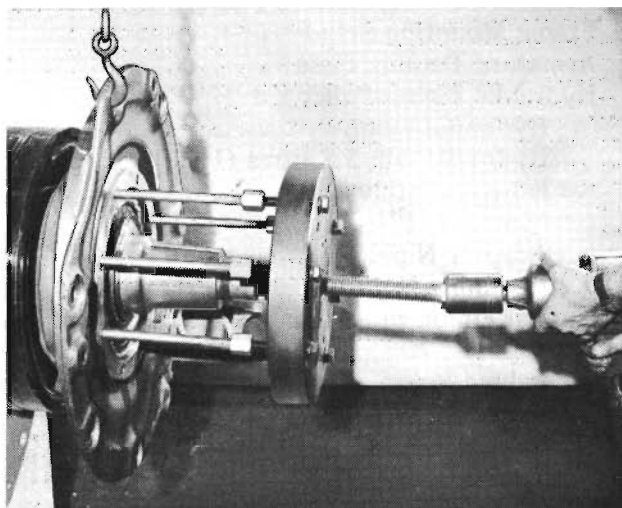
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Fig. 11 - Pinion End Bearing Assembly

NOTE: On current model D77 motors, the pinion end outer grease slinger and outer oil slinger are replaced with one slinger. The pinion end inner oil thrower and inner oil ring are replaced by one seal.

CAUTION: Remove outer seal and outer grease slinger before attempting to remove bearing assembly. Failure to remove seal and slinger could result in damage to bearing cap when pulling assembly.

3. Apply heat quickly and sparingly to outer grease slinger and remove slinger.
4. Remove the eight 5/8"-11 bolts from bearing cover.
5. Apply puller plate and studs through bearing cover into the bearing cap, Fig. 12.
6. Line up puller plate and remove complete pinion end bearing assembly. Ensure pulling plate is pulling equally on all studs to prevent damage to bearing cap.



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Fig. 12 - Removing Pinion End Bearing Assembly

7. When bearing assembly is free of shaft, remove puller plate and all but one stud. One stud should be left in assembly to prevent parts from falling.
8. Support bearing assembly with a crane and slide bearing assembly and housing off the bearing inner race.
9. Remove bearing outer race from bearing housing by completely supporting the face of the bearing race, and pressing the bearing housing off the bearing race with a bearing press.
10. Apply sufficient heat to bearing inner race and inner oil ring to remove bearing inner race and oil ring by hand.

NOTE: If bearing parts are not be used immediately, they should be coated with Shell Cyprina RA Grade 3 to prevent corrosion.

SERVICE DATA

SPECIFICATIONS

Weights (Approximate)

Motor with Pinion	2 790 kg (6150 lbs)
Armature	821 kg (1810 lbs)

EQUIPMENT LIST

Lifting Eye Bolt, Pinion End	8067122
Armature Lifting Fixture ("E Series" motors)	8065527
Frame Mounting Stand	8064917
Armature Turning Plate	8067147
Hydraulic Pinion Puller Kit	8309742
Hydraulic Pump	8302969
Hydraulic Oil, 3.8 litres (1 gal)	8246430
Hose Assembly	8327054
Nipple, 1/2"-20	8309741
Adapter Nipple (Models D47B2 and D47B3 only), 3/8"-24	8302965
Retaining Nut (Models D47B2 and D47B3 only)	8303020
Manual Pinion Puller Kit (Models D37 and D47 only)	8303330
Pulling Plate Assembly	8168577
Pulling Plate	8168604
Includes Studs:	
5/8"-11 NC (C.E. bearing cap)	8168606
3/8"-16 NC (P.E. outer oil ring)	8168611
5/8"-11 UNC-2A (P.E. bearing cap)	8204436
Induction Heater, Pinion	8041446