



VERTICAL DRILLING MOTOR TYPE GE752

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■ Revisions are indicated by margin bars.

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FIG. 1. GE752 VERTICAL DRILLING MOTOR.
E-39088.

INTRODUCTION

GE752 drilling motors designed for vertical operation, Fig. 1, are available in GE's UP, AUP, US and AUT series. This instruction provides inspection, maintenance and basic overhaul procedures for all of these motors. See Table I (page 3) for the models covered.

These motors have a ball bearing and a reinforced framehead at the commutator end to support the armature shaft vertically. They also have a shaft extension at the commutator end for installation of a brake. Mounting feet are precision machined to align with the rotational ovals of the motor.

Refer to GEK-64271C for coverage of GE752 models designed for horizontal operation.

GENERAL DESCRIPTION

GE752 motors are used by the oil and gas industry to power offshore and land-based drill rigs. Designed for vertical operation, they are d-c machines which require a nominal 750 volt d-c power source.

With suitable switching, they will operate equally well in either rotational direction. The following provides a listing of basic features.

The GE752UP and US models are of the "Shunt" class of motors which means they are separately excited with shunt wound fields.

The GE752AUP and AUT models are of the "Series" class of motors which means they are self excited with series wound fields.

GE752UP and AUP motors are original design motors introduced in 1983. GE752US and AUT motors are Hi-Torque motors with:

1. A new shallow slot design and split conductor arrangement reduce heat generating eddy currents. Kapton™ insulation and new slot design allow more copper cross-section and allow the field windings and armature to operate at increased power levels.
2. The spiral groove commutator provides better commutator and brush cooling, better commutation ability, and increased brush life.
3. An additional six exhaust openings in the motor drive end framehead and revised air flow passage increases air flow and the motor's ability to transfer generated heat.

*Kapton is a registered trademark of E.I. duPont de Nemours & Co.

TABLE 1. MODEL DIFFERENCES

Motor	Model Differences	Superseded By
752UP1	This is a shunt motor with the following distinctions: – Has internal greasing tubes for both drive end (pinion end) and commutator–end bearings – Has a double–ended shaft.	
752UP2	Same as UP1 except: – Has armored cable – Has no grease tubes at commutator end	
Motor	Model Differences	Superseded By
752UP3	Same as UP2 except: – Has a single grease tube at drive end which is part of the framehead/bearing assembly for ease of armature disassembly.	
752UP3A	Same as UP3 except: – Has class H Kapton wrapped exciting coils	
752UP4	Same as UP3A except: – Has an ABS certified shaft.	
752UP5	Same as UP3A except: – Has a thermal sensor embedded in each of its exciting and commutating coils.	
752UP6	Same as UP3A except: – Has an improved commutator–end bearing assembly and an ABS–certified armature shaft.	
752US1	This is a shunt motor with the following distinctions: – Same as UP3 except: – Has an AG type armature with an AF commutator and a standard AUP flash ring. – Has AG type commutating coils and poles with brazed instead of bolted connections. – Has air vents in the drive–end framehead – Has a frame specially machined for mounting the customer gearbox at the drive end. – Has a different drive–end grease arrangement. – Has rubber hardtop brushes instead of regular duplex brushes.	
752US2	Same as US1 except: – Has an improved commutator–end bearing assembly and an ABS–certified armature shaft.	
752AUP1	This is a series motor with the following distinctions: – Has internal greasing tubes for both drive end and commutator–end bearings – Has a double–ended shaft.	
752AUP2	Same as AUP1 except: – Has armored cable – Has no grease tubes at commutator end – Mounting feet have dowel holes for vertical mounting.	

TABLE 1 (Cont'd) MODEL DIFFERENCES

Motor	Model Differences	Superseded By
752AUP3	Same as AUP2 except: – Has a single grease tube at drive end which is part of framehead/bearing assembly for ease of armature disassembly.	
752AUP4	Same as AUP3 except: – Has improved insulation for higher temperatures.	
752AUP5	Same as AUP4 except: – Has an improved commutator–end bearing assembly and an ABS–certified armature shaft.	
752AUT1	This is a series motor with the following distinctions: – Same as 752AUP3 except: – Has an AG type armature with an AF commutator and a standard AUP flash ring. – Has AG type commutator coils and poles with brazed instead of bolted connections. – Has air vents in the drive–end framehead – Has a frame specially machined for mounting the customer gearbox at the drive end. – Has a different drive–end grease arrangement. – Has rubber hardtop brushes instead of regular duplex brushes.	
752AUT2	Same as AUT1 except: – Has an improved commutator–end bearing assembly and an ABS–certified armature shaft.	

DATA

Max. Permissible Speed (rpm) 1800

Max. Permissible Vibration (Commutator End) (in.) 0.002

“Resistance at 25° C (Ohms):	<u>Min.</u>	<u>Max.</u>
Armature		
Model 752UP	0.00912	0.00949
Model 752AUP	0.00912	0.00949
Model 752US	0.00749	0.00800
Model 752AUT	0.00749	0.00800
Exciting Field (With Cables)		
Model 752UP	1.25	1.33
Model 752UP (After 3/88)	1.13	1.22
Model 752AUP	0.00512	0.00558
Model 752US	1.13	1.22
Model 752AUT	0.00486	0.00535
Commutating Field (With Cables)		
Model 752UP	0.00508	0.00540
Model 752UP (After 3/88)	0.00439	0.00534
Model 752AUP	0.00439	0.00477
Model 752US	0.00432	0.00480
Model 752AUT	0.00432	0.00480

DATA (Cont'd)

Carbon Brushes

Type	T900
Size (in.)	3/4 x 2-1/4 x 2
Minimum Brush Length (length at which brush becomes inoperative) (in.) (brush is measured on the longest side)	1-3/32
Spring Pressure on Brush, Preset (lb.)	10-12

Brushholder

Clearance to Commutator (in.)	1/16-3/32
Clamp Bolt Torque (lb.-ft.)	225-250

Commutator

Side Mica Thickness (in.)	0.060
Slot Depth (in.)	0.047
Undercutting Saw:	
Width (in.)	0.063
Diameter (in.)	1.000
Diameter: (in.)	
New	16.625
Worn (minimum permissible)	15.375
Riser Width (minimum permissible) (in.)	0.625

Dust Groove: (in.)

Width	0.250
Depth	0.125

Commutator (Cont'd)

Concentricity – New Commutator (in.)	
Total Indicated Runout, TIR	0.001
Variation of Indicator Runout within (in.)	
any Group of 20 Bars	0.0004
Variation of Indicator Reading between (in.)	
any Two Adjacent Bars	0.0001
Concentricity – Used Commutator (in.)	
(Resurface if runout exceeds 0.010 TIR	
or 0.003 within any group of 6 bars):	
After Resurfacing, TIR (in.)	0.001
Bar-To-Bar Test (500 v) Voltage	
Variation Bar-To-Bar	+/- 5%

Armature Balance

Commutator End	12 grams (0.42 oz.)
Drive End	10 grams (0.35 oz.)

Armature Bearings

	<u>Min.</u>	<u>Max.</u>
Diametral Clearance, Assembled (In.)		
Drive End	0.005	0.009
Commutator End	0.0005	0.0035
Runout Measured from Shaft to Outer Race (in.):		
Drive End		0.004
Commutator End		0.003

DATA (Cont'd)

Pole Bore Diameter (measured at center of pole) (in.)

Motors:	<u>Min.</u>	<u>Max.</u>
Exciting Poles (Shunt models)	19.606	19.640
Exciting Poles (Series models)	19.613	19.640
Commutating Poles (Both Shunt and Series models)	19.956	19.998

Impedance Test

(Coiled Frame Without Armature):

	<u>Voltage Drop</u>	
	<u>Min.</u>	<u>Max.</u>
Exciting Field (With Cables)		
Model 752UP (0.5 Amps @ 60 Hz)	59.0	66.6
Model 752AUP (24 Amps @ 60 Hz)	13.1	15.6
Model 752US (0.5 Amps @ 60 Hz)*	59.0	66.6
Model 752AUT (24 Amps @ 60 Hz)	13.1	15.6
Commutating Field (With Cables)		
Model 752UP (24 Amps @ 60 Hz)	7.3	8.5
Model 752AUP (24 Amps @ 60 Hz)	7.2	8.5
Model 752US (24 Amps @ 60 Hz)**	7.3	8.1
Model 752AUT (24 Amps @ 60 Hz)	7.7	8.5"

Lubrication* – Armature Bearings

Grease Capacities (oz.):

Drive End	39.1
Commutator End	31.8
Lubricant	GE-D6A2C10*

**See Grease Specification at the end of the DATA table.

Weights (lb.) (approx.)

Complete	6720
Armature Only	2100

High-Potential Test

60 Hz, a-c, to ground for one minute (All Windings) (volts):

New or Rewound Armature	3500
Reconditioned	2000

Megger Test

Reading (megohms)

Minimum Megohmmeter

 Shunt Models

A1-A2	1.4
F1-F2	0.3

 Series Models

A1-A2	1.4
F1-F2	1.4

* With Commutating Poles (CP) out.

**Excitation Field in.

DATA (Cont'd)

Motor Ratings*	<u>Continuous Max. HP</u>
Shunt (UP)	
Volts	750
Armature Amps	1050
Field Amps	57
RPM	1050
Horsepower	1000
Series (AUP)	
Volts	750
Armature Amps	1050
Field Amps	100%
RPM	975
Horsepower	1000

***NOTE: With 2800 SCFM air flow.**

Motor Ratings**	<u>Continuous Max. HP</u>	<u>Continuous Max. Torque</u>	<u>Intermittent Duty Cycle</u>
Shunt (US)			
Volts	750	650	750
Armature Amps	1185	1250	1435
Field Amps*	60	60	60
RPM	1040	900	1065
Torque	5705	5995	6745
Horsepower	1130	1030	1365
Series (AUT)			
Volts	750	570	750
Armature Amps	1150	1250	1400
Field Strength	100%	100%	100%
RPM	965	700	920
Torque	5900	6620	7530
Horsepower	1085	880	1320

****NOTE: With 2800 SCFM air flow and ABS temperature rise standards, 155° C over 40° C ambient.**

Grease Specification

D6A2C10 grease is a lithium soap base grease with added antioxidant. It contains an oil of heavy viscosity and is especially suitable for high speed, high temperature open or shielded bearings in drilling motors.

Specifications:

Worked Consistency, 77° F, MM/10	220-240
Dropping Point, Degrees F (Min)	380
Mineral Oil Viscosity At 100° F, SSU	475-525
Free Alkali, Percent (Max)	0.50
Free Acid, Percent (Max)	Nil
Color	Amber
Base (With Antioxidant)	Lithium
Oxidation Resistance Time To Reach 20 psi Drop At 210° F, Hr. (Min)	1000
Corrosion	Must Pass
Approved Vendor	Shell Oil
Brand Name	Cyprina RA

SPECIAL TOOLS AND EQUIPMENT

CAUTION: This machine is of open splash-proof construction. It is force-ventilated and requires an ample supply of cooling air. The cooling air should not contain combustible gases. If it is applied in an environment which may contain combustible gases, an adequate supply of non-contaminated cooling air must be provided.

The following items are required to maintain, repair and overhaul the motors:

	<u>Part</u>
Megohmmeter (or "Megger"*)	
600 volts	111X910 or equivalent
Voltmeter	Simpson Multimeter, Model 260 or equivalent
Puller Tools	41E903423G1
Commutator Grinder	427C592G1
Resurfacing Stones:	
Medium Grade	8828492P11
Finish Grade	8828492P8
Brush-Seater Stone (White)	106X98
Lifting Eye	P9945894P8
Crows-Foot Pressing Tool	41C685430G1
Ball and Socket Tool	41C685080G1
Guide Pins, Three (3) Recommended for Armature Asm. In Frame	6717114P1
Spanner Wrench	8843522G1
Spring Scale (for brush-spring pressure check)	0-20 lb. capacity
Hub Assembly Gauge	41D790941G1
Hub Puller (Less Pump)	41B535703G1
Pump (For Above)	8843947G1

*Tradename of James G. Biddle Co.

GROUNDING INSTRUCTIONS

Grounding motor frames is required to safeguard personnel from electric shock in event of an insulation failure in the machine.

WARNING: Failure to properly ground electrical equipment may expose personnel to a potentially hazardous condition in which serious or fatal injury from electrical shock is possible.

Grounding conductors must be provided between the machine frame and the supporting structure to avoid hazardous potential difference between the machine frame and the adjacent surface on which a person may be standing while touching the machine.

NOTE: This type of ground connection is referred to in electrical standards as "equipment grounding" or "enclosure grounding" which is not to be confused with "system" or "circuit" grounding. Drilling drive systems normally do not have intentional circuit ground connections, except through high impedance detectors.

Grounding conductors must be provided on drilling units on which the construction of the unit and/or the installation of the machines do not inherently insure positive grounding of the equipment. Examples are those portable (modular) platform rigs and land rigs which do not already have ground cables to all machinery structures. Offshore rigs with equipment fastened to the

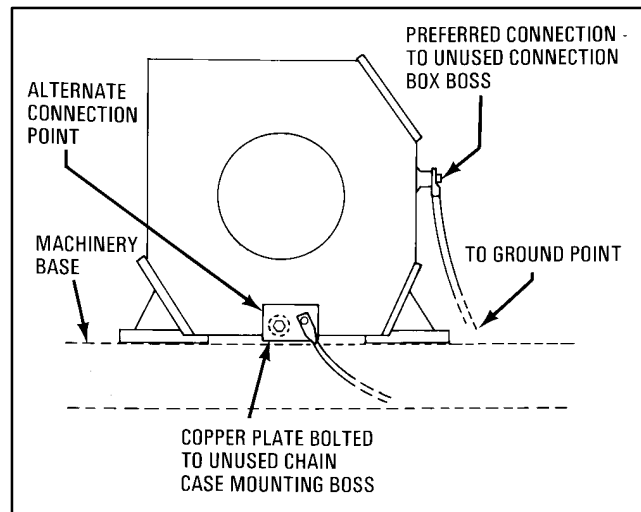


FIG. 2. DRILLING MOTOR - FRAME GROUNDING CABLE CONNECTIONS. E-28717.

decks by bolting or welding should not require additional grounding. (References: ABS Rules for Building and Classing Steel Vessels, Section 35.9.6, and IEEE Standard 45-1977, Recommended Practice for Electrical Installations on Shipboard, Section 21.4.)

GROUNDING PROCEDURES (Fig. 2)

Most GE drilling machines have extra tap blocks on the frame for mounting of the connection boxes. One of these may be used for attaching the grounding cable. If one is not available, use the lower chain case mounting boss on the end opposite the drive end in accordance with Step 2.

1. To attach the ground cable to a tap block, obtain a 0.75-10 bolt with length of 1.0 to 1.5 in. and a lockwasher. Also obtain a cable lug to fit the ground cable and large enough for the 0.75 diameter bolt.
2. To attach the cable to the chain case boss, obtain a 1.25-7 bolt with length of 1.0 to 1.75 in. and a lockwasher. Prepare a copper plate at least 1/8 in. thick with a 1.25 in. diameter hole for bolting to the chain case boss, and with enough extra area for holes to attach a cable lug. Drill hole(s) in plate for cable lug. Clean all paint, rust and oil from the chain case boss and bolt the copper plate to the chain case boss.
3. Prepare a ground conductor* long enough to run from the motor frame to an existing ground conductor system or to a suitable equipment ground point as defined by the National Electrical Code Article 250 or other applicable regulation. Check that the system ground detector is also connected to the Common ground point for the rig and make connection if necessary.
4. Install terminal lugs on cable. Remove paint, rust and oil from the surfaces to which the cables are to be attached and bolt the lugs securely to these surfaces.

*Use 4/0 size or larger copper cable for GE752 machines. (Reference: National Electrical Code, 1978 Edition, Table 250-95.)

5. Use a digital ohmmeter to check that the bolted connections are solid, low resistance connections from the cable conductor to the ground point and to the motor frame. The meter reading should be 0.2 ohms or less.

OVERHAUL

Overhaul intervals will depend on the severity of service seen by the machine. However, General Electric Co. recommends that an overhaul be performed every 18,000 hours (approximately every two years) on all machines subjected to normal operation.

The motor should be removed, disassembled, cleaned, inspected and reconditioned as necessary (including varnish treatment of armature and fields). Motor bearings should be repacked with grease. See the DATA section for grease type and quantity.

LUBRICATION

Periodic lubrication **is required** on all GE752 drilling machines designed for vertical operation between scheduled overhaul periods. Every six months or 2500 hours, whichever comes first, apply approximately 2 oz. of grease at each end.

GREASE TUBES AND PIPE PLUGS

The following lists grease tube and pipe plug configurations for all models covered in this publication:

1. UP1 and AUP1 — Four grease tubes with pipe plugs, two at each end.
2. UP2 and AUP2 — Two grease tubes with pipe plugs, one at each end.
3. UP3, UP3A, UP4, UP5, UP6, AUP3, AUP4, AUP5 — One grease tube with a pipe plug at the drive end, one pipe plug only at the commutator end.
4. US1, US2, AUT1, AUT2 — One pipe plug only at each end.

Pipe plugs are provided on bearing caps and on the ends of all grease tubes to prevent the ingress of dirt or other contamination.

Remove the pipe plugs and install grease fittings to facilitate lubrication. Replace the pipe plugs after adding lubricant. See the DATA section for recommended grease type.

INSPECTION

MONTHLY

Inspect the exterior of the machine, including cables, for damage.

Covers, Seals, Latches

Clean the outside of the machine and remove the inspection covers. Use clean, dry compressed air and blow the dirt and carbon dust from the interior of the machine.

WARNING: When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.

Check exterior covers to be sure felt seals are intact. If seals are missing or covers are damaged, replace seals or covers as necessary. Make sure covers fit properly and cover latches work properly.

Brushholders (Fig. 5)

Satisfactory operation of the drilling motor requires the brushholders to be in good condition. Of particular importance is the inside dimension of the carbonways. Operation may also be impaired by brushholders which have been mechanically damaged or sustained damage as the result of motor flashovers.

Inspect the brushholders for damage. If they require replacement, refer to BASIC REPAIRS, Brushholder Replacement section for instructions.

When new, brushholder carbonways should measure 0.753 \pm 0.002 in x 2.2575 \pm 0.0025 in. If or when the 0.753 in. dimension exceeds 0.765 in., the brushholder should be scrapped. If it falls between 0.758 and 0.765 in., the carbonway can be restored to its proper dimension according to the following instructions:

1. Remove the brushholder. Position it as shown in Fig. 3 and tap the metal ridge with a hammer.

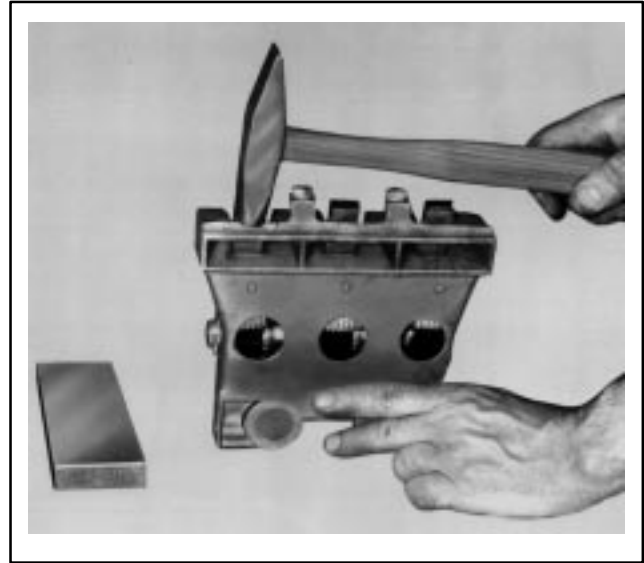


FIG. 3. RESIZING BRUSHHOLDER CARBONWAYS. E-11281.

Start at one end and work along the ridge to the other end.

2. Check progress frequently by means of a "Go/No-Go" gage made to the dimensions shown in Fig. 4.

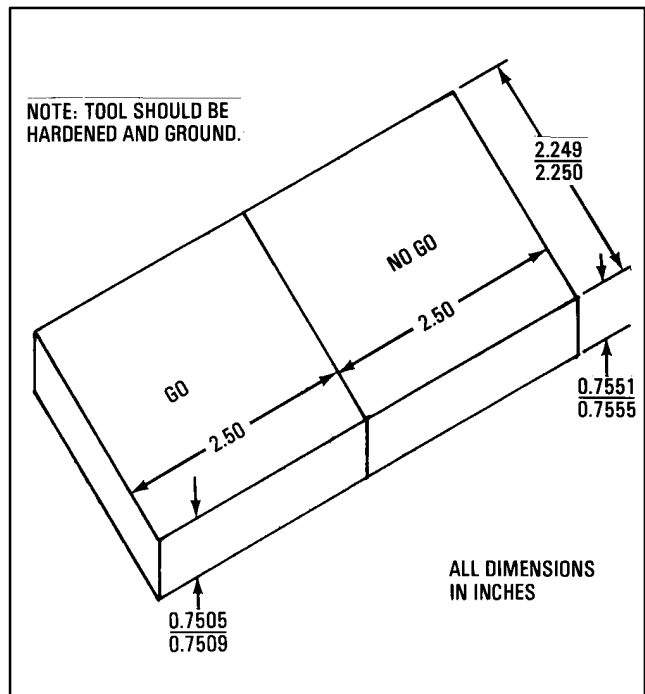


FIG. 4. BRUSHHOLDER CARBONWAY GAGE. E-11283A.

3. Continue tapping as described in Step 1 until the 0.753 dimension falls between 0.751 and 0.755.
4. If, due to excessive pounding, the inside dimension becomes less than 0.751 in., file back to size with a fine mill file.

Additional repairs can be made to restore damaged brushholder bodies. Brushholder damage is fairly typical when flashovers have occurred, resulting in some burning or melting of metal at the corners of the brushholder. Metal thus removed can be restored according to the following instruction, unless more than 1/4 in. buildup of metal is required in the affected area, in which case the brushholder should be scrapped. Proceed as follows:

1. Thoroughly clean the affected area by wire brushing, and grind off any metal flow resulting from a flashover.
2. Apply a suitable brazing flux such as GE-A10B15 to the area to be built up.
3. Insert a carbon brush into the brushholder to prevent the brazing material from flowing into the carbonway.
4. Using a brazing torch and a 1/16 in. diameter brass brazing rod, puddle in sufficient metal to restore the metal that had been removed.
5. Check the carbonway for size with the "Go/No-Go" gage after the brushholder has cooled to room temperature.
6. Resize as required using the preceding method.

Brushholder Sleeves

Use a clean, lintless cloth and wipe dirt and grease from the Teflon* brushholder sleeves, Fig. 5. If necessary, use a cleaner such as MEK (methyl ethyl ketone) to clean the sleeves. Inspect sleeves for cracks and thin

spots caused by flashovers. Replace any damaged brushholder or one having a damaged sleeve.

WARNING: MEK is a volatile solvent. The fumes should not be inhaled. Use only in a well-ventilated area and take adequate precautions to protect eyes, skin and hands.

NOTE: Never paint these sleeves. Periodically wipe them clean with a dry cloth or a cloth dipped in an approved non-oily cleaning solvent.

Inspect the brushholder cables and make sure all terminal bolts and all brushholder clamp bolts are tight.

Brush Spring Pressure

Lift the brush pressure fingers to the "toggled-up" position, Fig. 5, and check for free movement of the spring assembly.

Inspect the brush springs for obvious failure or damage. Check brush-spring pressure by comparing spring pressure with a spring known to be good. Refer to the DATA section for brush spring-pressure value.

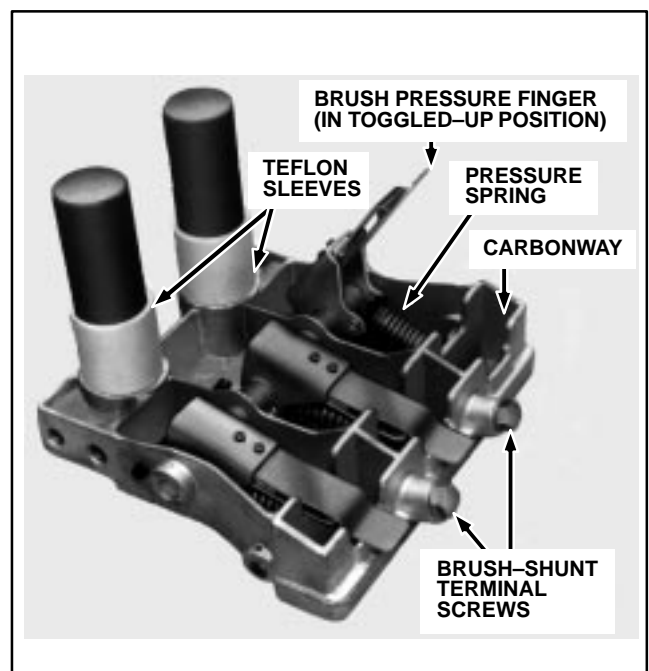


FIG. 5. BRUSH SPRING ARRANGEMENT. E-18963.

*Product of E.I. duPont de Nemours Company.

Brushes

Brush wear is determined by measuring actual brush length from the top of the carbon. Lift the brush spring, remove the brush and measure brush length on the longest side.

NOTE: If brush replacement is not required, be sure that brushes are of sufficient length to last until the next inspection.

If one or more brushes are worn to or near the minimum length listed in the DATA section it is generally recommended that all twelve brushes be replaced at the same time.

WARNING: To avoid possible electrical shock or injury from rotating equipment, do not remove or replace brushes while equipment is energized or rotating.

If brushes are to be replaced, see the BASIC REPAIRS, Brush Replacement section for brush installation instructions.

If brushes are not to be replaced, the following brush inspection should be made:

CAUTION: When replacing brushes, use only the GE recommended grade. Mixing of brush grades in the same motor or changing brushes to another grade may seriously affect commutation, surface film, commutator and brush life. See the DATA section for brush grade.

1. Inspect all brushes to be sure they are not chipped or broken. Make sure brush shunts are not frayed or broken. Replace any brush which shows damage of any kind.

NOTE: Chipped, burned or rough-faced brushes may indicate the commutator needs resurfacing.

2. Move the brushes up and down in their carbon-ways to be sure brushes slide freely.
3. Check brush shunts to be sure they are not twisted or out of position, Fig. 6. Make sure all

brush-shunt terminal connections and all brush-holder cable connections are tight.

Commutator

Inspect the commutator for possible flashover damage. The commutator should be clean, smooth, glossy and free of high mica, high bars, flat spots or rough surfaces.

If there are indications that the commutator is out-of-round (as evidenced by variations in width of the ridge between brush paths), check the concentricity of the commutator with a dial indicator. Condemning limits for concentricity are listed in the DATA section.

If the commutator requires grinding, refer to Commutator Resurfacing in the BASIC REPAIRS section of this manual for instructions.

Creepage Band

Clean the creepage band (located on the commutator cap) with a clean cloth dipped in an approved solvent. Inspect the band for possible flashover damage.

Make sure the creepage band is tight on the commutator cap.

Flash Ring

Examine the flash ring for possible flashover damage. Wipe the flash ring clean. Keep ring free of dirt and varnish.

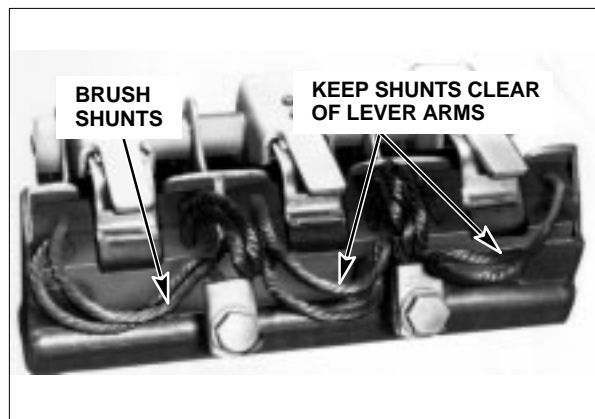


FIG. 6. CORRECT POSITION OF BRUSH SHUNTS. E-22568.

Insulation

Measure the insulation resistance with a meg-ohmmeter (Megger) to determine the condition of the insulation. If reading is low, make a further inspection to determine if insulation failure or excessive moisture is causing the low megohmmeter reading. Correct the cause of low readings before returning the motor to service.

Inspect all accessible parts of the field coil insulation for cracking and evidence of overheating.

Power Cables

Inspect the power cables for signs of excessive heating, poor insulation or mechanical damage. Assure all terminals are tight. Replace any cables which show low insulation resistance or will not stand 75% above rated voltage.

Mounting Bolts

Check all mounting bolts to assure tightness.

SEMI-ANNUALLY

1. Perform inspection operations listed under Monthly section.
2. Refer to the DATA section for the Brushholder Clearance dimension, and check the clearance between the brushholders and the commutator surface.

If clearance adjustment is required, refer to the BASIC REPAIRS, Brushholder Clearance Adjustment section for instructions.

BASIC REPAIRS

BRUSH REPLACEMENT

NOTE: *Brush spring pressure is pre-set and non-adjustable for the brushholders used on these machines. Any brushholder that is damaged or has a low spring pressure should be replaced before installing new brushes. Spring pressure can be measured with a 20-lb. spring scale pulling radially on the brush pressure fin-*

ger over the center of each brush. See the DATA section for limits.

1. Remove the commutator inspection covers.
2. Disconnect the brush shunt from the terminal screw, Fig. 5, located on the brushholder body.
3. Lift the pressure finger away from the brush to the toggled-up position. Remove the brush.
4. Use dry, compressed air and blow the carbon dust from the carbonway.

WARNING: *When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.*

5. Insert a new brush and make sure it slides freely in the carbonway.
6. Carefully lower the pressure finger on the brush. Do not allow the finger to snap down on the brush; this could damage the brush.
7. Bolt the brush shunt terminals to the brushholder(s). Arrange the brush shunt strands so they clear the pressure fingers, Fig. 6, and tighten the terminal screw(s). Make sure brush shunts are not positioned under the pressure fingers. Check and tighten all brushholder cable connections.
8. Seat the new brushes with a white seater stone.

CAUTION: *When replacing brushes, use the GE recommended grade. Mixing of brush grades in the same motor or changing brushes to another grade will seriously affect commutation, surface film, commutator and brush life. See the DATA section for brush grade.*

BRUSHHOLDER REPLACEMENT

Removal

1. Remove brushes from the brushholders and cover the commutator with heavy paper.
2. Disconnect the cable from the brushholder(s) involved.

3. Remove bolt, washer and brushholder clamp. Lift the brushholder out of the frame.

Installation

1. Position the brushholder in the frame with the brushholder studs resting in the clamp surfaces of the brushholder support.
2. Install bolt and washer. Tighten bolt but do not torque until the brushholder-to-commutator clearance has been established. Refer to Brushholder Clearance Adjustment section for instructions to adjust brushholder clearance.
3. After brushholder clearance has been set, connect the brushholder cable and remove protective paper from commutator surface.
4. Check brushes to insure they exceed the minimum brush length dimension and are free of any damage. If they are long enough and are not damaged, they can be re-used. If not, replace with new brushes.

BRUSHHOLDER CLEARANCE ADJUSTMENT

Refer to the DATA section for the brushholder-to-commutator clearance dimension and adjust brushholder as follows:

1. Remove the brushes.

CAUTION: Do not allow the brushholder to touch, bump or rest on the commutator.

2. Insert a fiber gauge (equal in thickness to the clearance dimension) between the commutator and the brushholder. (Loosen brushholder first if below minimum allowable clearance.)

Do NOT use a metallic gauge.

3. Loosen the brushholder support bolt and move the brushholder against the fiber gauge so clearance-to-commutator is the same as the gauge thickness.
4. Torque bolt to 225–250 ft.-lb. and recheck the brushholder clearance gap.

COMMUTATOR RESURFACING

Prior to resurfacing, consider the following:

1. The brush surface diameter of the commutator must not be less than the minimum permissible diameter, listed in the DATA section, after resurfacing operations are completed.
2. The commutator can be resurfaced by sanding, stoning or grinding. Choose the method to be used based on the condition of the commutator.

NOTE: Outside power will be required to operate the motor for the following commutator-resurfacing procedure.

WARNING: For the safety of personnel during resurfacing operations, the following safety precautions must be adhered to:

1. **A second person must be at the auxiliary power (welder) control station, ready to shut off power in case of an emergency during the grinding operation.**
2. **The grinding operator should wear goggles and a dust mask when resurfacing or blowing out the commutator.**
3. **To avoid electrical shock, do not touch any part of the machine interior during grinding operations.**

Preparation For Operating Series Model Machines For Commutator Resurfacing

1. Break the coupling (if applicable) so the machine can be operated from a d-c welding set or other outside d-c power source.
2. Lift all the brushes except two of opposite polarity (adjacent brushholders) which are necessary to operate the motor.
3. Connect the machine to an outside source of controlled d-c power; such as a 3–5 kw, 100 vdc welding set which is capable of driving it at a speed of 900–1000 rpm.
4. Refer to Fig. 7 for diagram of connections to run a series machine from a welding set. Connect

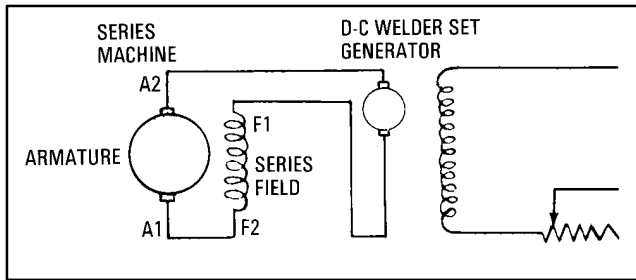


FIG. 7. DIAGRAM OF CONNECTIONS TO RUN A SERIES MACHINE FROM A WELDING SET. E-28718.

leads so machine will operate as a series motor, and the armature will rotate counterclockwise (viewed from the commutator end).

Preparation For Operating Shunt Model Machines For Commutator Resurfacing

1. Break the coupling (if applicable) so the machine can be run from a d-c power source.
2. Lift all brushes except two of opposite polarity (adjacent brushholders) which are necessary to operate the motor.
3. Connect the machine to an outside source of controlled d-c power, Fig. 8.
4. Apply power as follows:
 - a. Increase the field supply (0-50 v) to 32.0 volts at 25 amps.
 - b. Increase the armature supply (0-150 v) to 150 volts.
 - c. Slowly decrease the field supply to bring the speed up to 1000 rpm.

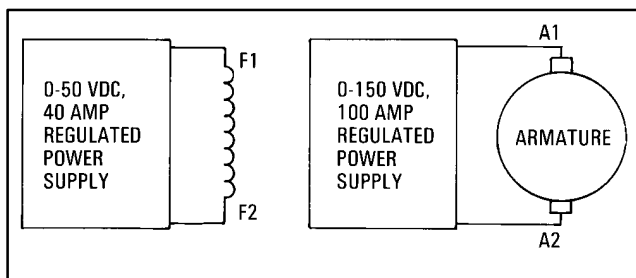


FIG. 8. CONNECTIONS TO RUN A SHUNT MACHINE FROM A D-C POWER SOURCE. E-23930A.

NOTE: When shutting down, increase the field supply to maximum, and then turn off the armature supply. After the armature supply has been shut off, shut down the field supply.

Sanding Procedure

If the commutator is dirty, blackened or slightly rough, resurface it by sanding with 00 sandpaper, or finer, as follows:

1. Attach the fine sandpaper to a wooden block shaped to fit the commutator, Fig. 9.
2. Run the machine at approximately 1000 rpm and hold the block against the commutator with a light, even pressure. Move the block back and forth longitudinally to clean the commutator.
3. Use clean, dry compressed air, to remove dust and sand.

Hand Stoning Procedure

If the commutator surface is mildly grooved, threaded or burned, and only a small amount of copper has to be removed to correct the trouble, use a hand stone. Hand stoning will **not** correct an out-of-round commutator. See "Fixture Grinding" section.

1. Use a fine-grade stone ground to fit the commutator curvature, Fig. 10. It should also be of sufficient width to bridge any flat spots; otherwise, the stone will ride in and out of the flat and will not correct it.
2. Remove one brushholder for access to the commutator.

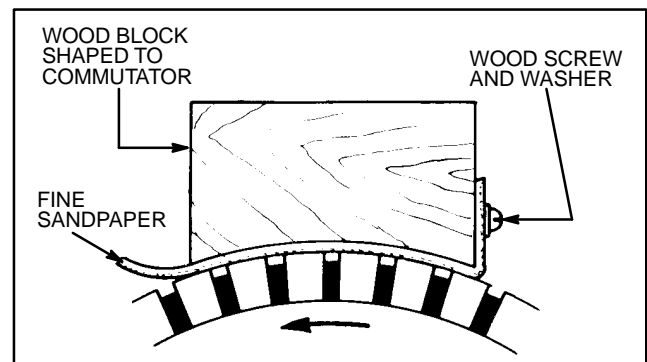


FIG. 9. METHOD OF SANDING COMMUTATOR. E-18149.

CAUTION: Never use an emery cloth on this or any commutator. The abrasive particles on emery cloth scratch the commutator surface and lodge in the groves between commutator segments. The condition creates the possibility of an eventual flashover which could seriously damage the machine.

WARNING: Do not come into close proximity of an energized motor during the cleaning process. The armature commutator and brush rigging have a high electrical charge which could cause serious injury or death. Always use a hose tip that is an electrical non-conductor when cleaning with air.

WARNING: When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.

3. Run the motor at approximately 1000 rpm.
4. Hold the stone firmly against the commutator surface, and with even pressure, move the stone back and forth longitudinally across the commutator surface.
5. Blow away dust and sand with clean, dry, compressed air.

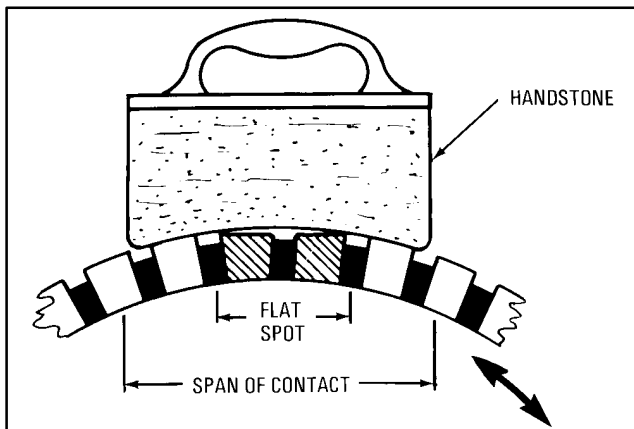


FIG. 10. PROPER SHAPE OF HANDSTONE. E-8779A.

WARNING: Do not come into close proximity of an energized motor during the cleaning process. The armature commutator and brush rigging have a high electrical charge which could cause serious injury or death. Always use a hose tip that is an electrical non-conductor when cleaning with air.

WARNING: When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.

Fixture Grinding

Perform fixture-grinding operations to correct a commutator that is grooved, threaded or out-of-round.

CAUTION: Be sure there is enough material on the commutator so grinding will not decrease the commutator diameter below the minimum permissible diameter listed in the DATA section.

Refer to SPECIAL TOOLS AND EQUIPMENT section for commutator grinder part number. See Fig. 11 for grinder nomenclature.

Grinder Installation

NOTE: Inspect the grinder before installing it to be sure it is reasonably clean. Make sure the traverse slides are free of accumulated dirt and copper chips; otherwise, the carriage may bind during the grinding operation.

1. Remove the inspection covers from the machine.
2. Remove the most accessible brushholder, and clamp the grinder mounting bracket to the frame.
3. Remove the brushes from one brushholder adjacent to grinder in a CCW direction.
4. Install old brushes in remaining brushholders.
5. Bolt the grinder to the mounting bracket.

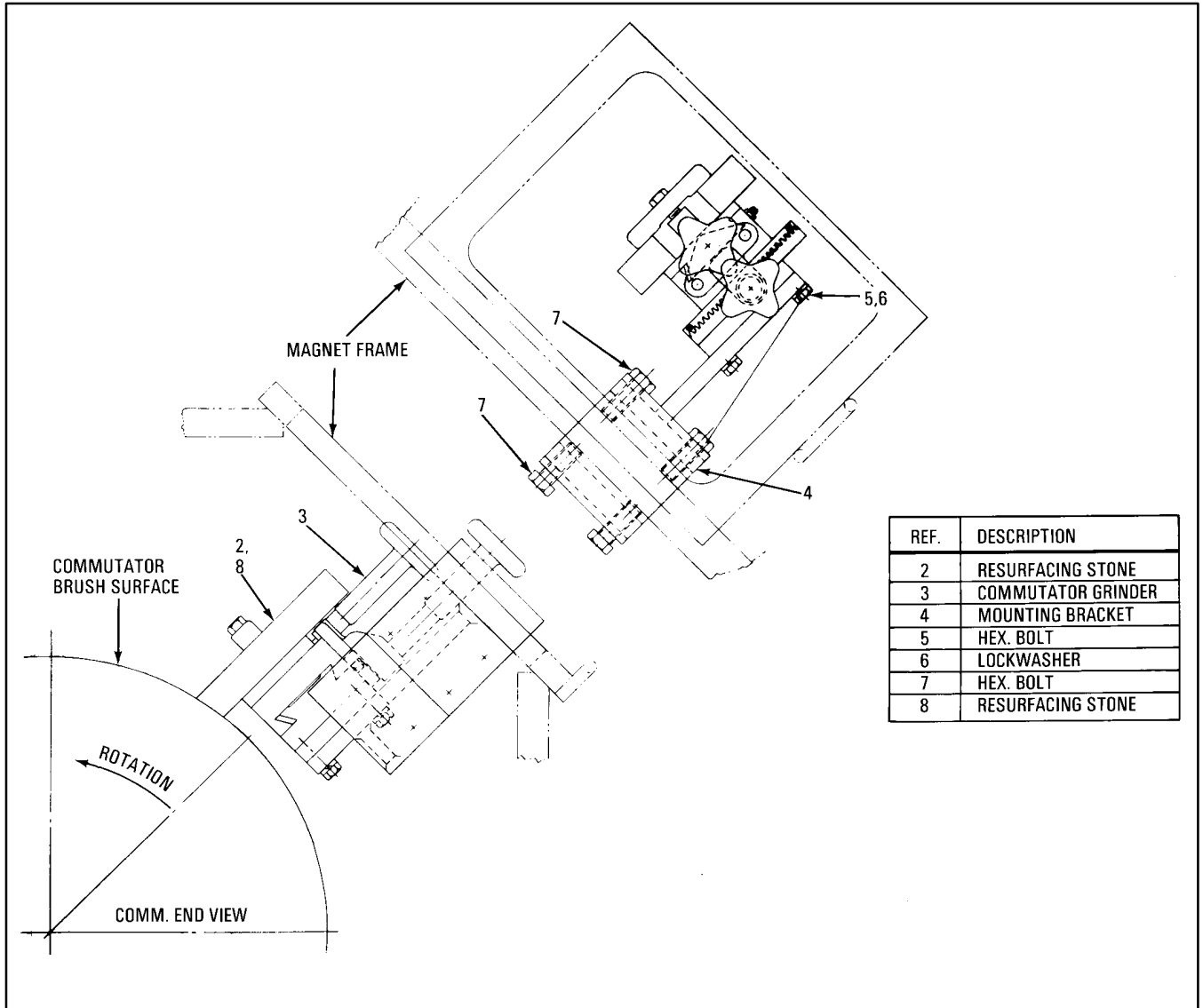


FIG. 11. COMMUTATOR GRINDER. E-18249.

NOTE: For most applications, finish-grade resurfacing stones are recommended. Medium grade stones can be used for rough grinding a deeply grooved or threaded commutator, or a commutator with deep flat spots, followed by finish-grade stones for the final grinding. If new stones will be used, they should be contoured on a Carborundum wheel to approximate the curvature of the commutator.

Install the stones in the grinder so the entire surface of the commutator will be resurfaced when the carriage is traversed from side-to-side. Proceed with alignment of the grinder as follows:

Install the resurfacing stones in the grinder and proceed as follows:

1. Traverse the carriage to one end of the commutator and check the clearance between the commutator surface and one stone with a feeler gauge or a fiber strip (approximately 0.030 in. thick). Traverse the carriage to the other end of the commutator and check the clearance under the same stone. The clearance should be the same at both ends. If clearance is not equal at both ends, adjust the mounting bracket by means of the set screws to obtain equal clearance at both ends.

- Turn the feed control to back the stones away from the commutator before starting the machine.

NOTE: If possible, use some method of collecting the copper chips and abrasive dust produced by the grinding operation. For example, use a vacuum cleaning device with the suction wand set just behind the trailing edge of the stones.

Grinding

- Apply power to the machine and gradually increase speed to 900–1000 rpm.

NOTE: Do not grind the commutator to a depth where no mica undercut remains, or to a diameter which is smaller than the minimum permissible diameter listed in the DATA section.

- Begin grinding by radially feeding the stones lightly against the commutator. Then, slowly move the carriage back and forth longitudinally across the surface. When the cutting action of the stone ceases, again feed the stone lightly against the commutator and continue grinding. Use care to make a light cut and to avoid chatter. Cutting action should take place at the trailing edge of the stones. Heavy cuts will cause excessive copper drag.
- Grind the commutator to obtain a uniformly smooth surface, but do not remove any more copper than necessary.
- Lighten the cutting pressure on the stones near the end of the grinding operation. If medium-grade stones were used, stop the motor, change to finish-grade stones and repeat Steps 1, 2, 3 and 4. After the final cut, traverse the stones back and forth without changing the feed until cutting action ceases.
- Remove power from the machine.
- Check commutator runout with a dial indicator. Refer to the DATA section for concentricity limits.

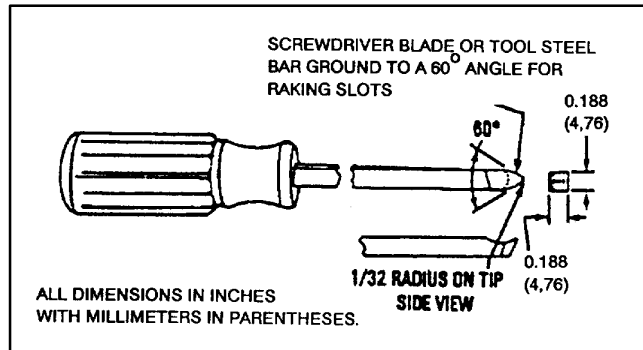


FIG. 12. COMMUTATOR SLOT RAKING TOOL. E-19771A.

- If necessary, continue grinding to meet concentricity values listed in the DATA section.
- Remove the grinder.
- See Fig. 12 for slot raking tool. Rake the commutator slots to remove projecting mica fins or copper whiskers.
- Run the machine again at 1000 rpm and polish the commutator with 00 sandpaper, crocus cloth or 400A Triemite* paper. The abrasive sheet should be mounted on a wooden block curved to fit the surface of the commutator.

CAUTION: Never use an emery cloth on this or any commutator. The abrasive particles on emery cloth scratch the commutator surface and lodge in the grooves between commutator segments. This condition creates the possibility of an eventual flashover which could seriously damage the machine.

- Blow the dust from the commutator and the interior of the motor with dry, compressed air. Hold the air nozzle one to two inches from the surface of the commutator and sweep nozzle longitudinally to dislodge copper chips and mica dust.
- Air cure the commutator. See the following section for air curing instructions.

*Product of Minnesota Mining and Manufacturing Co.

WARNING: When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.

Air Curing Commutator

After the commutator has been sanded, stoned or ground and blown clean, it should be air cured as follows:

1. Rotate the armature slowly with the same source of power used for sanding, stoning or grinding.
2. Use a rubber air-hose with the nozzle removed and sweep the commutator surface with 70 psi air pressure.

WARNING: Observe all the following safety precautions to avoid injury.

1. Remove all metal fittings from the air hose or, if impossible to remove, insulate the fitting.
2. Be certain an operator is stationed at the power-supply control to quickly remove power from the machine should an emergency arise.
3. Wear rubber-insulated gloves and goggles while air curing. Stand on an insulated platform.
4. Avoid contact with the cable terminals.

WARNING: Do not come into close proximity of an energized motor during the cleaning process. The armature commutator and brush rigging have a high electrical charge which could cause serious injury or death. Always use a hose tip that is an electrical non-conductor when cleaning with air.

3. Increase the machine speed to approximately 900 rpm and blow air on the commutator until the sparking stops.
4. Increase the speed until full speed is reached (do not exceed 1000 rpm) and continue to blow air on the commutator until all sparking stops.
5. Stop the machine.
6. Disconnect external power supply to machine. Make all necessary mechanical and electrical changes to restore the machine to service.
7. Use a clean cloth and wipe off the brushholders, creepage band and accessible surfaces in the commutator chamber.
8. Brushholder Clearance – Install the brushholder previously removed and check and adjust as required the brushholder-to-commutator clearance on all brushholders. See previous Brushholder Replacement and Brushholder Clearance Adjustment sections for instructions to install the brushholder, and to adjust brushholder clearance.
9. Installing Brushes – Refer to BASIC REPAIRS, Brush Replacement section, and install serviceable or new brushes per instructions listed.
10. Vacuum interior of commutator chamber.

BASIC OVERHAUL

NOTE: Be sure to use the correct drawings for the machine being overhauled. Refer to Table 2 on page 20 to determine the correct drawing.

It is recommended that a basic overhaul be performed every two years, or 18,000 hours. The time interval between overhauls may vary, depending on the condition of the machine and the severity of service.

The following basic overhaul procedures include instructions to disassemble, clean, inspect, repair, reassemble and test the machine.

TESTING BEFORE DISASSEMBLY

Perform the following tests prior to disassembly of the machine:

TABLE 2. DRAWING REFERENCE

GE752 Model	Inst. Book Longitudinal	Puller Tools		Arm. Shaft	Connection Diagram	Coiled Frame Assembly	Bearing Grease Distribution		Arm. Locking Arrangement	Outline
		Comm. End	Pinion End				Drive End	Comm. End		
AUP1	Fig. 15	Fig. 16	Fig. 17	Fig. 20	Fig. 22	Fig. 29	Fig. 34	Fig. 38	Fig. 43	Fig. 48
AUP2	Fig. 15	Fig. 16	Fig. 17	—	Fig. 22	Fig. 29	Fig. 34	Fig. 38	Fig. 43	Fig. 48
AUP3	Fig. 15	Fig. 16	Fig. 17	—	Fig. 22	Fig. 29	Fig. 35	Fig. 38	Fig. 43	Fig. 48
AUP4	Fig. 15	Fig. 16	Fig. 17	—	Fig. 22	Fig. 29	Fig. 35	Fig. 38	Fig. 43	Fig. 48
AUP5	Fig. 15	Fig. 16	Fig. 17	—	Fig. 22	Fig. 29	Fig. 35	Fig. 39	Fig. 43	Fig. 48
AUT1	Fig. 18	Fig. 16	Fig. 17	—	Fig. 24	Fig. 32	Fig. 36	Fig. 38	Fig. 43	Fig. 49
AUT2	Fig. 18	Fig. 16	Fig. 17	—	Fig. 24	Fig. 32	Fig. 36	Fig. 39	Fig. 43	Fig. 49
UP1	Fig. 15	Fig. 16	Fig. 17	Fig. 20	Fig. 21	Fig. 30	Fig. 34	Fig. 38	Fig. 43	Fig. 48
UP2	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 34	Fig. 38	Fig. 43	Fig. 48
UP3	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 35	Fig. 38	Fig. 43	Fig. 48
UP3A	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 35	Fig. 38	Fig. 43	Fig. 48
UP4	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 35	Fig. 38	Fig. 43	Fig. 48
UP5	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 35	Fig. 38	Fig. 43	Fig. 48
UP6	Fig. 15	Fig. 16	Fig. 17	—	Fig. 21	Fig. 30	Fig. 35	Fig. 39	Fig. 43	Fig. 48
US1	Fig. 18	Fig. 16	Fig. 17	—	Fig. 23	Fig. 31	Fig. 36	Fig. 38	Fig. 43	Fig. 49
US2	Fig. 18	Fig. 16	Fig. 17	—	Fig. 23	Fig. 31	Fig. 36	Fig. 39	Fig. 43	Fig. 49

Megohmmeter Test

Lift the brushes and perform a megohmmeter test on the armature windings and field coils to determine the condition of the insulation. A reading of less than 2 megohms indicates poor insulation, dirt accumulation or excessive moisture.

Bar-To-Bar Resistance Test

Test for open or short-circuited armature coils.

1. Pass a regulated d-c current through the armature coils.
2. Read the voltage drop between the commutator bars with a millivoltmeter. If the reading varies more than +/- 5% from the average value, a defective or short-circuited coil is indicated.

DISASSEMBLY

Armature Removal From Frame

Models UP, AUP

Before turning the machine from horizontal to vertical (or vice-versa), attach the armature locking arrangement to prevent the armature from moving axially. Remove the armature locking arrangement before operating the machine.

See Table 2 to determine the correct armature locking arrangement drawing.

Refer to the longitudinal drawing, Fig. 15, and puller tool drawings, Figs. 16 and 17.

1. Clean the outside of the frame.
2. Remove the hubs from the shaft if not already removed.
3. Remove the commutator covers. Disconnect and remove all brushes and brushholders. Wrap

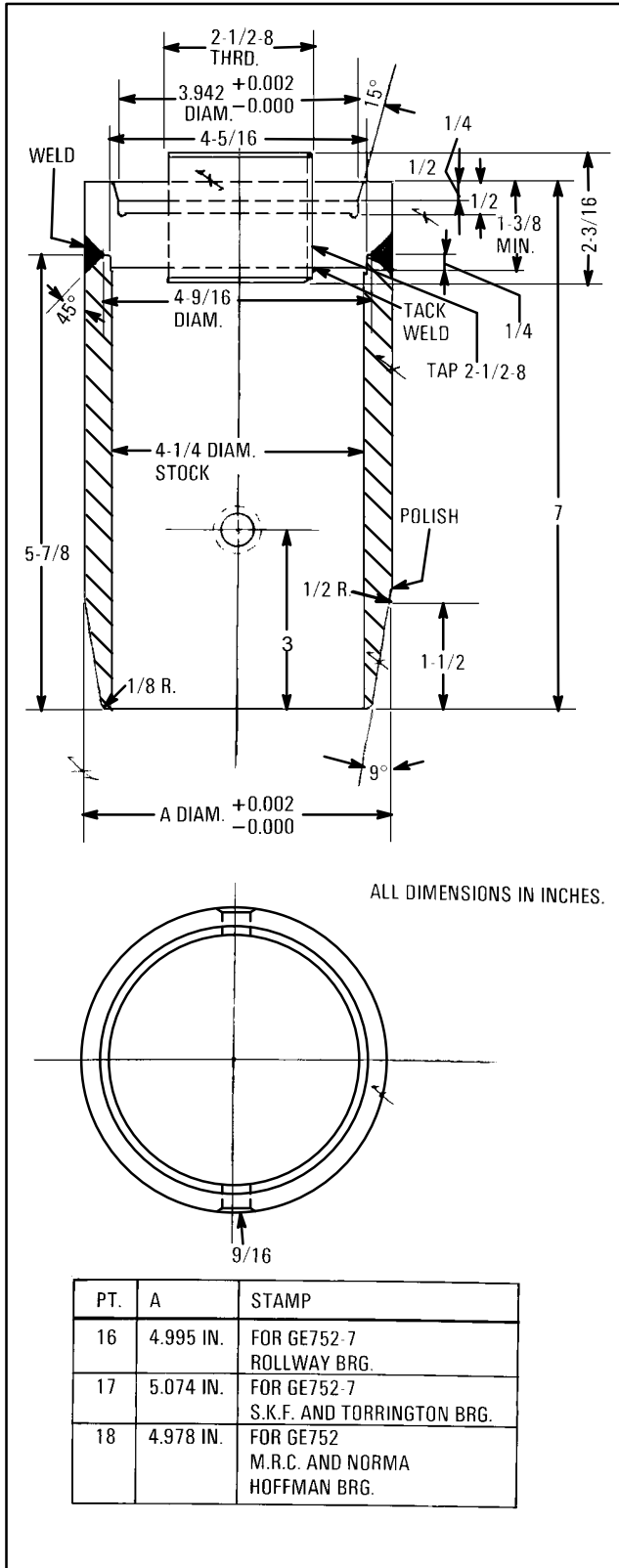


FIG. 13. COMMUTATOR-END BEARING PILOT. E-18150.

- heavy paper around the commutator for protection during handling.
4. Remove grease tubes from the commutator-end bearing cap:
 - a. On UP1 and AUP1 models, there are two grease tubes (19, 20).
 - b. On UP2 and AUP2 models, there is one grease tube (19).
 - c. On all other models, only a pipe plug is provided in the bearing cap.
5. Install puller (Part 6751547G4) and pull sleeve (42) from the shaft at the commutator end. The sleeve has four tapped holes for applying the puller. Apply heat to the sleeve with a torch while pulling to facilitate removal.
6. Remove bolts and washers (52) and remove bearing cap (4) and gasket (57) from the frame head.
7. Make sure the armature locking arrangement is securely installed. Turn the machine on end on a stand (commutator-end down) and level it so the armature can be lifted vertically out of the frame without damaging the bearings, commutator or brushholders. Remove the armature locking arrangement.

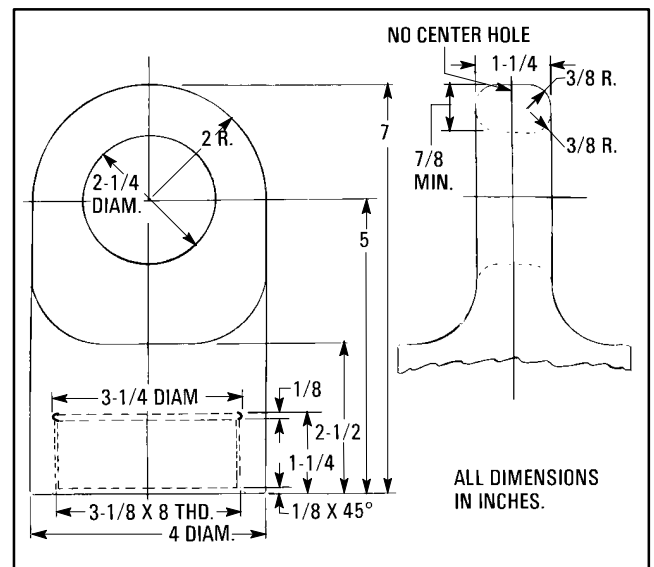


FIG. 14. ARMATURE LIFTING BAIL. E-23932.

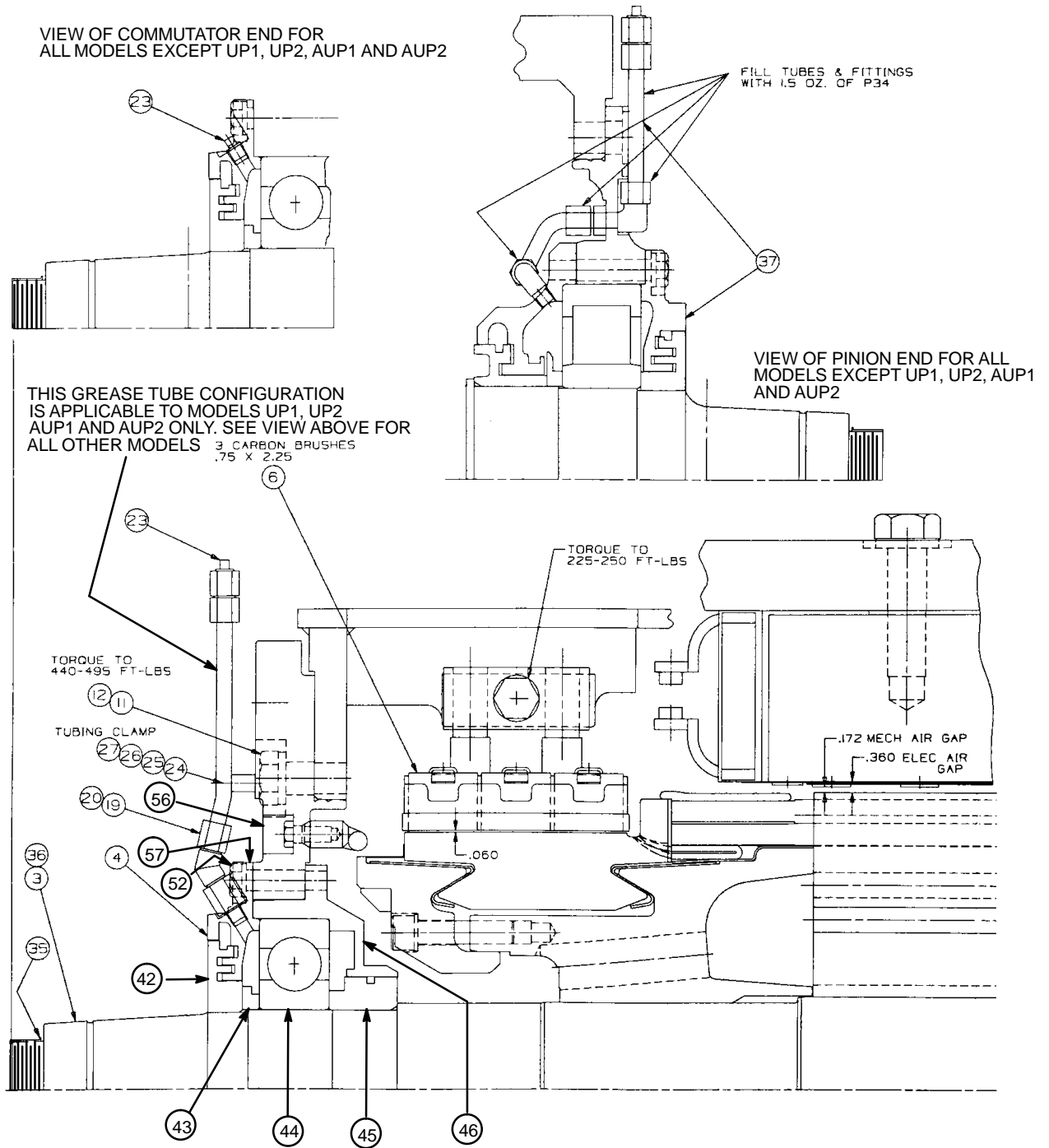


FIG. 15. LONGITUDINAL SECTION (41D732922 CHG. N). E-28621D.

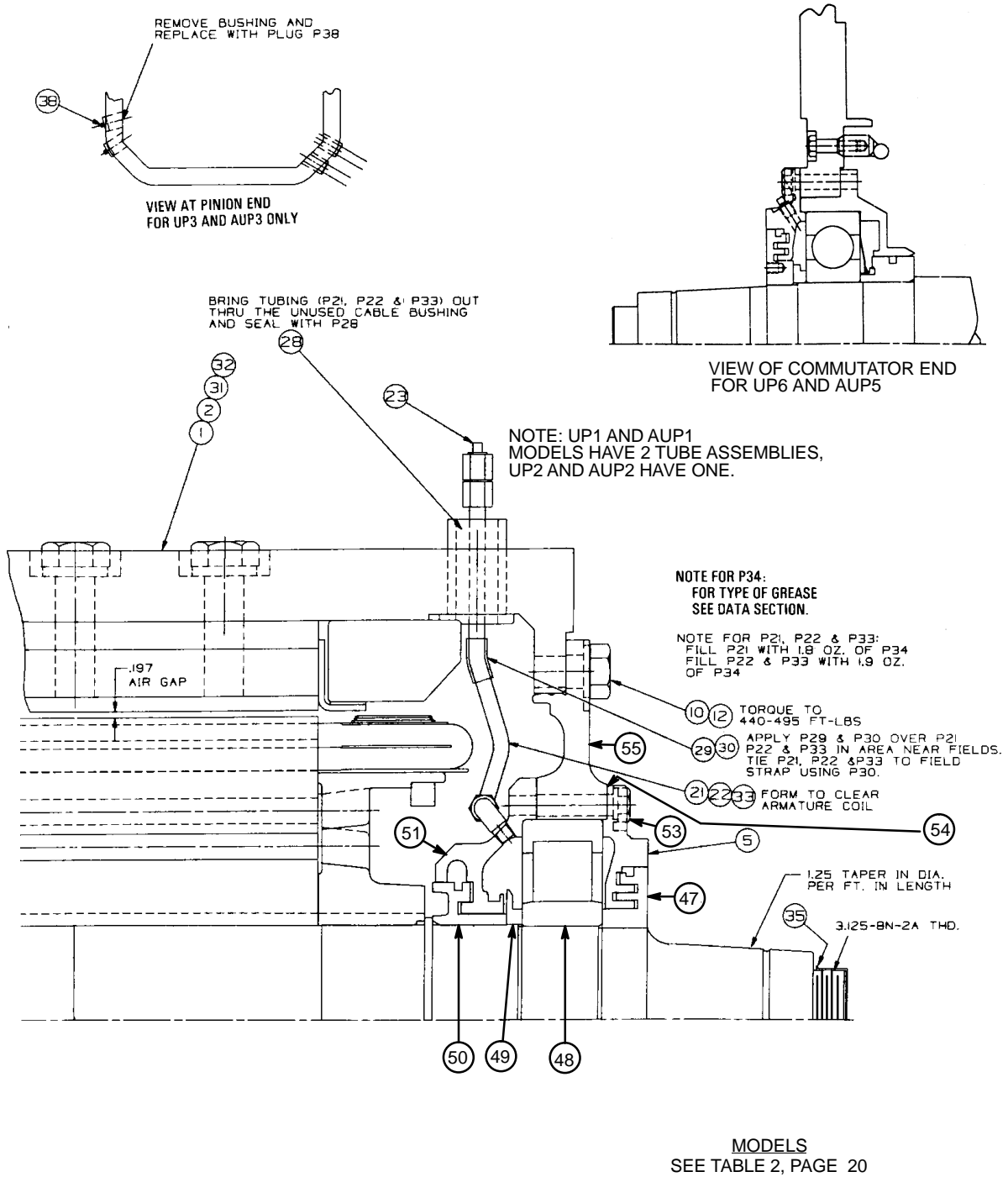


FIG. 15. LONGITUDINAL SECTION (41D732922 CHG. N). E-28621D.

GEK-91584D, Vertical Drilling Motor, Type GE752

REF.	DESCRIPTION
1	COILED FRAME
2	COILED FRAME
3	ARMATURE AND BEARING ASSEMBLY
4	OUTER BEARING CAP
5	OUTER BEARING CAP
6	CARBON BRUSH
7	COVER (TOP INSPECTION)
8	COVER (BOTTOM INSPECTION)
9	COVER (HAND HOLE)
10	BOLT (FRAMEHEAD), N22P39032, 1.00-8 X 2.00
11	BOLT (FRAMEHEAD), N22P39036, 1.00-8 X 2.25
12	LOCKWASHER, N405P50P, 1.00 MEDIUM
13	BOLT (COVER) N22P29014B13, 0.50-13 X 0.88
14	LOCKWASHER, N405P45P, 0.50 MEDIUM
15	NAMEPLATE
16	ESCUTCHEON PIN, N532P1106, NO. 12 X 0.38
17	MONOGRAM
18	ESCUTCHEON PIN, N532P1108, NO. 12 X 0.50
19	TUBING
20	TUBING
21	TUBING (SEE NOTE)
22	TUBING (SEE NOTE)
23	PIPE PLUG, N5700P31, 1/4
24	SPACER, 1/4 EXST. PIPE 3/4 LG.
25	CLAMP
26	BOLT, N22P21020B13, 0.25-20 X 1.25
27	LOCKWASHER, N405P41P, 0.25 MEDIUM
28	SEALER, RTV 108
29	1ST TAPING, 12.00 (IT-1/2L), 41A239176P112
30	2ND TAPING, 24.00 (IT-1/2L), 41A239176P18
31	COILED FRAME
32	COILED FRAME
33	TUBING (SEE NOTE)
34	GREASE (SEE NOTE)
35	CAP
36	ARMATURE AND BEARING ASSEMBLY
37	BEARING ASSEMBLY (PE) (SEE NOTE)
38	PLUG
39	COVER (TOP INSPECTION)
40	COVER (BOTTOM INSPECTION)
41	COVER (HAND HOLE)
42	SLEEVE
43	SPACER
44	BALL BEARING
45	SLEEVE
46	BEARING HOUSING
47	SLEEVE
48	ROLLER BEARING
49	FLINGER
50	SLEEVE
51	BEARING HOUSING
52	BOLTS AND WASHERS
53	BOLTS AND WASHERS
54	GASKET
55	FRAMEHEAD
56	FRAMEHEAD
57	GASKET

FIG. 15. LONGITUDINAL SECTION (41D732922 CHG. N). E-28621D.

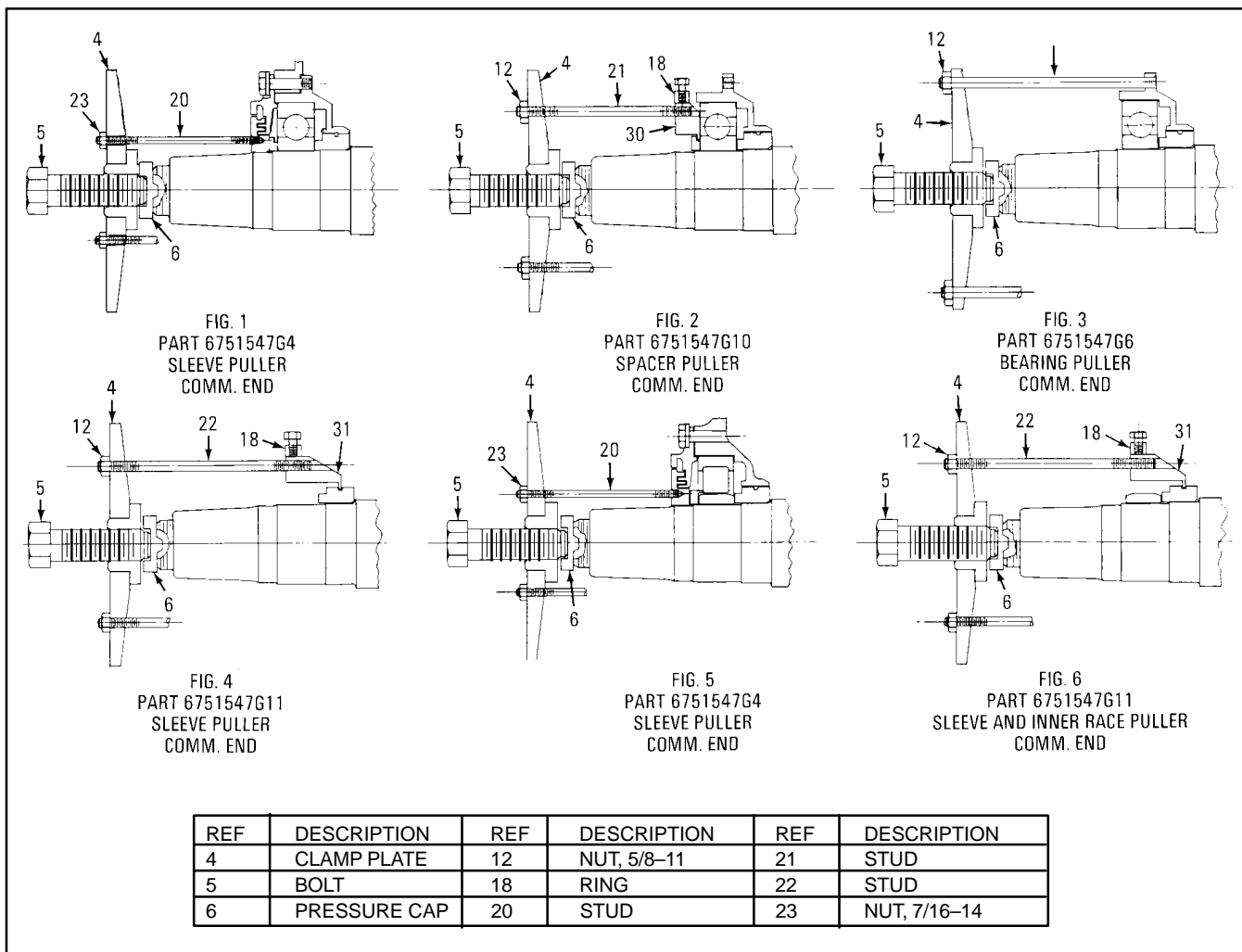


FIG. 16. PULLER TOOLS (41D731569 CHG. 0). E-14383C.

8. Reach into the drive-end of the motor and disconnect grease tubes.
 - a. On UP1 and AUP1 models, disconnect two grease tubes (21 and 22) from the inner bearing cap (51). Pull these tubes out through their hole in the frame. The sealing RTV in the hole will separate with sufficient force.
 - b. On UP2 and AUP2 models, disconnect one grease tube (21) from the inner bearing cap (51). Pull this tube out through its hole in the frame. The sealing RTV in the hole will separate with sufficient force.
 - c. On all other models, only one grease tube is used, connected between the inner bearing cap and the framehead. Remove this tube.
9. Place three 0.125 in. spacers (wedge shaped) around the armature in the air gap between the armature and the fields to maintain a vertical attitude of the armature and to prevent the armature from contacting the fields.
10. Remove bolts (10) and lockwashers (12) from the framehead (55). Insert bolts into the jackout holes in the framehead.
11. Install a lifting bail, Fig. 14, onto the end of the shaft.
12. Line up the hoist cable with the centerline of the armature before engaging the hook in the lifting bail on the end of the shaft. Engage the hook and lift slightly. With sufficient strain on the hoist cable to take the weight of the armature off the

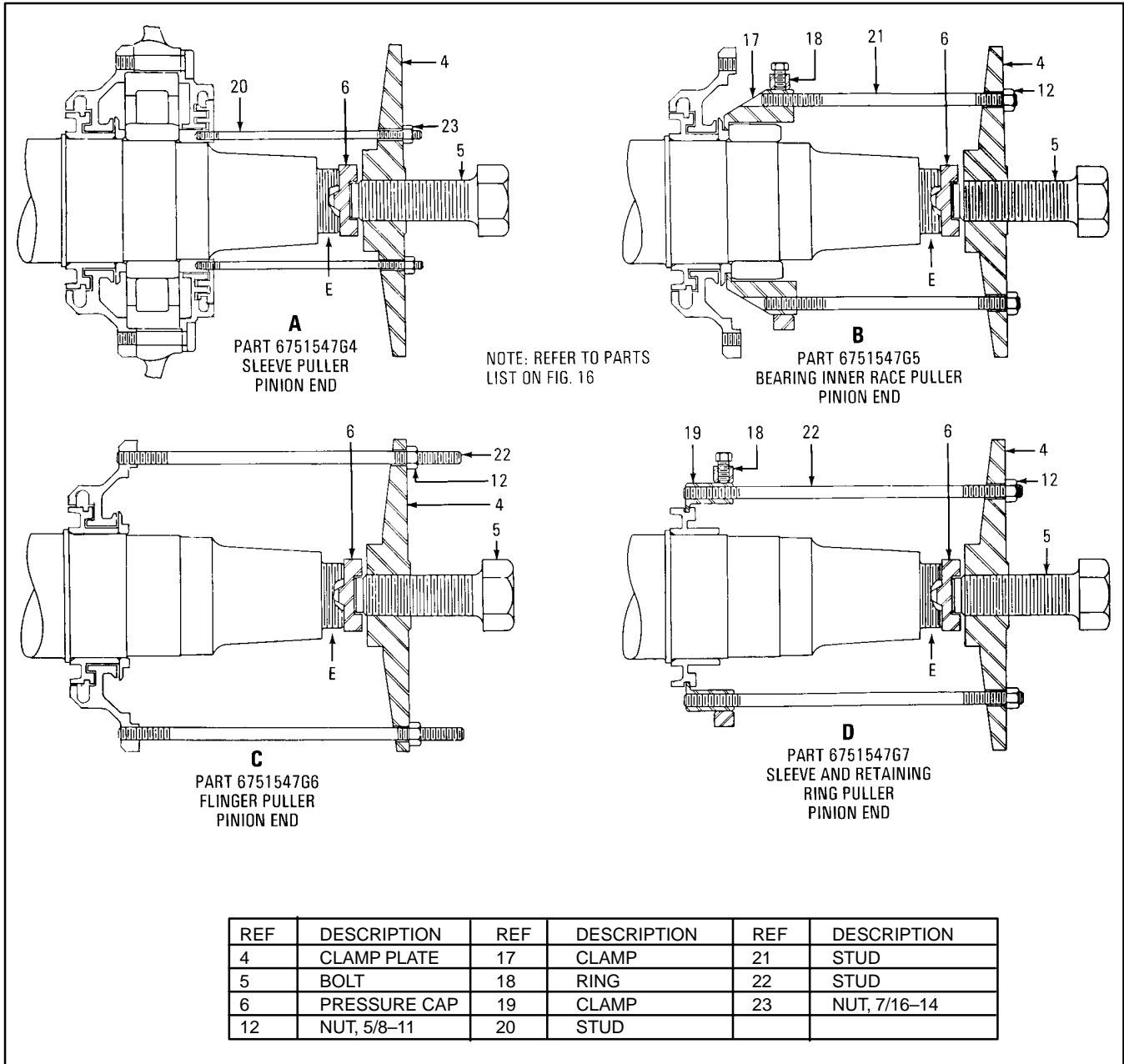


FIG. 17. PULLER TOOLS. E-18155A.

framehead, jack the drive-end framehead loose, and lift the complete armature assembly out of the frame. DO NOT DAMAGE THE COMMUTATOR.

13. Move the armature to a suitable fixture for further bearing disassembly or repair.

14. Install puller (Part 6751547G4) and pull sleeve (47) from the shaft at the drive end. Heat may be applied.

15. Remove bolts and lockwashers (53) from bearing cap (5). Remove the bearing cap and gasket (54).

16. Remove the framehead. It will come with the bearing outer race and bearing rollers.
17. Pull the inner bearing race off the drive end of the shaft with puller (Part 6751547G5).
18. Remove flinger (49) and inner bearing cap (51) with puller (Part 6751547G6) by inserting the four puller bolts into tapped holes in the inner bearing cap.
19. If necessary, remove inner sleeve (50) with puller (Part 6751547G7).
20. Press the outer bearing race and rollers from the framehead with an arbor press.

NOTE: Before pressing the drive-end outer bearing race out of the framehead, observe and record the number on the face of the race which is opposite the arrow on framehead. After removal, mark the date (with electric pencil) under this number to indicate that this position has been used. Reassemble the bearing with another number opposite the arrow. If the bearing has not been previously marked, etch Nos. 1, 2, 3 and 4 (spaced 90 degrees apart) on the face of race with an electric pencil. Locate No. 1 opposite the arrow on the framehead and mark it with the date.

21. Install puller (Part 6751547G10) and pull spacer (43) from the commutator end of shaft.
22. Install puller (Part 6751547G6) and pull bearing housing (46) with bearing (44) from the shaft.
23. Press ball bearing (44) from bearing housing (46) using an arbor press.
24. If applied, remove the nilos ring (4), Fig. 39, from the bearing and discard.
25. If applied, remove the seal ring (5), Fig. 39, from the sleeve and discard.
26. Install puller (Part 6751547G11) and pull sleeve (45) from the shaft.
27. If it is necessary to remove the commutator end framehead (56), place the frame commutator

end up and remove bolts (11) and lockwashers (12). Use bolts in the framehead jackout holes to break the fit and remove the framehead.

Armature Removal From Frame

CAUTION: When lifting the armature out of the frame, proceed slowly so that no damage will occur to the armature end-windings, bearings, bearing fits or the commutator.

Models US1, AUT

Before turning the machine from horizontal to vertical (or vice-versa), attach the armature locking arrangement to prevent the armature from moving axially. Remove the armature locking arrangement before operating the machine.

See Table 2 to determine the correct armature locking arrangement drawing.

Refer to the longitudinal drawing, Fig. 18, and puller tool drawings, Figs. 16 and 17.

1. Clean the outside of the frame, using compressed air, a steam-jenny or cleaning solvents, to remove accumulated dirt.
2. Remove the coupling hub from the shaft, if not already removed.
3. Remove the commutator covers. Disconnect and remove all brushes, and wrap heavy paper around the commutator for protection during handling.
4. Install puller tool (Part 6751547G4) and pull the sleeve (6) from the commutator end of the shaft.
5. Remove bolts (10) which hold the bearing cap and the bearing housing to the commutator-end framehead. Remove the bearing cap (8) and gasket (11).
6. Turn the machine on end on a stand, commutator end down, and level it so that the armature can be lifted vertically out of the frame without damaging the bearings, commutator or brush-holders.
7. Screw three guide pins into the commutator-end bearing housing (3) to help guide the armature out of the frame.

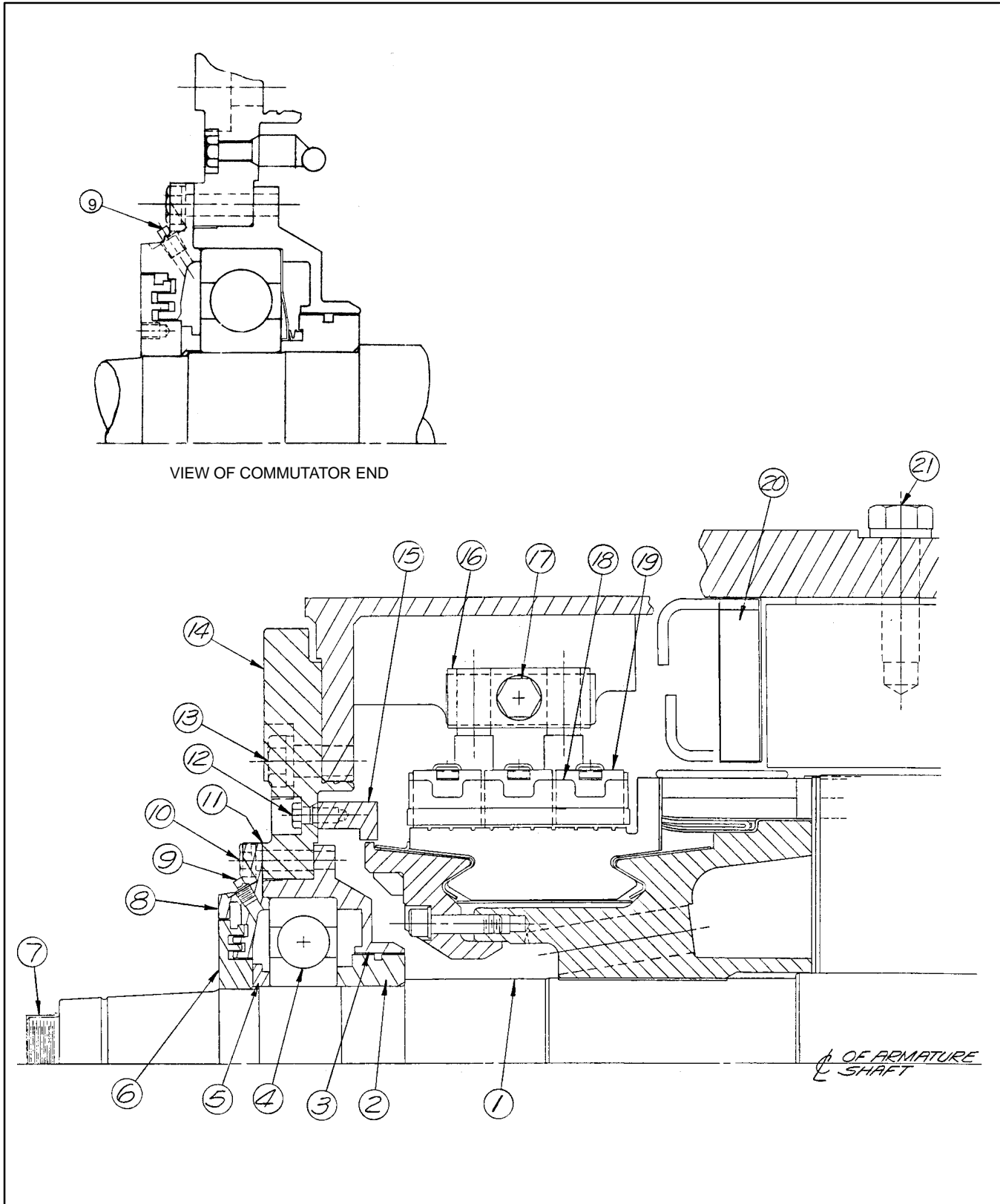
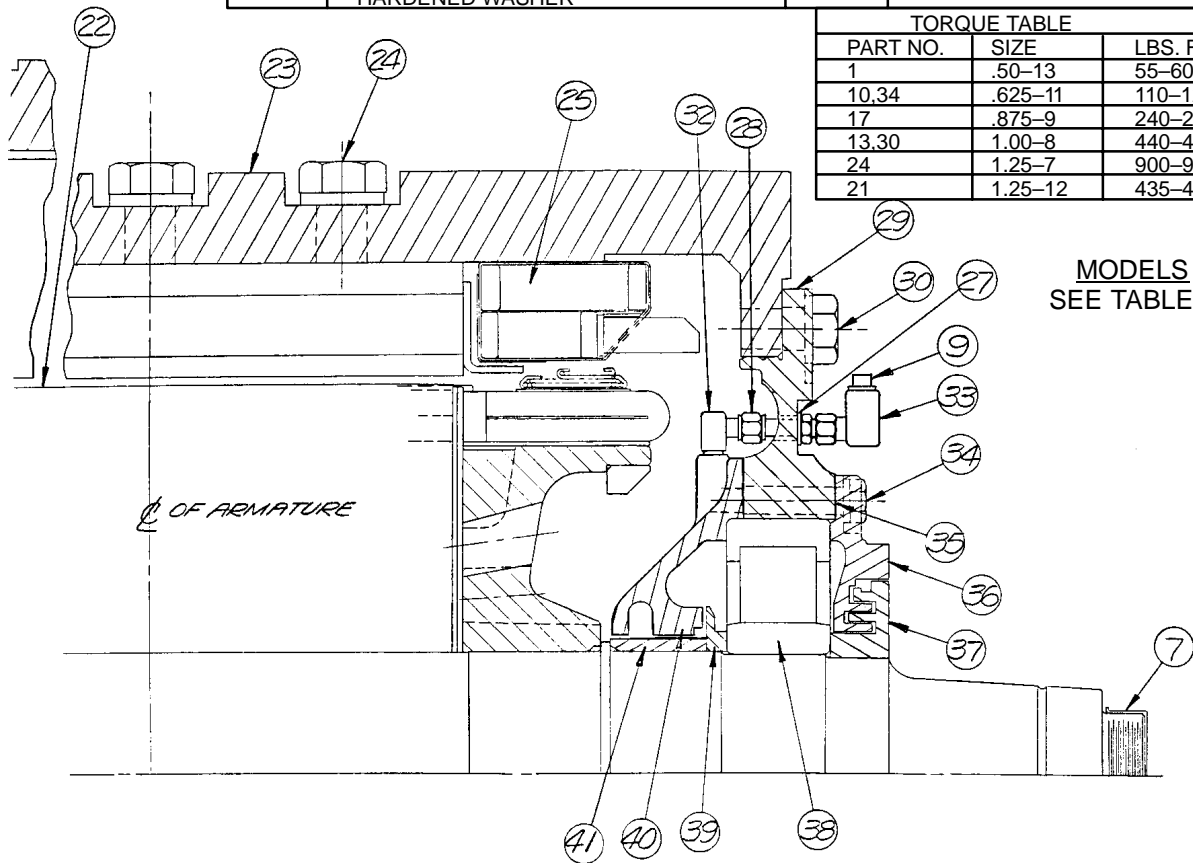


FIG. 18. LONGITUDINAL SECTION (41D735357, CHG. A). E-37949B

REF.	DESCRIPTION	REF.	DESCRIPTION
1	SHAFT	22	ARMATURE
2	SLEEVE	23	MAGNET FRAME
3	BEARING HOUSING	24	EXCITING POLE BOLT AND HARDENED WASHER
4	BALL BEARING	25	EXCITING FIELD COIL
5	SPACER	27	WASHER
6	SLEEVE	28	FITTING
7	CAP	29	FRAME HEAD
8	BEARING CAP (OUTER)	30	BOLT AND LOCKWASHER
9	PIPE PLUG	31	GASKET
10	BOLT AND LOCKWASHER	32	FITTING
11	GASKET	33	FITTING
12	BOLT	34	BOLT AND LOCKWASHER
13	BOLT AND LOCKWASHER	35	GASKET
14	FRAME HEAD	36	BEARING CAP (OUTER)
15	FLASH RING	37	SLEEVE
16	BRUSH HOLDER CLAMP	38	ROLLER BEARING
17	BOLT AND LOCKWASHER	39	FLINGER
18	BRUSH HOLDER	40	BEARING CAP (INNER)
19	CARBON BRUSH	41	SLEEVE
20	COMMUTATING FIELD COIL		
21	COMMUTATING POLE BOLT AND HARDENED WASHER		

PART NO.	SIZE	LBS. FT.
1	.50-13	55-60
10,34	.625-11	110-120
17	.875-9	240-260
13,30	1.00-8	440-495
24	1.25-7	900-995
21	1.25-12	435-483



MODELS
SEE TABLE 2

FIG. 18. LONGITUDINAL SECTION (41D735357, CHG. A). E-37949B.

8. Screw a lifting bail, Fig. 14, on the drive end of the shaft.
9. Remove drive-end framehead bolts (30) and insert three jack screws in the threaded holes provided in the framehead.
10. Line up the hoist cable with the centerline of the armature before engaging the hook in the lifting bail on the end of the shaft. Engage the hook and lift slightly. With sufficient strain on the hoist cable to take the weight of the armature off the framehead, jack the drive-end framehead loose, and lift the complete armature assembly out of the frame. DO NOT DAMAGE THE COMMUTATOR.

CAUTION: Special precautions should be taken to avoid damage to the armature end-windings, bearings or bearing fits, and the commutator when lifting the armature in the vertical position or turning the armature to a horizontal position.

11. Place the armature horizontally in an armature saddle for bearing disassembly.
12. At the drive end, remove the lubricating tube assembly (9, 33, 32 and 28) from the framehead.
13. Using puller tool (Part 6751547G4), pull the outer sleeve (37) from the drive end of the shaft. The sleeve has tapped holes for applying the puller. Heat may be applied.
14. Remove bolts (34), and then remove outer bearing cap (36) and gasket (35).
15. Slide framehead (29) off the shaft together with the outer race and rollers of bearing (38). The inner race will remain on the shaft.
16. Pull the inner bearing race off the shaft with puller (Part 6751547G5).
17. Remove flinger (39) and inner bearing cap (40) with puller (Part 6751547G6) by inserting the four puller bolts into the tapped holes in inner bearing cap (40).
18. Press the outer bearing race and rollers from the framehead with an arbor press.

NOTE: Before pressing the drive-end outer bearing race out of the framehead, observe and record the number on the face of the race which is opposite the arrow on the framehead. After removal, mark the date (with electric pencil) under this number to indicate that this position has been used. Reassemble the bearing with another number opposite the arrow. If the bearing has not been previously marked, etch Nos. 1, 2, 3 and 4 (spaced 90 degrees apart) on the face of race with an electric pencil. Locate No. 1 opposite the arrow on the framehead and mark it with the date.

19. Install puller tool (Part 6751547G10) and pull spacer (5) from the commutator end of the shaft.
20. Install puller tool (Part 6751547G6) and pull bearing (4) and bearing housing (3) from the commutator end of the shaft.
21. Press the bearing from the framehead with an arbor press.
22. If applied, remove the nilos ring (4), Fig. 39, from the bearing and discard.
23. If applied, remove the seal ring (5) Fig. 39, from the sleeve and discard.
24. Install puller tool (Part 6751547G11) and pull sleeve (2) from the commutator end of the shaft.
25. If necessary to remove the commutator framehead (14), turn the frame commutator end up and remove bolts and lockwashers (13). Use bolts in the framehead jack-out holes to break the fit and remove.

CLEANING

The two recommended methods for cleaning are steam cleaning and vapor degreasing.

CAUTION: Do not use caustic soda solution on the armature or coiled frame.

Steam Cleaning

(Recommended for both insulated and metal parts)

1. Use steam in combination with a commercial non-caustic cleaner.

2. Suspend the part in a position accessible from all directions to a direct flow of steam from the hose.
3. Rinse all residue from parts with a mixture of clean steam and water.
4. Bake insulated parts for at least 8 hours at 150° C (302° F) to remove all moisture.

Vapor Degreasing

(Recommended for metal parts)

1. Bring the cleaning solution to a boil, and allow the vapor line in the tank to rise to the condenser coils at the top of the tank.
2. Keep the vaporized cleaning solution at about 120° C (248° F).
3. Lower the part to be cleaned into the vapor-laden atmosphere, so the vapor will condense on the part.
4. To speed the removal of heavy dirt accumulations, spray hot solution directly from the tank onto the part being cleaned. The temperature of the solution must be kept below its boiling point.
5. Remove the cleaned part from the degreaser. Drain and cool the part.

Anti-Friction Bearings/Shaft Tapers/Bearing Fits

Use a cleaning solution that leaves an oil film to protect finished surfaces from rust. Kerosene, petroleum spirits or other petroleum-base cleaners provide limited protection for these surfaces.

INSPECTION AND TEST OF DISASSEMBLED MOTOR

BEARING INSPECTION

1. Clean the bearings. See Cleaning section.
2. Inspect for broken or cracked races, broken or cracked rollers and balls, broken, cracked or distorted retainers, scored, pitted, scratched or chipped races, and for indication of excessive

wear on rollers and balls. Replace the bearing if any of these conditions is found.

3. Look for evidence of smearing caused by inadequate lubrication, and corrosion pitting (usually at roller spacing) caused by moisture or other corrosive agent. Replace the bearing if any of these conditions are found.
4. Inspect bearing outer races for indentations caused by dirt or foreign material having gone through the bearing. If the indentations are small and few in quantity, the bearing can be used. If the indentations are large and numerous, this may be an indication the rollers or cone are starting to spall out. Examine the rollers and cone carefully for spalled areas. Replace the bearings if spalled areas are found.
5. Dip good bearing parts in a light mineral oil (SAE-10) heated to 90° C (194° F) to avoid corrosion before reassembly.
6. If a bearing will not be mounted immediately, wrap it in an oil-proof paper.

CAUTION: Do not interchange bearing parts of different manufacture or mix new and used bearing parts.

Perform the following inspection and tests to determine the condition of the armature, coiled motor frame and brushholders.

After the inspection and test procedures have been completed and all defects or damage noted, refer to the REPAIR section for the correct repair procedure.

ARMATURE

Handle the armature carefully during overhaul operations to avoid damage to the core, banding, end turns, shaft fits and commutator. Support the armature in a saddle to protect the commutator and to coil the ends. Keep the commutator covered with heavy paper.

Armature Test

1. With the armature at room temperature, 25° C (77° F), use a 500 or 1000 vdc megohmmeter and make a dielectric test of the armature insula-

tion. A reading of one megohm or higher should be obtained. If necessary, perform additional cleaning and baking operations to obtain this value before proceeding.

NOTE: If additional cleaning and baking operations do not increase the resistance value of the insulation, it may be necessary to replace the creepage band and rewind the armature.

2. Measure and record armature resistance. See the DATA section for values.
3. If there are no armature coils grounded, perform a bar-to-bar comparison test to check for open or short-circuited armature coils.
 - a. Pass a regulated d-c current through the armature coils.
 - b. Read the voltage drop between the commutator segments with a millivoltmeter. If the reading varies more than plus or minus 5%, a defective or short-circuited coil is indicated. If the armature fails the bar-to-bar test, the armature must be rewound.

If the armature will not be rewound, proceed to inspect the following items.

Insulation

Inspect the insulation of armature coils for cracks, physical damage, burns and deterioration. If minor repairs are required, refer to Fig. 19 for insulation details.

Glass Band, Commutator End

Inspect the glass bands for split, frayed or loose condition.

Wire Band, Drive End

Inspect the wire band for physical damage, loose tie clips or broken wire.

Creepage Band

Inspect the surface of the Teflon creepage band for possible flashover damage. Tap the band lightly and

check for movement of the band to determine if loose. If the band is loose or has deep burns, replace it. See REPAIR section for instructions.

COMMUTATOR

Check the commutator for threading, pitting, grooving, burns, flat spots, high bars and copper drag.

Check the commutator to make sure that it is not out-of-round. See the DATA section for concentricity limits.

Resurfacing

For the resurfacing procedure for a commutator, see REPAIR, Armature section.

Refer to the DATA section for the minimum permissible commutator diameter dimension and check the diameter of the commutator.

NOTE: If the brush surface diameter will be less than the minimum permissible diameter after resurfacing operations are performed, the commutator must be replaced.

Tightening

If the commutator is loose (has high bars), see the "REPAIR, Commutator Tightening" section for instructions to tighten the commutator.

ARMATURE SHAFT INSPECTION

Armature shaft bearing fit dimensions can be checked and compared to armature shaft drawings provided in Fig. 20. If the bearing fit dimensions are not within stated tolerances the shaft must be replaced or repaired. Refer to Table 2 to determine the correct shaft drawing for the machine being repaired.

MOTOR FRAME

1. Check the connection strap insulation for damage, signs or burning, cracks or discoloration.
2. Check the insulation on the coils for damage, signs of burning, cracks or discoloration.
3. Check the lead cables for damage, overheating and signs of deterioration.

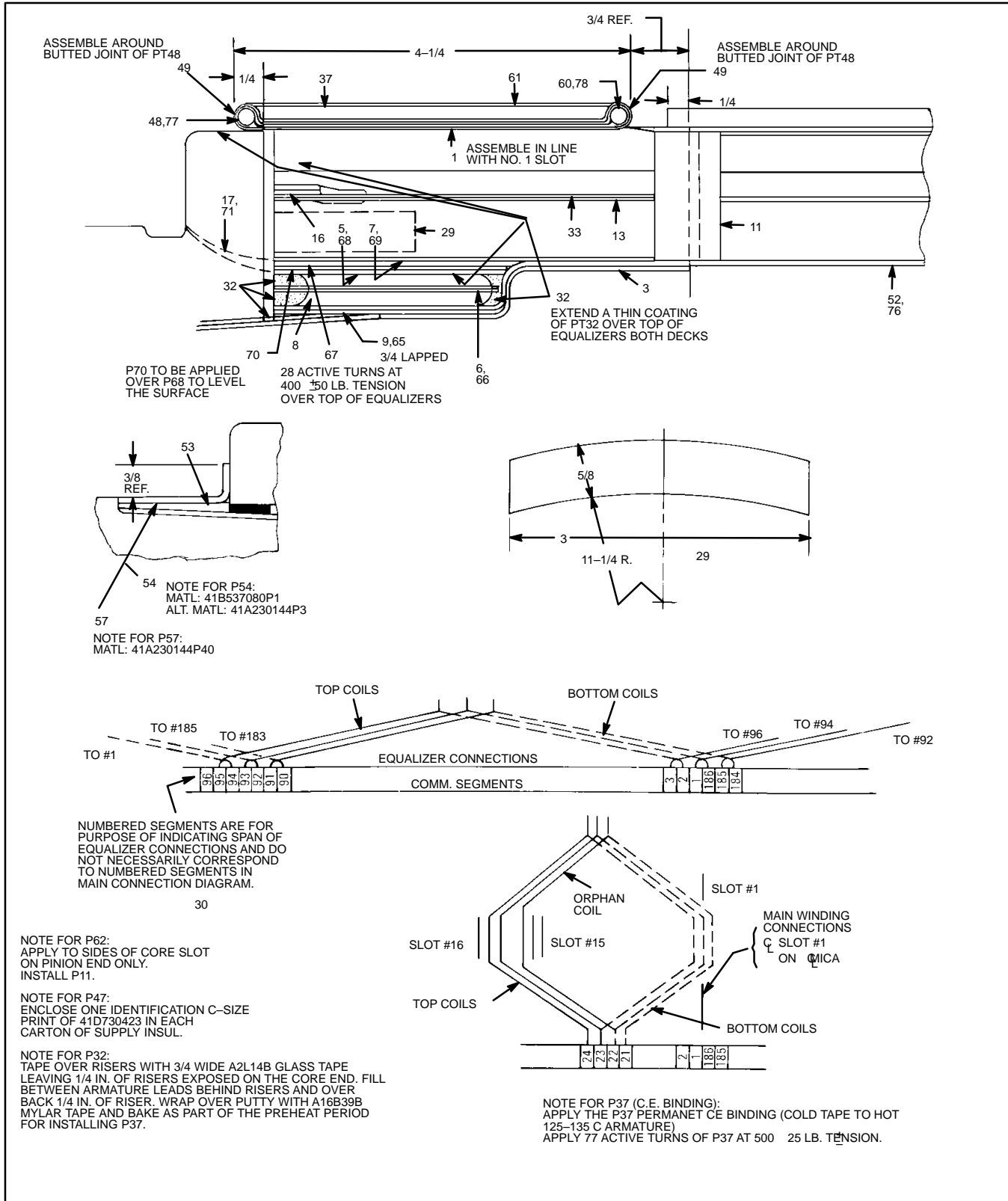
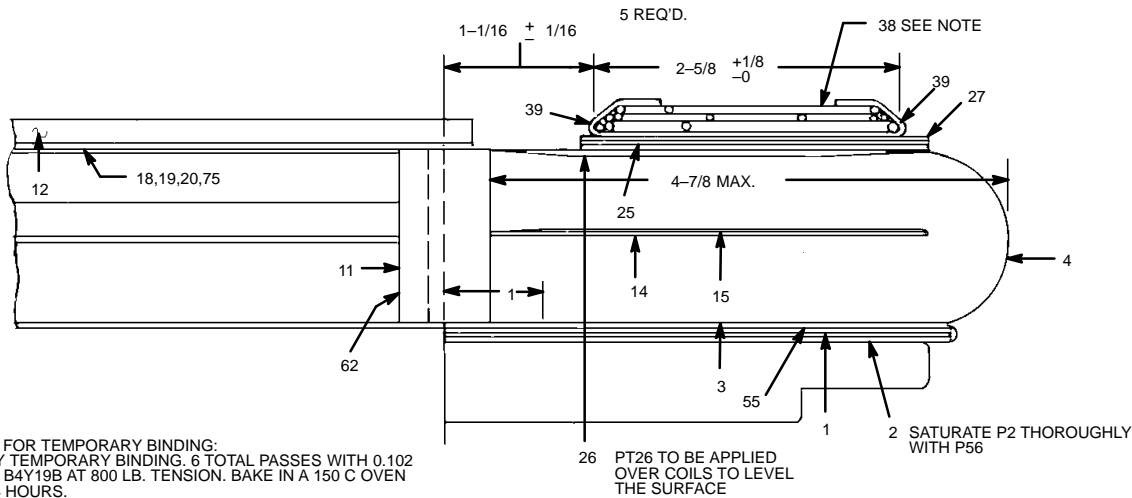


FIG. 19 ARMATURE INSULATION (41D731545 CHG. F). E-18156A.

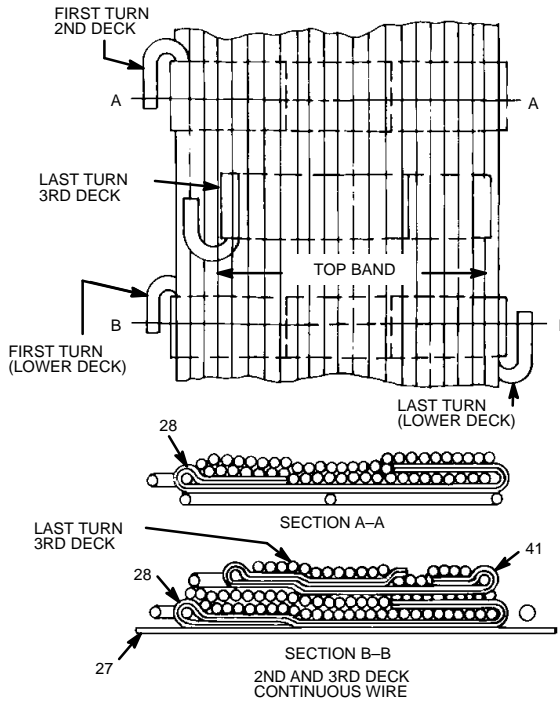
GEK-91584D, Vertical Drilling Motor, Type GE752



NOTE FOR TEMPORARY BINDING:
 APPLY TEMPORARY BINDING. 6 TOTAL PASSES WITH 0.102
 DIAM. B4Y19B AT 800 LB. TENSION. BAKE IN A 150 C OVEN
 FOR 4 HOURS.

26 PT26 TO BE APPLIED
 OVER COILS TO LEVEL
 THE SURFACE

2 SATURATE P2 THOROUGHLY
 WITH P56



REF.	DESCRIPTION	REF.	DESCRIPTION
1	HEAD INSUL. P.E.	40	BINDING CLIP
2	HEAD INSUL. P.E.	41	TIE CLIP
3	FILLER	42	METHOD OF FASTENING BINDING WIRE (P.E.)
4	ARMATURE COIL	43	METHOD OF SWAGING
5	INSUL. OVER EQUALIZERS	44	COMM. RISERS
6	INSUL. IN EQUALIZER LOOP	45	CORE INSUL.
7	INSUL. OVER EQUALIZER	46	WINDING INSUL.
8	EQUALIZER	47	BINDING AND BINDING INSUL.
9	HEAD INSUL. C E	48	IDENTIFICATION PRINT
10	SLOT STRIP BOT	49	BINDING BASE
11	U PIECE AT SLOT ENDS	50	JOINT INSUL.
12	SLOT WEDGE	51	PAD
13	WINDING INSUL. C E	52	SLOT WEDGE
14	INSUL. IN LOOP P.E.	53	SLOT STRIP BOTTOM
15	INSUL. IN LOOP	54	TAPE
16	FILLER STRIP	55	TEFLON BAND
17	FILLER	56	TEFLON GLASS TAPE
18	SLOT STRIP (UNDER WEDGE)	57	VARNISH
19	FILLER STRIP	58	TEFLON BAND
20	FILLER STRIP	59	EQUALIZER
21	SLOT STRIP CENTER	60	FILLER FOR COMM. STRING BAND
22	RADIUS SPACER C.E. TOP AND BOTTOM	61	BINDING BASE
23	BINDER OVER COMM. MICA	62	MYLAR TAPE
24	SEAL OVER COMM. MICA AND STRING BAND	63	CEMENT
25	BINDING INSUL. P.E.	64	CEMENT
26	FILLER P.E.	65	CORE INSUL.
27	BINDING BASE	66	HEAD INSUL.
28	TIE CLIP	67	INSUL. IN EQUALIZER LOOP
29	RADIUS SPACER (C.E. BOTT.)	68	BAND FOR EQUALIZERS
30	DIAGRAM	69	INSUL. OVER EQUALIZERS
31	SHIM (IN RISER SLOT)	70	FILLER
32	FILLER PUTTY	71	FILLER
33	WINDING INSUL. C.E.	72	WINDING INSULATION
34	FILLER FOR COMM. STRING BAND	73	ASBESTOS ROPE
35	FILLER FOR COMM. STRING BAND	74	ARMATURE COIL
36	BINDING BASE	75	FILLER STRIP
37	BANDING	76	SLOT STRIP BOTTOM
38	BINDING WIRE	77	BINDING BASE
39	BINDING CLIP P.E.	78	BINDING BASE

NOTE FOR P38 (P.E. BINDING):
 APPLY THE P38 PERMANENT BINDING.
 APPLY 37 ACTIVE TURNS OF P38 AT 650 20 LB. TENSION
 AS THE 1ST DECK.
 APPLY 35 ACTIVE TURNS OF P38 AT 600 20 LB. TENSION
 AS THE 2ND DECK.

APPLY 34 ACTIVE TURNS OF P38 AT 550 20 LB. TENSION
 AS THE 3RD DECK

THE 2ND AND 3RD DECK MUST BE A CONTINUOUS BAND.

FIG. 19. ARMATURE INSULATION (41D731545 CHG. F). E-18156A.

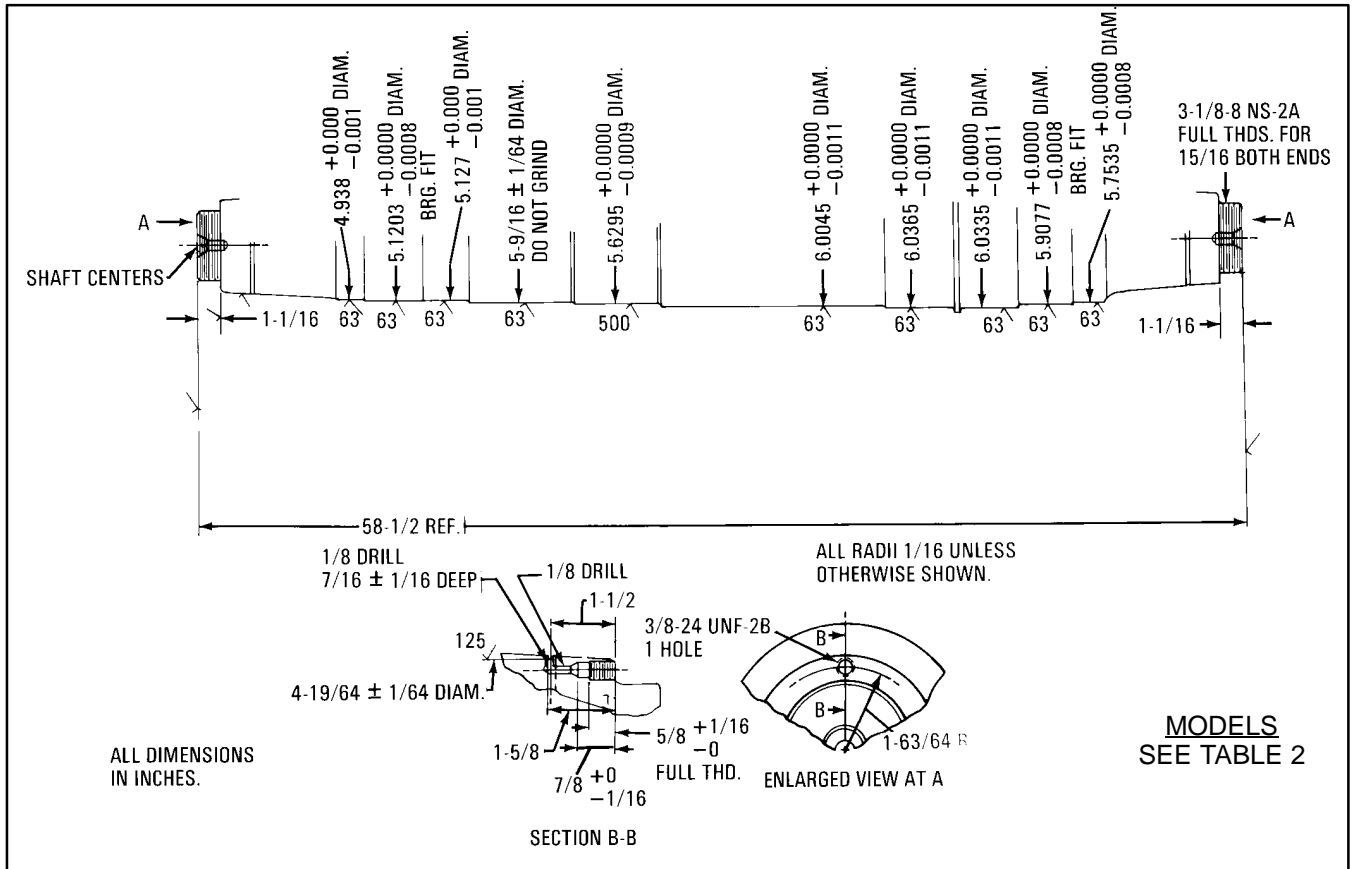


FIG. 20. ARMATURE SHAFT (334B336 CHG. D). E-39091A.

4. Conduct a 500 volt megohmmeter test on the coils. A reading of 20 megohms or more is acceptable.
5. See Figs. 21 thru 24 and measure and record commutating and exciting-coil resistance. Refer to Table 2 to determine the correct connection diagram for the machine being repaired.
6. High-potential test the field coils to ground.

WARNING: Electric shock can cause serious injury or death. Strict safety precautions must be taken and observed by personnel conducting a high-potential test.

Apply a high-potential test of 2000 volts, 60 Hz for one minute.

BRUSHHOLDERS

1. Inspect the brushholder for flashover damage, cracks and burned or pitted areas.
2. Check the brush springs to be sure they move freely and do not bind.
3. Insert a new brush in the carbonway and move it up and down in the carbonway to be sure it moves freely.

REPAIR

LUBRICATION OF BOLTS

The threads and washer faces of bolts and nuts should be lubricated to obtain maximum clamping force (at the nominal or at a recommended torque value) when bolts and nuts are installed at reassembly. Lubricate all bolts.

Use a High Pressure Lubricant such as; graphite in oil (1 part graphite to 5 parts machine oil by volume), Lu-

briplate* (Part 147X1614), Molykote** (Part 147X1143), Dag*** (Part 147X1613), or anti-seize compound (Part 147X1640) to lubricate bolts.

NOTE: Threads and washer-contact surfaces must be clean before lubricant is applied.

Where specific torque values are **not** listed in these instructions, refer to Table 3 for standard bolt torque values of lubricated bolts.

*Product of Fisk Bros. Refining Co., Newark, N.J.

**Registered trademark of Dow Corning Corp.

***Acheson Colloids Co., Port Huron, Mich.

BRUSHHOLDER SLEEVE REPLACEMENT

1. Remove the damaged Teflon sleeve from the brushholder stud. To remove sleeve, heat the brushholder in an oven to 150° C (302° F) then peel or cut sleeve from the stud.
2. Thoroughly clean the surface of the stud and remove any carbon or dirt build-up.
3. Heat a new Teflon sleeve in a 150° C (302° F) oven for 15 minutes.
4. Using adequate hand protection, immediately assemble the hot sleeve on the stud.

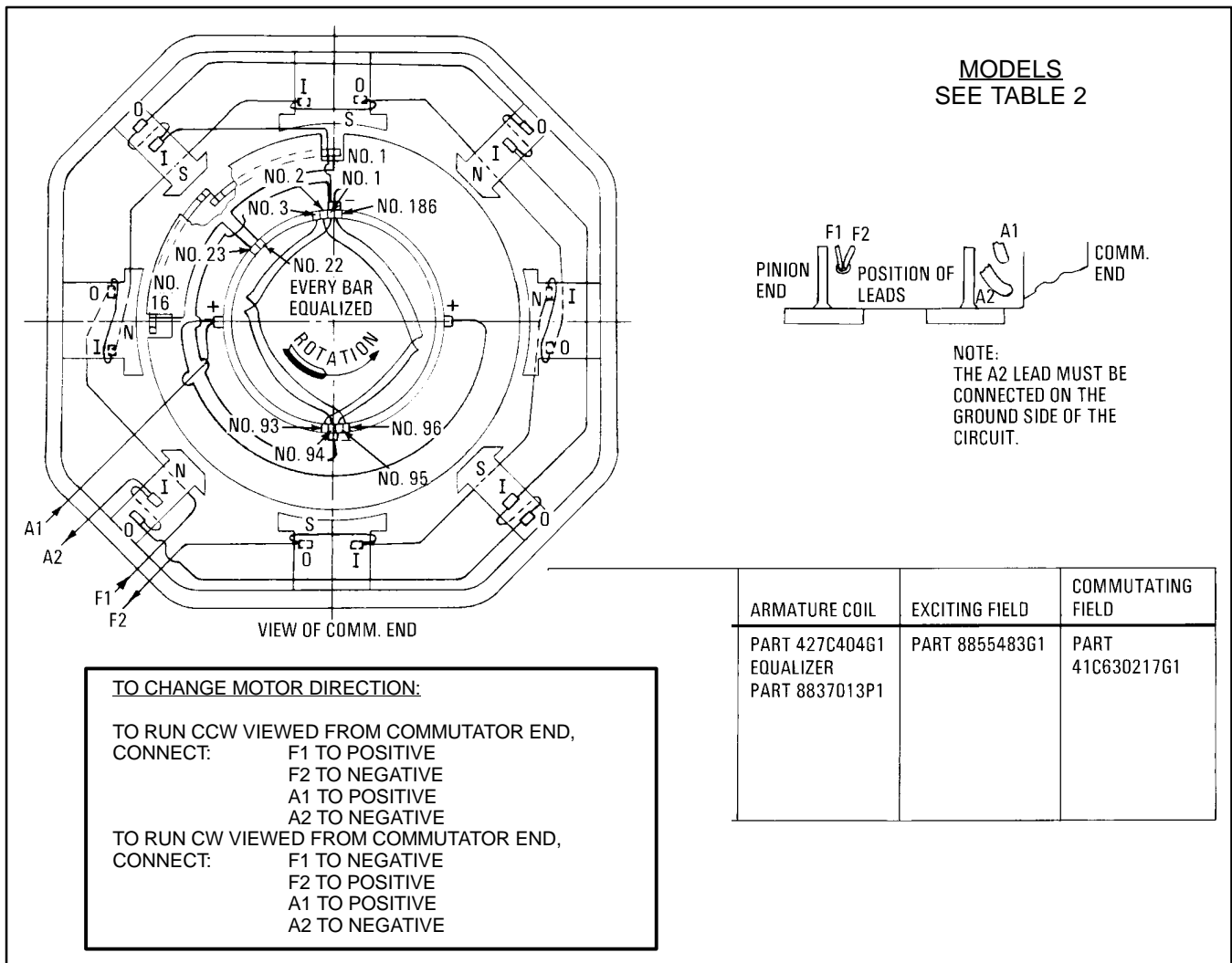


FIG. 21. CONNECTION DIAGRAM (493A210 CHG. 4). E-39092B.

ARMATURE

Creepage Band Replacement

Because of its superior adhesion qualities, the Teflon creepage band on the outer end of the commutator should be applied using the "hot bond" process. A copy of this process is included in each Teflon Band Kit, Part No. 76518, which can be ordered from the following address:

General Electric Company
 Insulating Materials Product Section
 One Campbell Road
 Schenectady, NY 12345
 Attn: Customer Service

NOTE: The Teflon band is not included in the kit, but can be ordered through normal Renewal Parts channels.

Inspect the Band

1. There should be no gaps at the joint or between the edge of the Teflon band and the copper bars.
2. The band surface must be smooth, free of varnish and bonded to the underlay material. There must not be any bubbles under the Teflon or buckling of the band.
3. The surface must be free of damage including scratches and cuts.

Rewinding Armature

The armature must be rewound if any coils are shorted or grounded.

Riser Width



During the rewinding procedure, the TIG welds on the commutator risers are machined to break the armature coil connections. Machining reduces the width of the risers 1/32 to 1/16 in. each time, which in turn decreases the current-carrying capacity of the risers.

If the calculated width of the risers (after machining) will be less than the Minimum Permissible Riser Width listed in the DATA section, a new commutator must be installed before new armature coils are assembled.

**TABLE 3
 STANDARD BOLT TORQUE VALUES
 (For Lubricated Bolts)**

USE THE TORQUE VALUES IN THIS TABLE AS A GUIDE TO INSURE SATISFACTORY TIGHTENING OF BOLTS AND NUTS WHERE A SPECIFIC VALUE IS NOT GIVEN IN THE INSTRUCTIONS.

*INCLUDES SOCKET HEAD SCREWS.

BOLT DIAM.	THREADS PER INCH	TORQUE VALUES (LB./FT.)	
		MEDIUM CARBON (SAE GRADE 5) 	ALLOY STEEL (SAE GRADE 8)* 
1/4	20 28	5-8 5-8	10-12 10-12
5/16	18 24	12-15 12-15	18-21 20-23
3/8	16 24	20-25 25-28	30-36 34-40
7/16	14 20	35-40 40-45	50-56 60-65
1/2	13 20	55-60 60-70	80-90 95-105
9/16	12 18	75-80 90-100	110-123 130-145
5/8	11 18	105-115 125-140	152-169 185-205
3/4	10 16	185-205 220-245	285-315 340-370
7/8	9 14	300-330 340-380	440-490 510-565
1	8 12	440-490 530-570	685-735 790-8665
1-1/8	7 12	620-690 750-830	935-1040 1115-1240
1-1/4	7 12	890-990 1040-1160	1250-1360 1600-1750
1-3/8	6 12	1160-1290 1420-1580	1745-1940 2125-2360
1-1/2	6 12	1570-1740 1800-2000	2300-2600 2600-3020

E-38274

Diameter

Refer to the DATA section for the Minimum Permissible Commutator Diameter dimension. If the commutator brush-surface diameter will be less than the minimum permissible diameter after resurfacing operations are performed, replace the commutator before the new armature coils are assembled.

NOTE: Before rewinding the armature, first check the shaft pinion and bearing fits to determine whether or not shaft replacement is required. See Table 2 to determine the correct shaft drawings.

The armature can be rewound using a GE Co. Supply Kit, Part 41D730545G8, and the information supplied in the kit.

NOTE: After the armature is rewound, the armature coil leads must be TIG welded to the commutator risers, the armature must be Vacuum Pressure Impregnated, and the commutator must be cleaned and polished.

Commutator Tightening

If the commutator requires tightening, commutator assembly pressure can be restored at overhaul by performing a commutator tightening procedure; however, it is necessary that spin-seasoning and resurfacing operations be performed after the commutator is tightened.

Before proceeding to tighten a loose commutator, it must first be determined whether or not the brush-surface diameter of the commutator will be larger than the minimum permissible diameter after the commutator is resurfaced.

If the brush-surface diameter is calculated to be smaller (after resurfacing) than the minimum permissible diameter, listed in the DATA section, the commutator must be replaced.

After a long period of service, the mica insulation may relax, due to temperature cycling, and relieve commutator assembly pressure. This could result in a loose commutator (with raised bars), or an out-of-round commutator.

The assembly pressure can be restored by tightening the commutator bolts. This must be done before undertaking any resurfacing operation on the commutator.

Procedure

1. Chip the weld from the commutator bolt heads to free bolts from the cap.

2. Torque the commutator bolts by one of the following methods.

Hydraulic Press (Preferred Method)

1. Clean the front face of the cap and the segments, Fig. 25. Remove ONE bolt at a time, and lubricate the bolt threads and under the bolt head. See Lubrication of Bolts section. Follow the sequence shown on Fig. 27 for bolt removal. Reassemble bolt and tighten to the initial breakaway torque value.
2. Using a depth micrometer, measure the distance (X in Fig. 25) between the face of the cap and the segments at four points, 90 degrees apart. The face of the cap and the segments should be parallel within 0.020 in. If necessary, tighten the appropriate cap bolts to obtain this parallel relationship between the face of cap and the segments.
3. Place the armature in a vertical press. Position ball and socket tool (Part 41C685080G1) and crow-foot pressing fixture (Part 41C685430G1) on the commutator, and apply 70 tons pressure at the diameter shown on Fig. 26.
4. Tighten the commutator bolts to 145 lb.-ft. torque in a crisscross sequence, Fig. 27. Tighten the bolts twice in this sequence, then tighten bolts once-around at 145 lb.-ft. torque.

NOTE: The specified torque values have no significance unless the bolts are lubricated.

5. Check the dimension between cap face and segments at four locations, 90 degrees apart, to assure surfaces are still parallel within 0.020 in.

Torque Wrench (Acceptable Method)

In the absence of a suitable press, bolts may be tightened with a torque wrench adjusted to apply the indicated torque to each bolt.

1. Clean the front face of the cap and the segments. Using a depth micrometer, measure the distance (X in Fig. 25) between the face of the cap and the segments at four points, 90 degrees apart. The face of the cap and the segments should be parallel within 0.020 in.

If necessary, tighten the appropriate cap bolts to obtain this parallel relationship between the face of the cap and the segments.

2. Remove ONE bolt. Clean and lubricate the bolt threads under the bolt head. Reassemble bolt, and torque to 97 lb.-ft.
3. Repeat Step 2 for remaining bolts, following the crisscross tightening sequence shown on Fig. 27.
4. Repeat the tightening sequence increasing the torque by 10% each time until a FINAL value of 145 lb.-ft. torque for all bolts is obtained.
5. Check the dimension between face of cap and segments to assure these surfaces are parallel within 0.020 in.

NOTE: Do not tack-weld the bolts to the commutator cap before spin seasoning or resurfacing operations are performed.

Refer to following sections for instructions to spin season and resurface the commutator.

Spin Seasoning (Commutator Assembled On Armature)

A commutator seasoning cycle is required after commutator tightening operations have been performed.

Prior to spin-seasoning, dynamically balance the armature to within 12 grams on the commutator end and 10 grams on the drive end. Refer to longitudinal section for balance weight locations (see Table 2 to determine the correct drawing).

To spin season the commutator, place the armature in a spin-seasoning stand and proceed as follows:

1. Heat the commutator to 155–165° C (312–330° F) in 60 minutes at 2940 rpm. Spin at 155–165° C (312–330° F) for 60 minutes at 2940 rpm. Cool to 50° C (122° F) maximum in 30 minutes at 2940 rpm.
2. Allow the commutator to cool, and grind cold. See “Commutator Resurfacing” section.
3. Heat the commutator to 155–165° C (312–330° F) in 60 minutes at 2940 rpm. Spin at 155–165° C (312–330° F) for 30 minutes at 2940 rpm. Cool to 50° C (112° F) maximum in 30 minutes at 2940 rpm. Repeat for a total of 2 cycles.
4. Heat the commutator to 140–150° C (284–302° F) in 60 minutes at 2940 rpm, and check commutator smoothness at 2940 rpm.
5. Allow the commutator to cool, and grind cold. See the “Commutator Resurfacing” section. Check commutator runout per the information in the DATA section. If the commutator is rough or has high bars, repeat the pressing, tightening, spin-seasoning and resurfacing procedures until the runout is within the limits specified in the DATA section.
6. Tack-weld the bolts to the commutator cap with bronze welding rod, GE-B50E37.
7. Refer to the “Test After Repair (Armature)” section for the test voltage, and perform a High-Potential test on the armature windings.

Commutator Resurfacing

Prior to turning or grinding the commutator, be certain there is sufficient stock so the commutator will not be turned or ground below the minimum permissible diameter.

Refer to the DATA section for the minimum permissible commutator diameter dimension.

If the brush surface diameter will be less than the minimum permissible diameter after the resurfacing operations are performed, the commutator must be replaced.

Grinding

1. Prior to grinding, true the shaft centers with respect to the bearing fits by scraping.
2. Place the armature in a lathe equipped with a grinding attachment or in a grinding machine.

Check the concentricity of the bearing fits. The TIR should not exceed 0.001 in.
3. Cover the armature windings to prevent entry of grinding dust and chips.

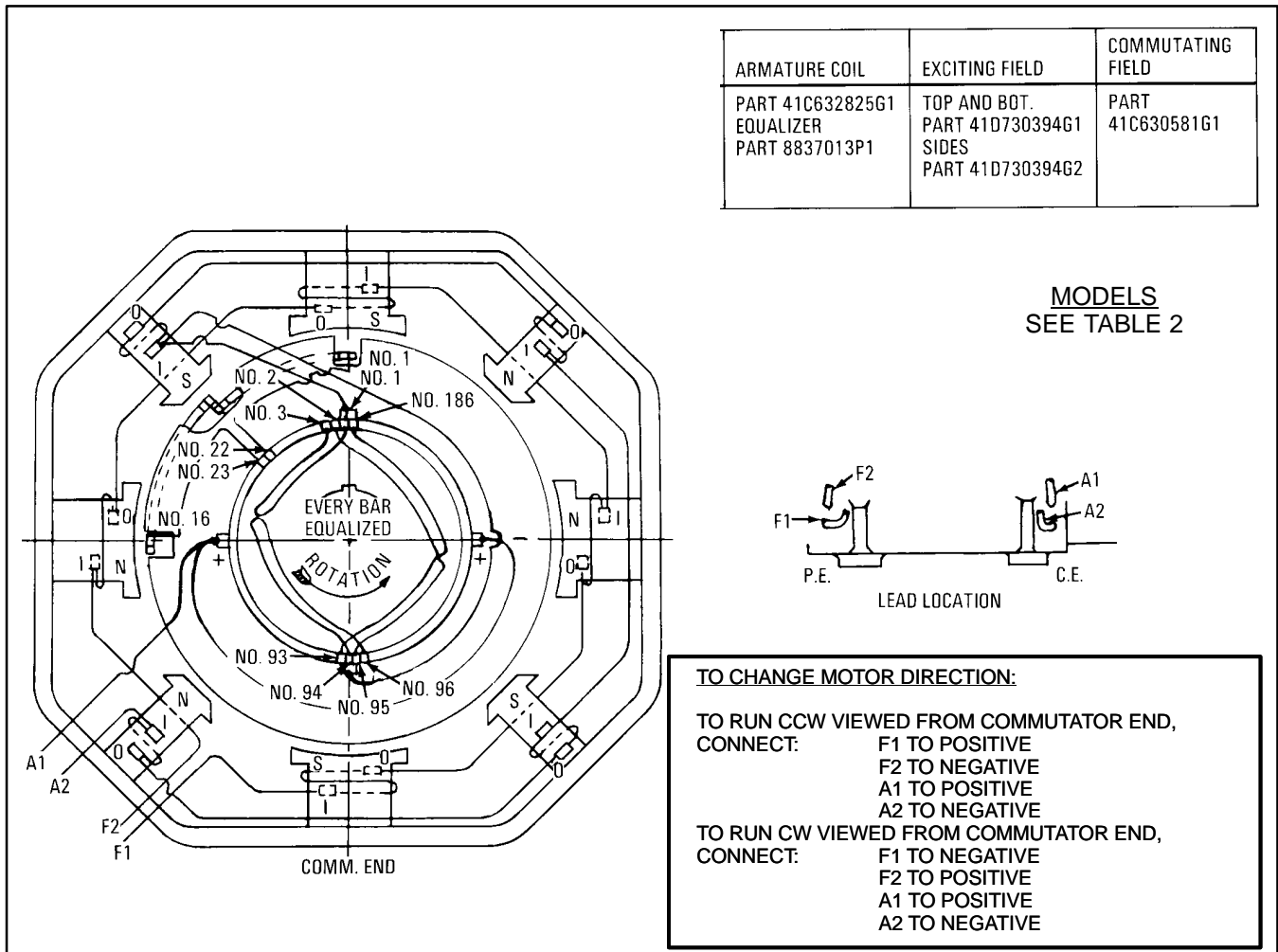


FIG. 22. CONNECTION DIAGRAM (41A237276 CHG. 0). E-39093A.

4. Grind the commutator and check commutator runout with a dial indicator. The maximum commutator runout is 0.001 in.
5. Perform the undercutting, raking and polishing operations.

Turning

If the surface of the commutator is badly worn, burned or scarred, turn the commutator in a lathe as follows:

1. True the shaft centers with respect to the bearing fits by scraping. Place the armature in a lathe and check the concentricity of the bearing fits. The TIR should not exceed 0.001 in.

2. Cover the windings to keep out chips.
3. Set the cutting tool for turning copper, and set lathe speed to give a commutator surface speed of 300 feet per minute. Refer to the DATA section for dust groove dimensions.
4. Make clean, smooth cuts to remove just enough copper to renew the commutator surface. Do not allow the cutting tool to chatter.
5. After turning operations have been completed, check commutator runout with a dial indicator. The maximum runout is 0.001 in.
6. Perform the undercutting, raking and polishing operations.

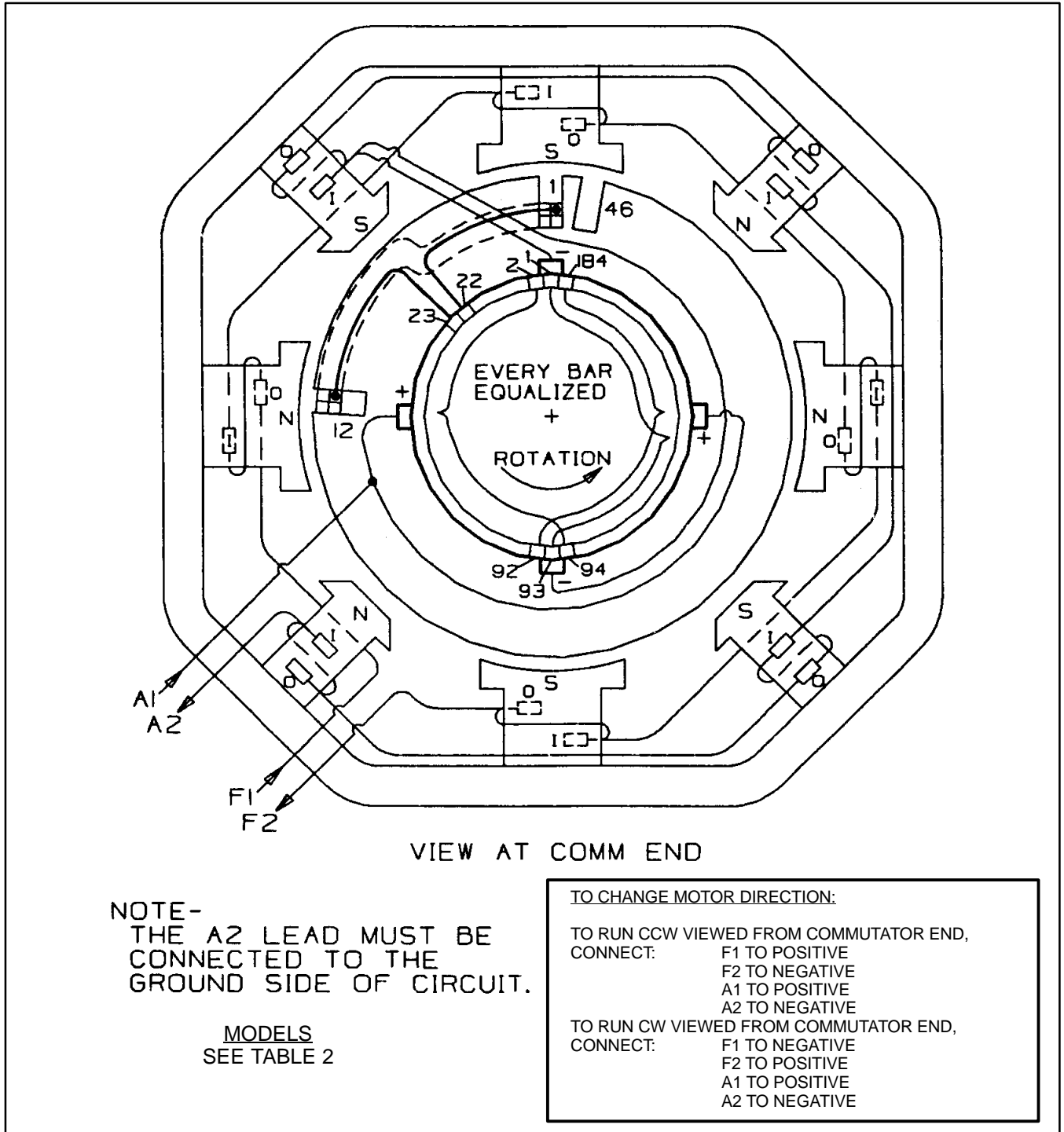


FIG. 23. CONNECTION DIAGRAM (41A330278, CHG. 0). E-38055B.

Undercutting

See Fig. 28 for a diagram of proper undercut.

A sharp hacksaw blade may be used but caution must be observed since a dull blade or saw produces

small cracks in the mica into which dirt or moisture may accumulate and cause a breakdown in the insulation between the commutator segments.

With practice, hand-held power undercutters can be used. Follow the tool manufacturer's instructions and

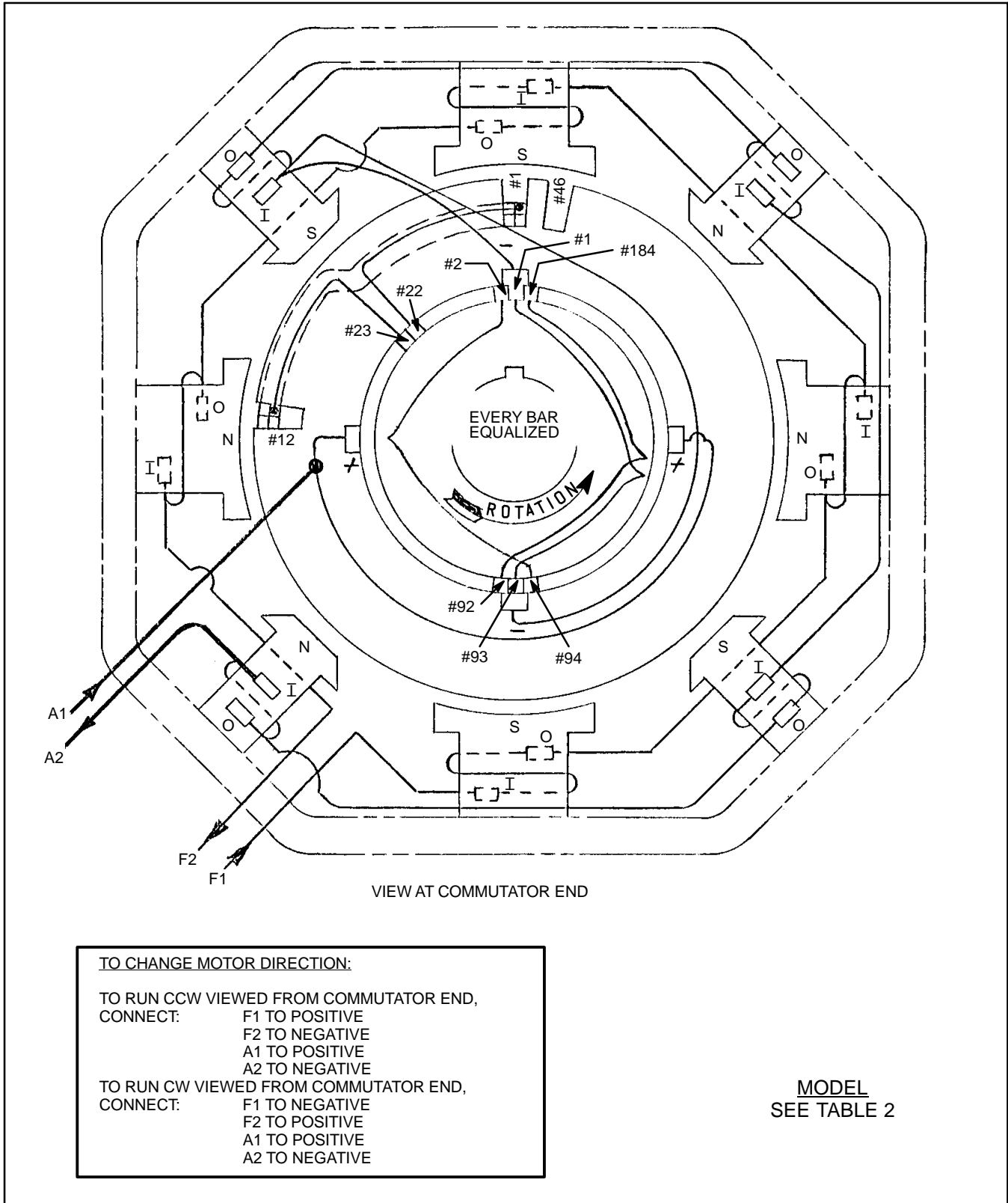


FIG. 24. CONNECTION DIAGRAM (41A330179, CHG. A). E-37950A

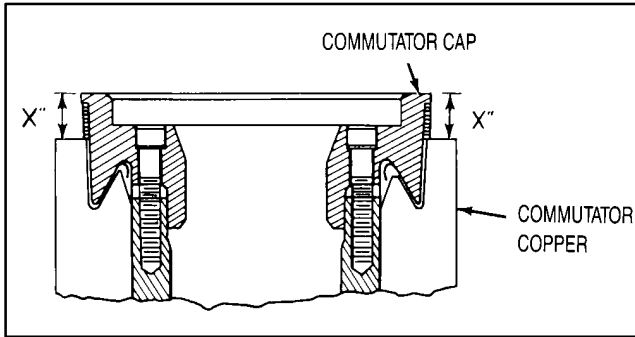


FIG. 25. COMMUTATOR TIGHTENING. E-4270B.

WARNING: During resurfacing operations, eye protection and a respirator should be worn to protect personnel from dust and flying particles.

use slot guides and depth gauges for accurate, uniform cuts. Make a few practice passes over a scrap commutator to get the "feel" of the tool. Care must be taken to prevent the power undercutter from jumping out of the slot and across the commutator surface. The high-speed operation of the blade will quickly gouge the commutator.

1. After a commutator has been resurfaced, the mica between the bars should be undercut to a depth of 0.047 in. Undercutting should be done with a sharp-edged tool with a cutting width of 0.063 in.
2. Blow loose material off the commutator with dry, compressed air.

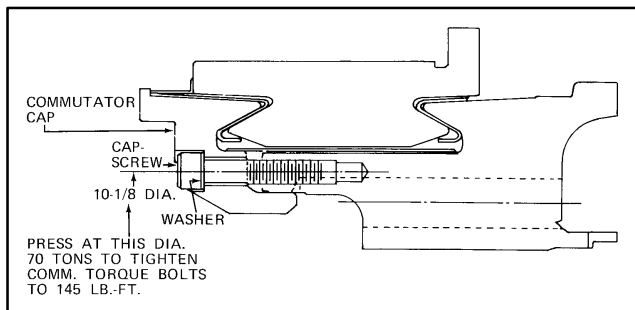


FIG. 26. COMMUTATOR PRESSING DIAMETER. E-18140

WARNING: When using compressed air for cleaning purposes, flying debris and particles may present a hazard to personnel in the immediate area. Personnel should be provided with, and trained in the use of, personal protective equipment as specified by applicable federal or state safety regulations.

Raking

Resurfacing usually leaves particles and slivers of copper hanging on the bar edges or lodged in the undercut slots. These must be removed before the motor is placed in service, or the particles may bridge the side mica and cause a flashover.

1. Brush out dirt and copper whiskers attached to the trailing edge of the bars with a stiff-bristle brush; preferably one with nylon bristles. A new paint brush or stencil brush with the bristles cut short for added stiffness may also be satisfactory. If stoning and undercutting have produced considerable dragging of copper from the edges of the bars, use a raking tool to remove the copper fins and ragged edges. Use the tool to rake the bar edges with the point inserted in the slot so that sides of the V rake the trailing edge of the bar. If the tool is ground with flat sides and used with moderate pressure as a raking tool, it will remove ragged copper fins and break the sharp

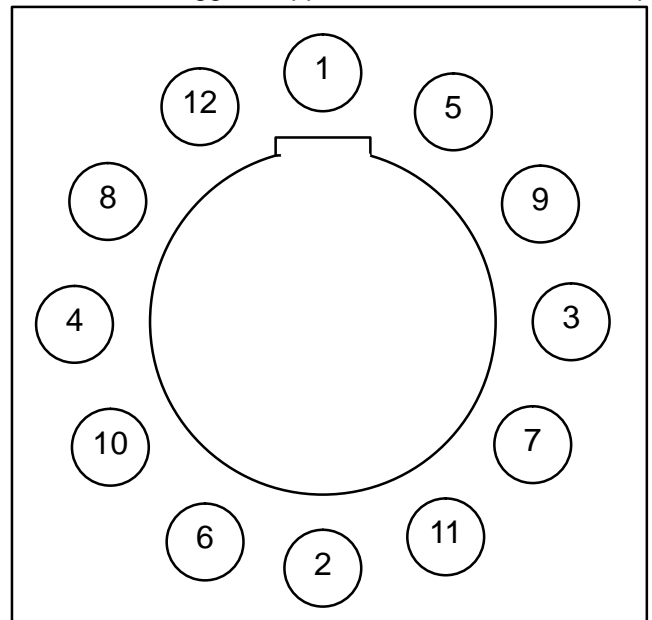


FIG. 27. COMMUTATOR BOLT TIGHTENING SEQUENCE. E-4502.

edges of the bars. See Fig. 12 for an illustration of the tool. Another method of removing copper fins is to rake the slots with a piece of fiberboard approximately 0.045 in. thick.

2. After slots have been raked with fiberboard or a raking tool, sand the commutator with fine sandpaper to remove small pieces of copper sticking from edges of slots.
3. Thoroughly clean the armature core and commutator with dry, compressed air to remove copper and dust.
1. If the commutator is discolored or smudged, polishing with canvas, crocus cloth, fine (4/0) sandpaper or 400A Triemite paper is usually sufficient.

Abrasive paper should be mounted on a wooden block curved to fit the surface of the commutator.

2. Blow loose material off the commutator with dry, compressed air.
3. Check commutator concentricity with a dial indicator. Refer to the DATA section for runout limits.
4. Cover the commutator with heavy paper or felt to protect it from damage.

WARNING: Personal injury may result if proper eye protection is not worn when cleaning with compressed air.

CAUTION: Never use an emery cloth on this or any commutator. The abrasive particles on emery cloth scratch the commutator surface and lodge in the grooves between commutator segments. This condition creates the possibility of an eventual flashover which could seriously damage the machine.

TEST AFTER REPAIR (Armature)

High Potential Test

Apply test voltage between the commutator (with all segments shorted) and the shaft.

Used Armature

Apply a high-potential test voltage of 2000 volts, 60 Hz for one minute.

Rewound Armature

Apply a high-potential test voltage of 3500 volts, 60 Hz for one minute.

NOTE: Measure leakage current to ground during test 3-85.0 milliamps.

WARNING: Electric shock can cause serious or fatal injury. To avoid such injury, personnel should take and observe proper precautions during the high-potential testing.

Resistance Measurement

Refer to the DATA section for armature the resistance value and measure armature resistance.

NOTE: Insulation Processing (Armature VPI)

After the armature has been cleaned and repaired or rewound, it must be vacuum pressure impregnated. See the Varnish Treatment, "Vacuum Pressure Impregnation" section for further required processing of the armature.

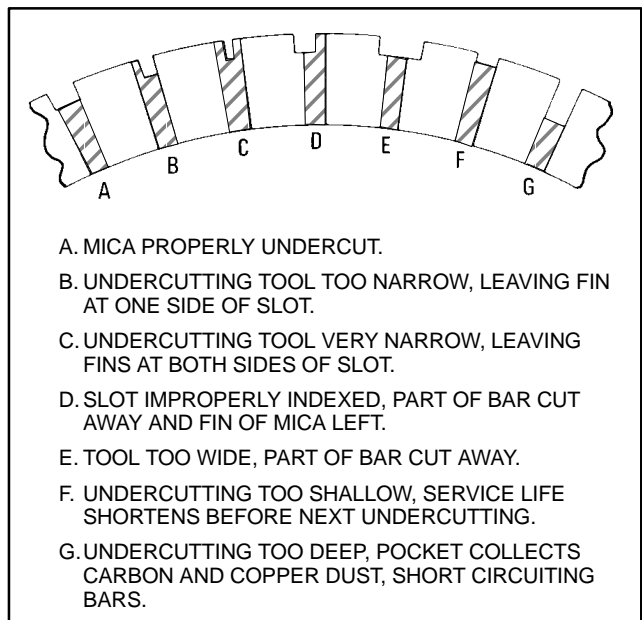


FIG. 28. COMMON MISTAKES IN UNDERCUTTING COMMUTATOR SLOTS. E-5024A.

MOTOR FRAME FIELD COIL REPLACEMENT

Refer to Table 2, Page 20, to determine the correct coiled frame assembly drawing for the machine being repaired.

Coil Removal

1. Remove terminal insulation and disconnect coil leads. Use a gas torch or brazing tongs to separate brazed connections. When using brazing tongs use low voltage and high a-c current to heat coil connections.

WARNING: Safety glasses and leather gloves must be worn at all times during brazing operations to protect personnel from physical harm.

NOTE: If a gas torch is used, coil insulation must be protected from heat by a non-flammable heat absorbent.

1. **Pack absorbent around the insulation near the connection and over adjacent coils.**
2. **Make sure all exposed insulation is covered with a thick layer of absorbent, then heat and separate the coil connections.**
2. Heat the coiled frame in an oven at 150° C (302° F) for four hours to soften the varnish so pole bolts can be removed.

Remove the pole bolts and the coil-pole assembly from the magnet frame.

3. Mark any shims for reassembly with the corresponding pole when the coil(s) is installed in the frame.

Coil Installation

Procedure for New Coil-Pole Assembly

NOTE: Install any exciting coils and braze their connections before installing commutating coils.

1. Before installing any coil and pole, clean the pole contact surface on the frame and the pole piece mounting surface.
2. Install the new pole and coil in the frame with any shims that were on the damaged coil. Use new washers under bolt heads. Lubricate the bolt heads, threads and washers and draw the pole bolts moderately tight.
3. Refer to Table 2, Page 20, to determine the correct coiled frame assembly drawings. All coil connections must be brazed with silver solder, GE-B20A6. Use two pieces of solder (0.010 x 1 in. x 1 in.) between terminal surfaces and braze terminals as follows:

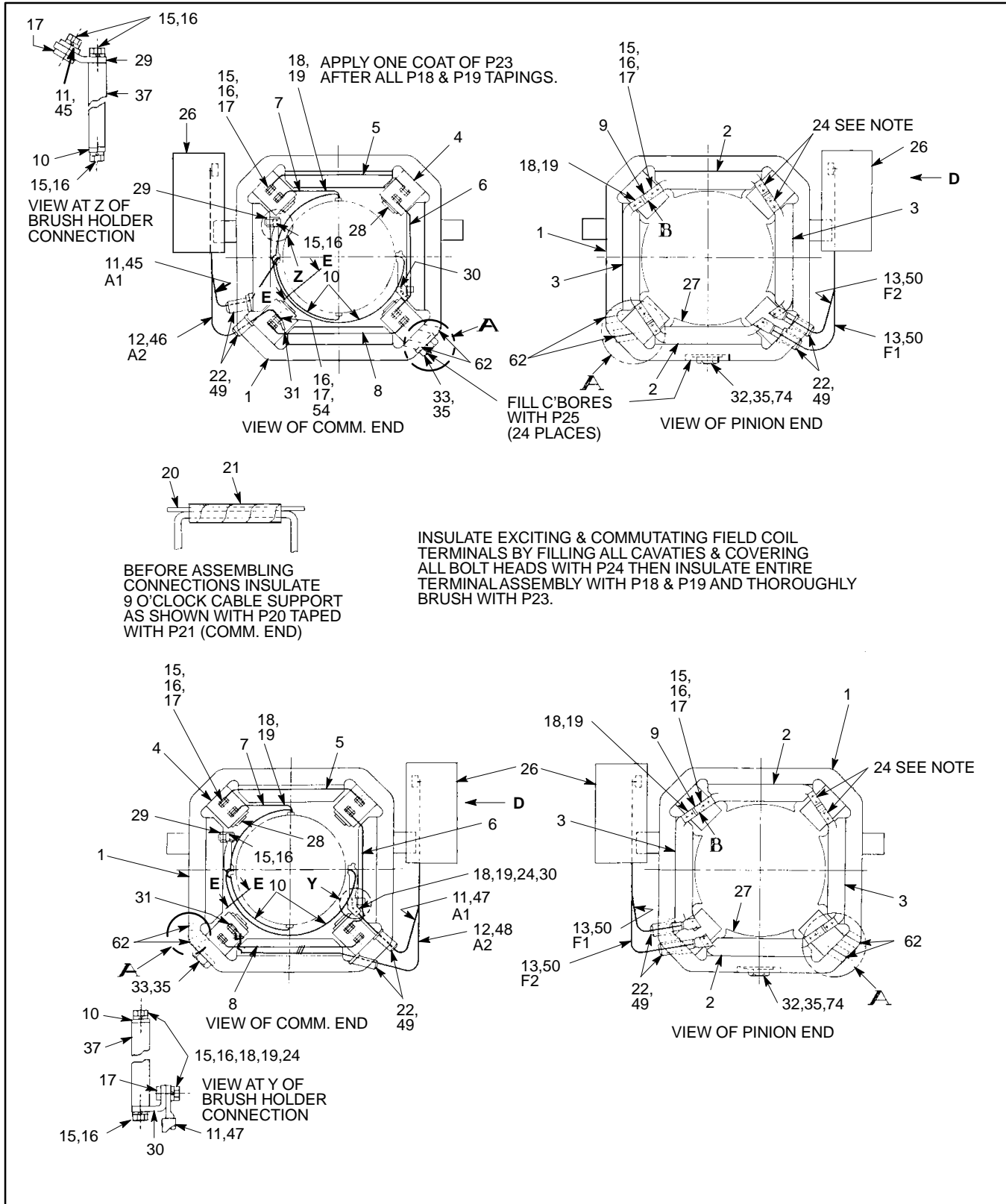
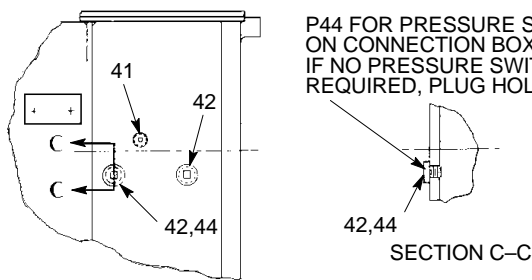
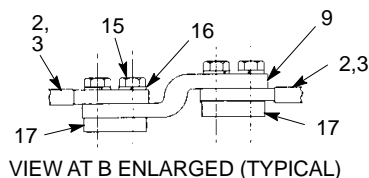
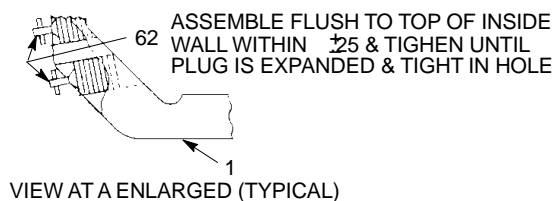
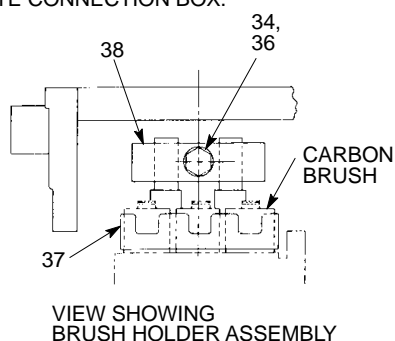
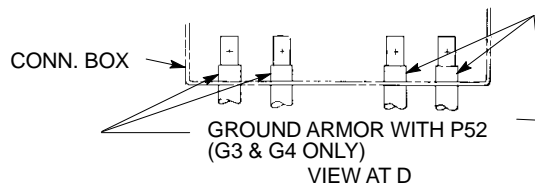


FIG. 29. COILED FRAME ASSEMBLY (41D732353 CHG. N). E-39094A.



SIDE VIEW OF COMM. CHAMBER SHOWING PLUGS ON SIDE OPPOSITE CONNECTION BOX.



NOTE: AN ACCEPTABLE ALTERNATE METHOD IS TO TREAT COILED FRAME WITH ONE VPI, STATIONARY BAKE FOLLOWED BY ONE SPRAY COAT IN COMMUTATOR CHAMBER ONLY.

NOTE FOR P61: ATTACH MARKING BAND (P61) TO EACH END OF CABLE PTS. 11,12,13,45,46,47,48, 50,56,57,58,64,65,67 & STAMP WITH APPROPRIATE MARKINGS AT ASSEMBLY.

REF.	DESCRIPTION	REF.	DESCRIPTION
1	MAGNET FRAME	37	BRUSHHOLDER
2	EXC. FIELD COIL	38	BRUSHHOLDER SUPPORT
3	EXC. FIELD COIL	41	PIPE PLUG
4	COMMUTATOR FIELD COIL	42	PIPE PLUG
5	CONN. STRAP	44	REDUCER
6	CONN. STRAP	45	CABLE
7	CONN. STRAP	46	CABLE
8	CONN. STRAP	47	CABLE
9	CONN. STRAP	48	CABLE
10	CABLE (BRUSHHOLDER)	49	BUSHING
11	CABLE	50	CABLE
12	CABLE	51	CABLE
13	CABLE	52	GROUND CABLE
15	BOLT, N22P27020B13	53	SPRING FLANGE
16	LOCKWASHER, N405P44P	54	BOLT, N22P27024B13
17	BOLTING PLATE	55	MAGNET FRAME
18	1ST TAPING, 50.00 (IT-1/2L), 41A239176P48	56	CABLE
19	2ND TAPING, 50.00 (IT-1/2L), 41A239176P13	57	CABLE
20	INSULATION	58	CABLE
21	TAPE, 21 FT (IT-1/2L), 41A239176P21	59	CABLE
22	BUSHING	60	CABLE ASSEMBLY
23	VARNISH, 41A239176P487	61	MARKING BAND (SEE NOTE)
24	INSULATION	62	PLUG
25	SEALANT, 497A806P60 (SEE NOTE)	63	CABLE ASSEMBLY
26	CONN. BOX	64	CABLE
27	EXC. POLE	65	CABLE
28	COMM. POLE	66	CABLE
29	CONN. BAR	67	CABLE
30	CONN. BAR	68	NIPPLE, 1.50 X 3.00
31	CONN. BAR	69	PIPE, 1.50 X 4.50
32	BOLT, N22P45060	70	CONNECTOR
33	BOLT	71	CONNECTOR
34	BOLT, N22P37052	72	CABLE ASSEMBLY
35	HARDENED WASHER	73	MAGNET FRAME
36	LOCKWASHER, N405P49P	74	BOLT

MODELS
SEE TABLE 2, PAGE 20

LUBRICATE BOLTS

TORQUE TABLE		
PART	SIZE	TORQUE LB.-FT.
32-74	1.25-7	900-1000
33	1.25-12	435-483
34	.875-9	115-125

FIG. 29. COILED FRAME ASSEMBLY (41D732353 CHG. N). E-39094A.

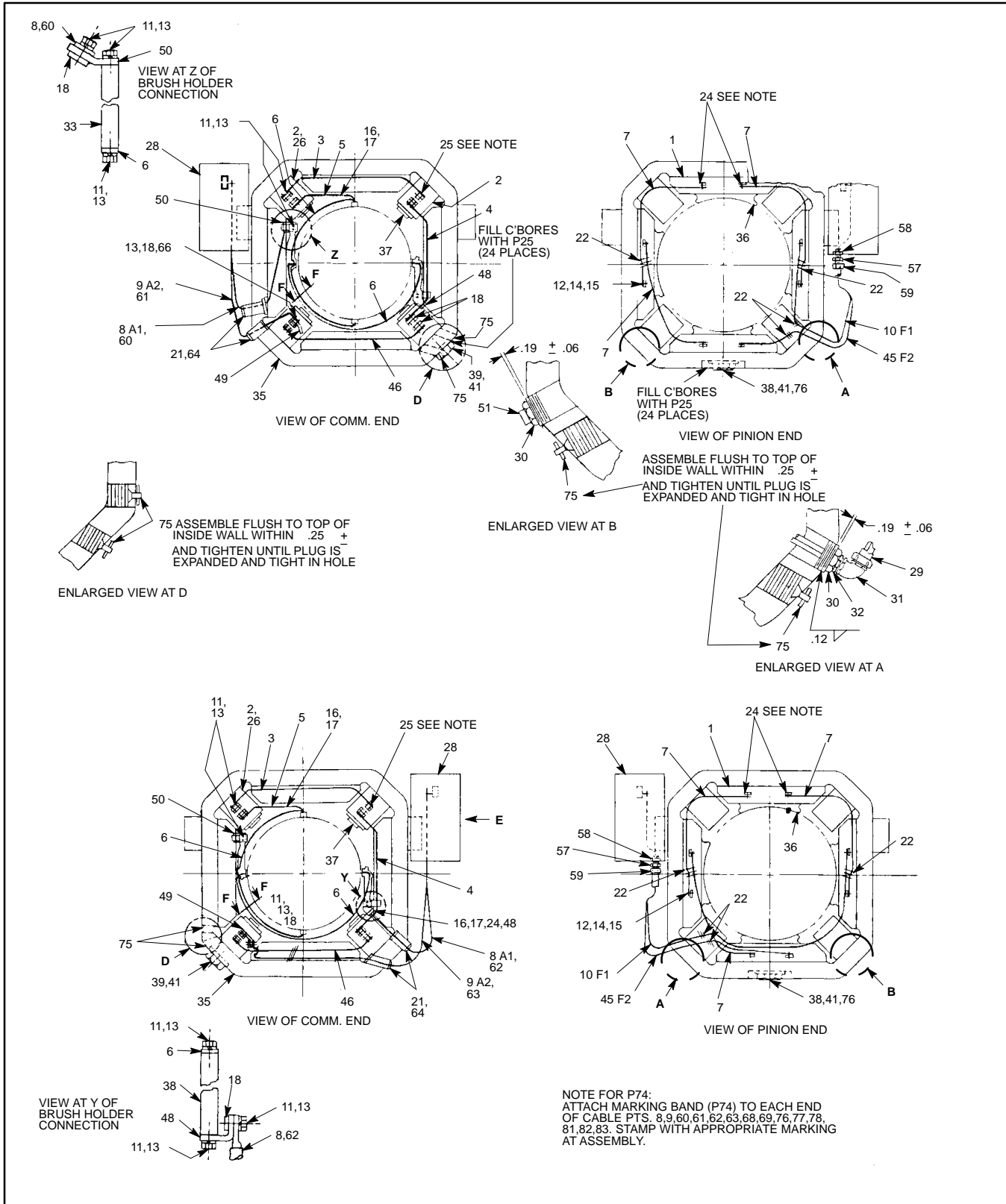
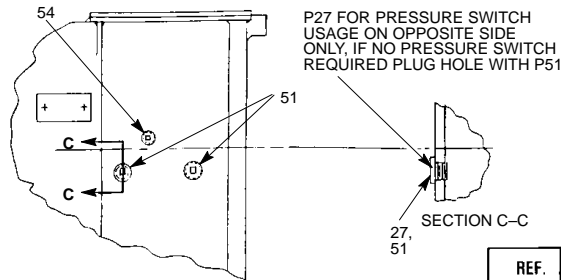
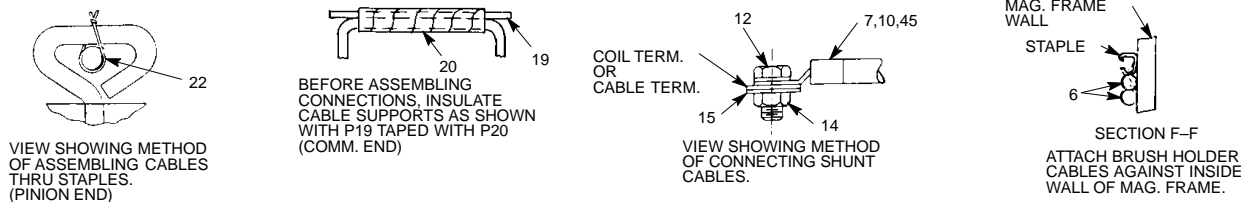
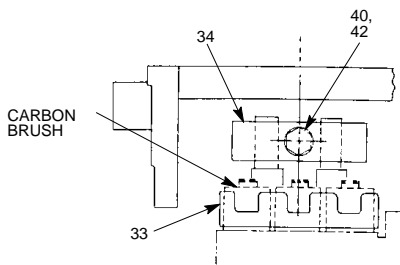


FIG. 30. COILED FRAME ASSEMBLY (41D732345 CHG. V). E-39095A.



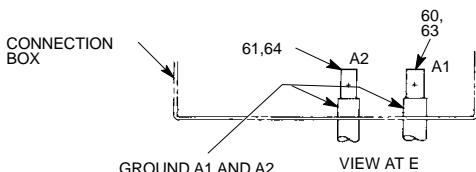
SIDE VIEW OF COMM. CHAMBER SHOWING PLUGS OPPOSITE SIDE OF CONNECTION BOX.



VIEW SHOWING BRUSH HOLDER ASSEMBLY

NOTE FOR P10 AND P15: INSTALL P10 AND P45 WITH LARGER TERMINAL ON EXC. COIL CONNECTION.

NOTE FOR P52 AND P53: INSTALL P52 AND P53 ON CONNECTION BOX END OF P10 AND P45.



LUBRICATE BOLTS

TORQUE TABLE		
PART	SIZE	TORQUE LBS-FT
40	.875-9	115 -125
38,76	1.25-7	900-1000
39	1.25-12	435-483

MODELS
SEE TABLE 2, PAGE 20

VPI COILED FRAME WITH ONE COAT STATIONARY BAKE, FOLLOWED BY ONE SPRAY COAT ON THE COMM. CHAMBER ONLY.

MODELS R7A AND R7B
INSULATE EXCITING AND COMMUTATING FIELD COIL TERMINALS BY FILLING ALL CAVITIES AND COVERING ALL BOLT HEADS WITH P24. THEN INSULATE ENTIRE TERMINAL ASSEMBLY WITH P16 AND 17 AND BRUSH THOROUGHLY WITH P23.

REF.	DESCRIPTION	REF.	DESCRIPTION
1	EXC. FIELD COIL	47	PIPE PLUG, N5700P1031
2	COMMUTATOR FIELD COIL	48	CONN. BAR
3	CONN. STRAP	49	CONN. BAR
4	CONN. STRAP	50	CONN. BAR
5	CONN. STRAP	51	PIPE PLUG, N5700P63
6	CABLE (BRUSHHOLDER)	52	MARKING BAND (SEE NOTE)
7	CABLE	53	MARKING BAND (SEE NOTE)
8	CABLE	54	PIPE PLUG, N5700P51
9	CABLE	55	CAP
10	CABLE	56	PIPE PLUG
11	BOLT, N22P27020B13	57	REDUCER
12	BOLT AND WASHER	58	LOCKNUT
13	LOCKWASHER, N405P44P	59	FITTING CONDUIT
14	NUT, N203P21B13	60	CABLE
15	WASHER	61	CABLE
16	1ST TAPING, 50.00 (IT-1/2L), 41A239176P48	62	CABLE
17	2ND TAPING, 50.00 (IT-1/2L), 41A239176P13	63	CABLE
18	BOLTING PLATE	64	BUSHING
19	INSULATION	65	GROUND CABLE
20	TAPE, 21 FT (IT-1/2L), 41A239176P21	66	BOLT
21	BUSHING	67	MAGNET FRAME
22	TIE, 11 FT., 41A239176P399	68	CABLE
23	VARNISH, 41A239176P487	69	CABLE
24	PUTTY, 41A239176P448	70	CABLE
25	SEALANT, 497A806P60 (SEE NOTE)	71	CABLE
26	COMM. FLD. COIL	72	BUSHING
27	REDUCER	73	CABLE ASSEMBLY
28	CONN. BOX (SEE NOTE)	74	MARKING BAND
29	FLEX. CONDUIT	75	PLUG
30	REDUCER BUSHING	76	BOLT
31	FITTING CONDUIT	77	CABLE
32	LOCKNUT	78	CABLE
33	BRUSHHOLDER	79	CABLE ASSEMBLY
34	BRUSHHOLDER SUPPORT	80	SEALER
35	MAGNET FRAME	81	CABLE
36	POLE, EXCITING	82	CABLE
37	POLE, COMM.	83	CABLE
38	BOLT, N22P45060	84	FITTING
39	BOLT	85	CONNECTOR
40	BOLT, N22P37052	86	NIPPLE, 1.50 X 3.00
41	HARDENED WASHER	87	PIPE, 1.50 X 4.50
42	LOCKWASHER, N405P49P	88	MAGNET FRAME
43	CABLE	89	REDUCER, 1.00-2.00
44	CABLE	90	CABLE ASSEMBLY
45	CABLE (SEE NOTE)	91	REDUCER
46	CONN. STRAP	92	PIPE PLUG, N5700P103

FIG. 30. COILED FRAME ASSEMBLY (41D732345 CHG. V). E-39095A.

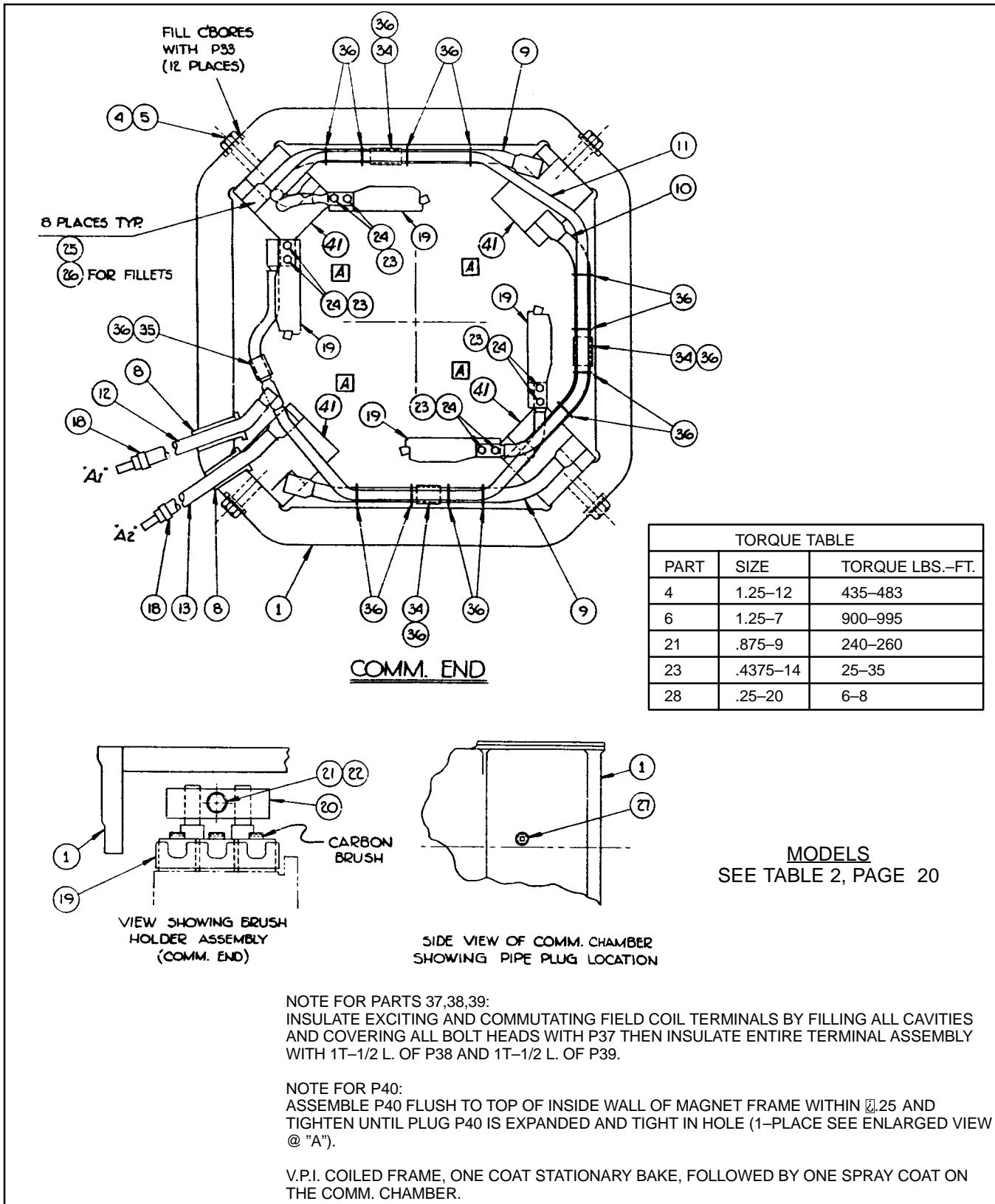
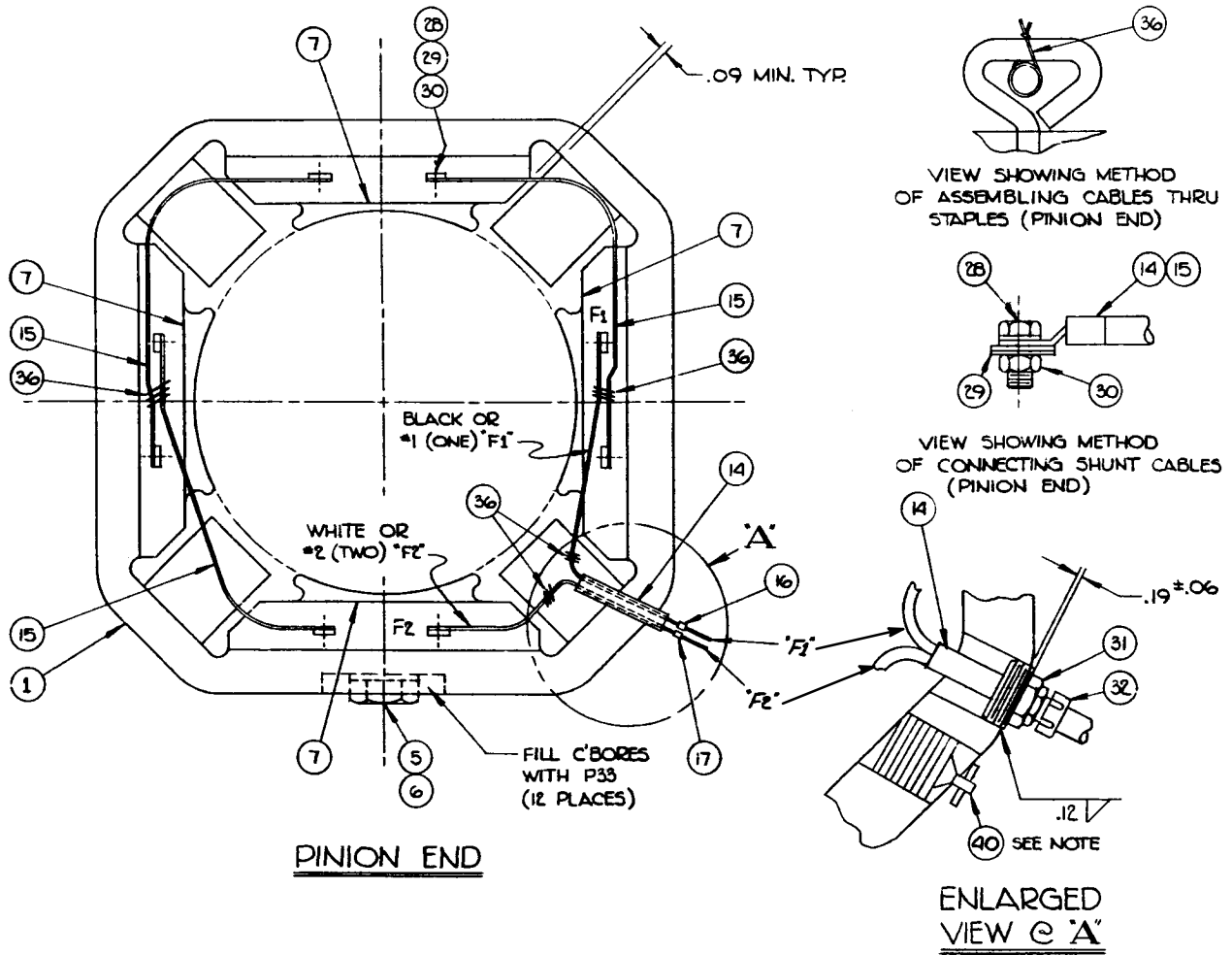


FIG. 31. COILED FRAME ASSEMBLY (41D735440, CHG. A). E-38056B



REF.	DESCRIPTION	REF.	DESCRIPTION
1	MAGNET FRAME	23	BOLT, 7/16-14X1
4	BOLT(NON-MAGNETIC), 1 1/4-12X4	24	LOCKWASHER, 7/16
5	HARD WASHER, 1 1/4	25	BRAZING STRIP, 1X1
6	BOLT, 1 1/4-7X3 3/4	26	BRAZING ROD
7	EXCITING COIL AND POLE	27	PIPE PLUG, 1/2 NPT
8	BUSHING	28	BOLT/WASHER, 1/4-20X1/2
9	CABLE	29	BELL WASHER, 1/4
10	CABLE	30	NUT, 1/4-20
11	CABLE	31	REDUCER
12	CABLES	32	FITTING
13	CABLES	33	SEALER #1473, SILMATE
14	CABLE	34	PAD
15	CABLE	35	PAD
16	MARKER	36	TWINE
17	MARKER	37	PUTTY
18	TAG	38	1ST TAPING
19	BRUSHHOLDER ASSEMBLY	39	2ND TAPING
20	BRUSHHOLDER SUPPORT	40	PLUG
21	BOLT, 7/8-9X3 1/4	41	COMMUTATOR POLE AND COIL
22	LOCKWASHER, 7/8		

FIG. 31. COILED FRAME ASSEMBLY (41D735440, CHG. A). E-38056B.

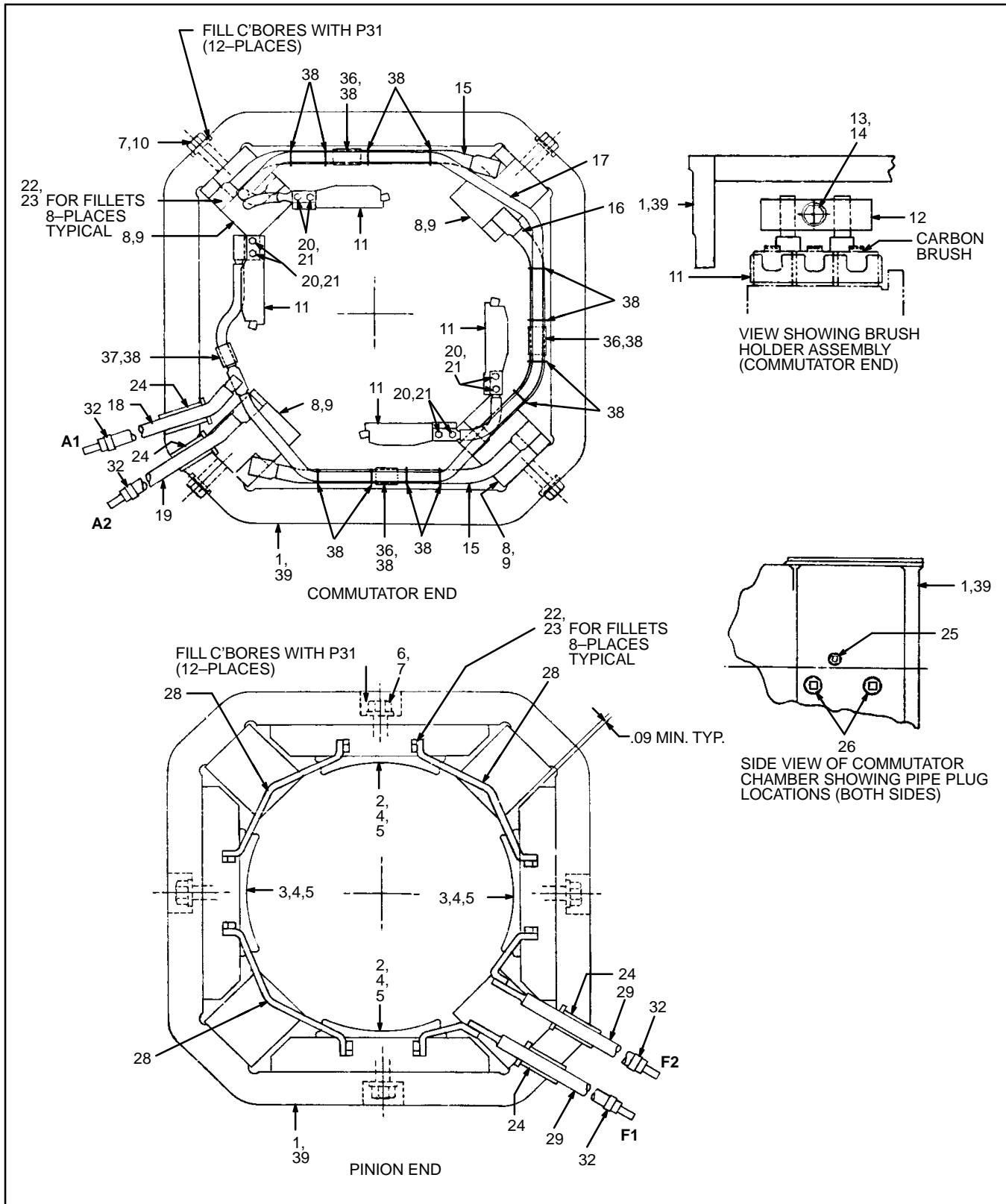


FIG. 32. COILED FRAME ASSEMBLY (41D735343, CHG. C). E-37951C

REF.	DESCRIPTION	REF.	DESCRIPTION
1	MAGNET FRAME	20	BOLT 7/16-14 X 1 N22P27016B13
2	EXCITING COIL	21	LOCKWASHER 7/16 N405P44P
3	EXCITING COIL	22	BRAZING STRIP 1 X 1
4	EXCITING POLE	23	ROD
5	SPRING COLLAR	24	BUSHING
6	BOLT 1 1/4-7 X 3 3/4	25	PIPE PLUG 1/2 NPT N5700P51
7	HARDENED WASHER 1 1/4	26	PIPE PLUG 3/4 NPT N5700P63
8	COMMUTATING COIL	28	CONNECTION STRAP
9	COMMUTATING POLE	29	CABLES
10	BOLT 1 1/4-12 X 4	31	SEALER NO. 1473 SILMATE 497A806P60
11	BRUSH HOLDER ASSEMBLY	32	TAG
12	BRUSH HOLDER SUPPORT	33	PUTTY 41A239176P443
13	BOLT 7/8-9 X 3 1/4 N22P37052	34	1 ST TAPING 41D735343P34
14	LOCKWASHER 7/8 N405P49P	35	2 ND TAPING 41D735343P35
15	CABLE	36	PAD
16	CABLE	37	PAD
17	CABLE	38	CORD 41D735343P38
18	CABLES	39	MAGNET FRAME
19	CABLES		

TORQUE TABLE		
PART	SIZE	TORQUE LBS. FT.
6	1.25-7	900-995
10	1.25-12	435-483
13	.875-9	240-260
20	.4375-14	30 ± 5

NOTE FOR PTS. 33, 34, AND 35
 INSULATE EXCITING AND COMMUTATING FIELD COIL TERMINALS BY
 FILLING ALL VAVITIES WITH P33 THEN INSULATE ENTIRE TERMINAL
 ASSEMBLY WITH 2T-1/2L. OF P34 AND 2T-1/2L. OF P35.

V.P.I. COILED FRAME ONE COAT. STATIONARY BAKE, SPRAY PAINT
 THE COMMUTATOR CHAMBER INNER SURFACES AND THE FRAME
 EXTERIOR. DO NOT SPRAY THE EXCITING AND COMMUTATING COILS.

MODELS
 SEE TABLE 2, PAGE 20

FIG. 32. COILED FRAME ASSEMBLY (41D735343, CHG. C). E-37951C

NOTE: If a gas torch is used, coil insulation must be protected from heat by a non-flammable heat absorbent.

1. Pack absorbent around the insulation near the connection and over adjacent coils.
2. Make sure all exposed insulation is covered with a thick layer of absorbent, then heat and separate the coil connections.
2. Heat the coiled frame in an oven at 150° C (302° F) for four hours to soften the varnish so pole bolts can be removed.

Remove the pole bolts and the coil-pole assembly from the magnet frame.

3. Mark any shims for reassembly with the corresponding pole when the coil(s) is installed in the frame.

Coil Installation

Procedure for New Coil-Pole Assembly

NOTE: Install any exciting coils and braze their connections before installing commutating coils.

1. Before installing any coil and pole, clean the pole contact surface on the frame and the pole piece mounting surface.
2. Install the new pole and coil in the frame with any shims that were on the damaged coil. Use new washers under bolt heads. Lubricate the bolt heads, threads and washers and draw the pole bolts moderately tight.
3. Refer to Table 2, Page 20, to determine the correct coiled frame assembly drawings. All coil connections must be brazed with silver solder, GE-B20A6. Use two pieces of solder (0.010 x 1 in. x 1 in.) between terminal surfaces and braze terminals as follows:

Brazing Coil Terminals

Braze the coil terminals by one of the following methods:

Machine Brazing

1. The recommended brazing current is 10,800 amperes at 1.6 volts. With silver-solder brazing strips inserted between connections, clamp the brazing tongs on the connection and braze the joint. If necessary, add additional solder to fill the joint and form a level surface.
2. Braze all exciting-coil connections before installing the commutating coils.

Gas Torch Brazing

1. Pack the coil insulation with non-flammable heat absorbent material; e.g., interwoven glass cloth.
2. Insert the brazing strips and use a C-clamp or vise-grip pliers to clamp the connection surfaces tightly together.
3. Use a torch tip with a 0.1 in. orifice and adjust the torch to obtain a slightly reduced flame. As the brazing strips melt, add more solder to fill the joint and form a level surface.
4. Remove heat absorbent packing from insulation. Use dry, compressed air and blow out the inside of the frame.

WARNING: Personal injury may result if proper eye protection is not worn when cleaning with compressed air.

5. Torque the pole bolts to the values listed in Table 3, Page 37, Standard Bolt Torque Values.
6. Check the polarity of the field poles:

Energize the field circuit with a battery and check pole polarity with a compass, Fig. 33.
7. Insulate the connections with silicone putty and wrap connections with Mylar film (30). Apply glass tape and extend each taping 1/2 in. beyond the bare area of the connection. Brush the connections with air-drying alkyd varnish GE-8001.
8. Install and connect any cables previously removed.

NOTE: Do not flood-dip the coiled frame before the cables are installed and the connections are insulated.

Flood Dipping Coiled Frame

After field coils have been repaired or replaced and electrical tests completed, insulate the coiled frame by flood dipping in GE-8001 varnish. See Table 4, Page 55, for varnish viscosity limits.

Varnish may be thinned, as necessary, with Solvesso* No. 100 thinner. Agitate varnish for 15 minutes before dipping frame.

1. Be sure all coil connections are made and insulated, and all cables and ties for cables and connection straps are in place. Tie cable ends above the varnish level.
2. Coat all machine-fit surfaces with GE-271 black varnish or stripping compound and plug bolt holes with dummy bolts.
3. Heat the coiled frame to 40-80° C (104-176° F) and dip the frame drive end down (with all coil connections covered) for at least 15 seconds. Drain and remove the frame from the varnish. Allow the frame to drain for at least 5 minutes in a vertical position, drive end down.
4. Bake the frame in a pre-heated oven at 150° C (302° F) for 30 minutes, minimum.
5. Clean the varnish from machined surfaces and unplug the tapped holes.

TEST AFTER REPAIR (Coiled Frame Without Armature)

1. Pass 24.0 amperes(60 Hz current) through the exciting (series) field and read the voltage drop.
 Minimum Volts 13.1
 Maximum Volts 15.6
2. Pass 24.0 amperes (60 Hz current) through the commutating (CP) field and read the voltage drop.
 For Non-Magnetic retainers:

*Standard Oil Co. of Pa.

**TABLE 4
VARNISH VISCOSITY CHART FOR
DIPPING COILED FRAME**

NOTE: When necessary, use Solvesso No. 100 to thin varnish.

GE NO. 8001 VARNISH
NO. 3 ZAHN CUP

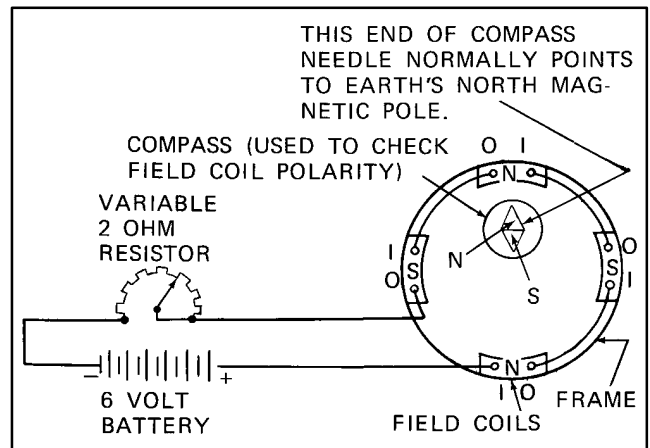
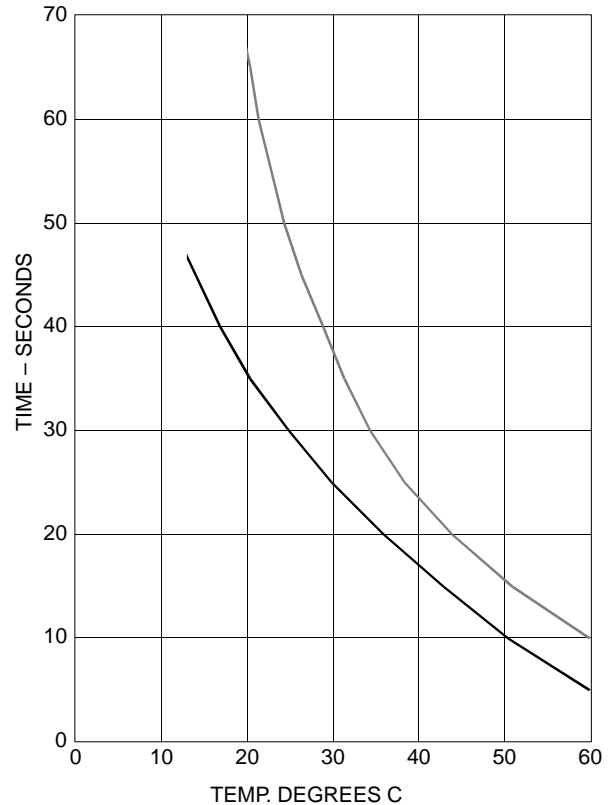


FIG. 33. FIELD COIL POLARITY CHECK. E-888A.

Minimum Volts	7.3
Maximum Volts	8.5
For Magnetic retainers:	
Minimum Volts	0.7
Maximum Volts	12.4

High-Potential Test

Frame With Used Coils

Apply a high-potential test voltage of 2000 volts, 60 Hz for one minute.

Frame With All New Coils

Apply a high-potential test voltage of 3500 volts, 60 Hz for one minute.

Measure leakage current to ground during this test. 5.0 milliamps is maximum.

WARNING: Electric shock can cause serious or fatal injury. To avoid such injury, personnel should take and observe proper precautions during the high-potential testing.

Resistance Measurement

Refer to the DATA section for values and measure the resistance of the exciting and commutating fields.

VARNISH TREATMENT (ARMATURE)

Vacuum Pressure Impregnation (VPI)

After all repairs have been completed, the armature must be vacuum pressure impregnated in GE-702C polyester varnish.

Refer to GEK-101183 for VPI procedure.

Following the VPI processing, the armature must be given a varnish immersion treatment.

NOTE: Do NOT clean previously protected machined surfaces, threads and tapped holes before varnish treating the armature.

Varnish Immersion Treatment After VPI (Armature)

The following immersion process must be performed on the armature assembly **after** the VPI process.

1. Preheat the armature in an oven at 140° C for at least five hours.
2. The temperature of the armature must not be less than 90° C, or above 120° C, before immersing. Immerse the armature in a vertical position (commutator end up) in the varnish (GE Spec. No. A15B53A) for at least one minute.

NOTE: One minute is the minimum time to insure adequate varnish penetration.

3. Lift the armature out of the varnish and spin until the excess varnish is removed. Clean the shaft with Xylene (GE Spec. No. D5B9).
4. Bake at 140° C in an oven for at least eight hours.

BALANCING ARMATURE

Refer to the appropriate longitudinal section (see Table 2, Page 20, to determine the correct drawing) for balance weight locations. Dynamically balance the armature within 10 grams (0.35 oz.) on the drive end and 12 grams (0.42 oz.) on the commutator end by adding weights on the commutator cap and the armature head.

REASSEMBLY

Brushholders

1. Using a bolt and washer, attach the brushholder clamp to the frame mount. Position the studs of the brushholder in the clamp, and move the brushholder radially outward as far as possible.
2. Tighten the brushholder clamp bolt but do not torque. Install all brushholders.
3. Connect the brushholder cables. Refer to Table 2, Page 20, to determine the correct connection diagram.

Armature Bearings

NOTE: Parts that will be shrink-fitted should be heated in an oven and assembled hot. Make sure shrink-fitted parts are tight against adjacent parts after they have cooled.

Drive-End Bearing (Figs. 34, 35, 36 and 37)

1. Place the armature in a saddle.
2. If the inner sleeve was removed, heat it to 110° C (230° F) and shrink it tight on the shaft against the shoulder.
3. Spread 0.5 oz. of grease onto the seals on the inner and outer bearing caps and the inner sleeve.
4. Pack 4.8 oz. of grease in the outer circumference of the inner bearing cap as shown by the shaded area in the bearing cap.
5. Install the inner bearing cap on the sleeve.
6. Heat and install the flinger tight against the sleeve.
7. Heat and install the inner race of the roller bearing tight against the flinger.
8. Install the outer race of the bearing in the framehead.
9. Fill the roller bearing completely with 29.0 oz. of grease.
10. Install the gasket onto the inner bearing cap.
11. Install guide pins into the inner bearing cap to guide the framehead into position.
12. Assemble the framehead/bearing assembly onto the shaft, over the guide pins until seated against the bearing cap. Remove the guide pins.

NOTE: Orient the inner bearing cap on UP, AUP, US and AUT models to facilitate grease tube assembly.

13. Assemble the grease tubes to the inner bearing cap:
 - a. On UP1 and AUP1 models, there are two grease tubes, assembled to the inner bearing cap and protrude through a hole in the frame.
 - b. On UP2 and AUP2 models, there is one grease tube, assembled to the inner bearing cap and protrudes through a hole in the frame.
 - c. On all other models, there is one grease tube assembled to the inner bearing cap and protrudes through a hole in the framehead.
14. Pack 4.8 oz. of grease in the outer circumference of the outer bearing cap and install the bearing cap to the framehead. Secure the assembly with bolts and lockwashers. Torque to the appropriate value in Table 3, Page 37.

Commutator-End Bearing

(All Models Except US2, UP6, AUT2 and AUP5)

Refer to Fig. 38.

1. Clean and inspect the bearing and the shaft bearing fit. Remove nicks and burrs.
2. If sleeve (16) was removed, heat it to 110° C (230° F) and shrink it tight onto the shaft against the shoulder.
3. Pack 5.25 oz. grease into the outer circumference of the cavity of bearing housing (8).
4. Heat bearing housing (8) in an oven to 100° C (212° F). While hot, assemble ball bearing (3) into the housing firmly against the shoulder at the bottom of the bearing fit.
5. Fill all voids in the ball bearing completely with approximately 20.8 oz. of grease, Fig. 38. Smear 0.5 oz. of grease on the bearing housing and the bearing cap seals.
6. Heat the bearing and housing assembly in an oven to 100° C (212° F). While hot, assemble it onto the shaft, with the inner race tight against sleeve (16).

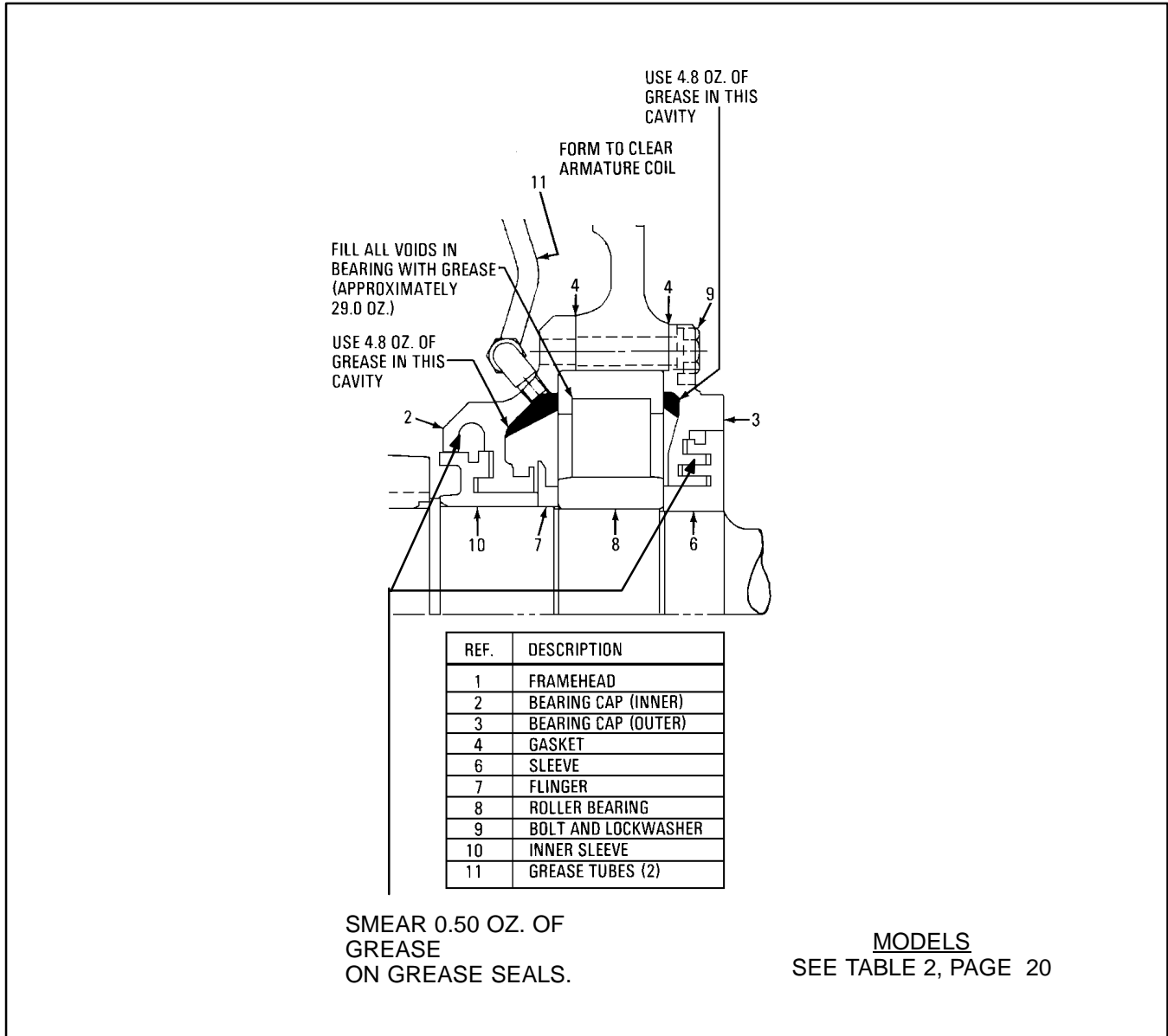


FIG. 34. DRIVE-END BEARING ASSEMBLY. E-18166E.

NOTE: Do not heat the bearing and housing assembly above 100° C (212° F). Higher temperatures may cause the oil to “bleed” from the grease.

- Heat spacer (9) to 110° C (230° F) and shrink it onto the shaft tight against the inner race of ball bearing (3).

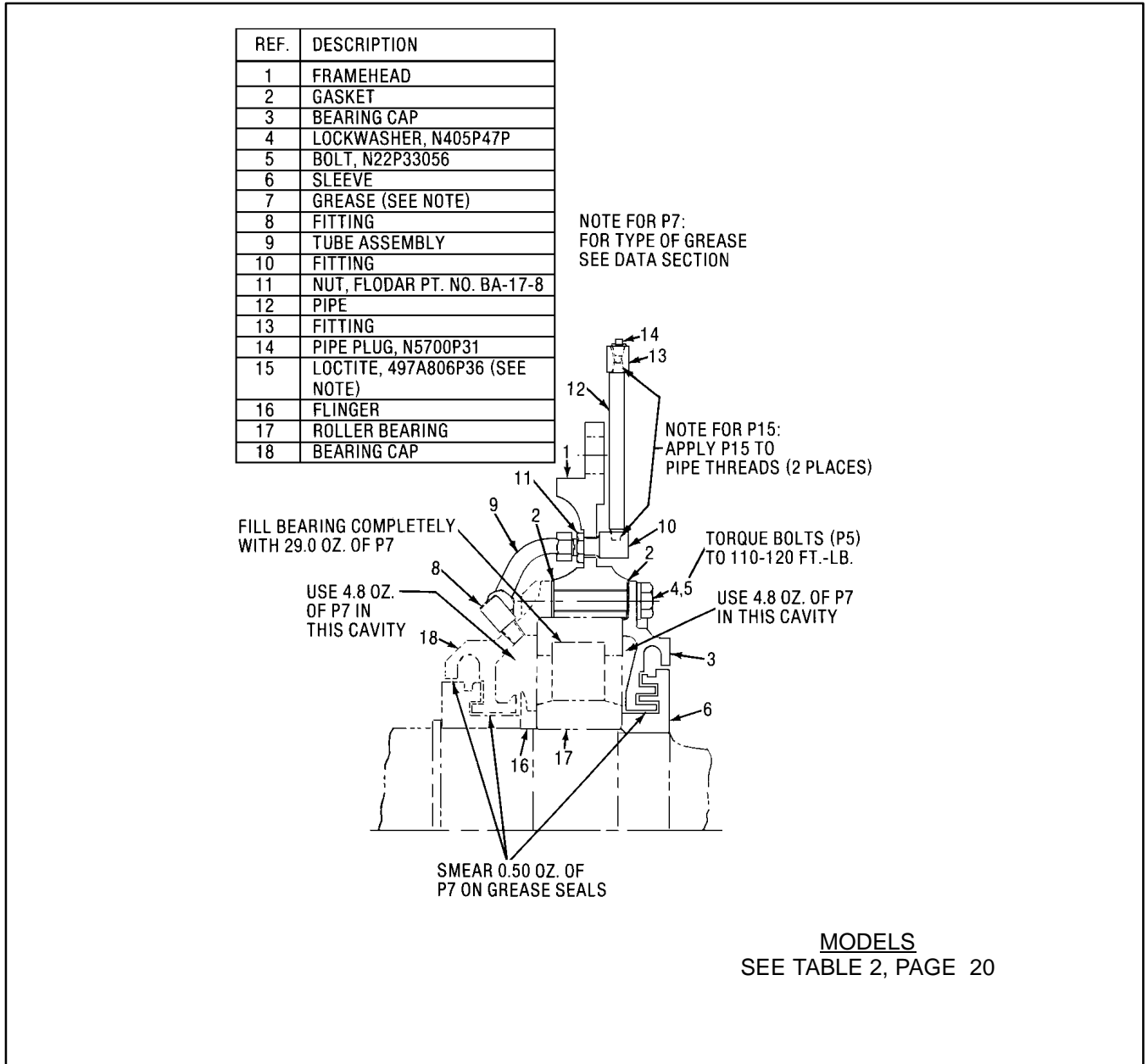


FIG. 35. DRIVE-END BEARING ASSEMBLY. E-39301.

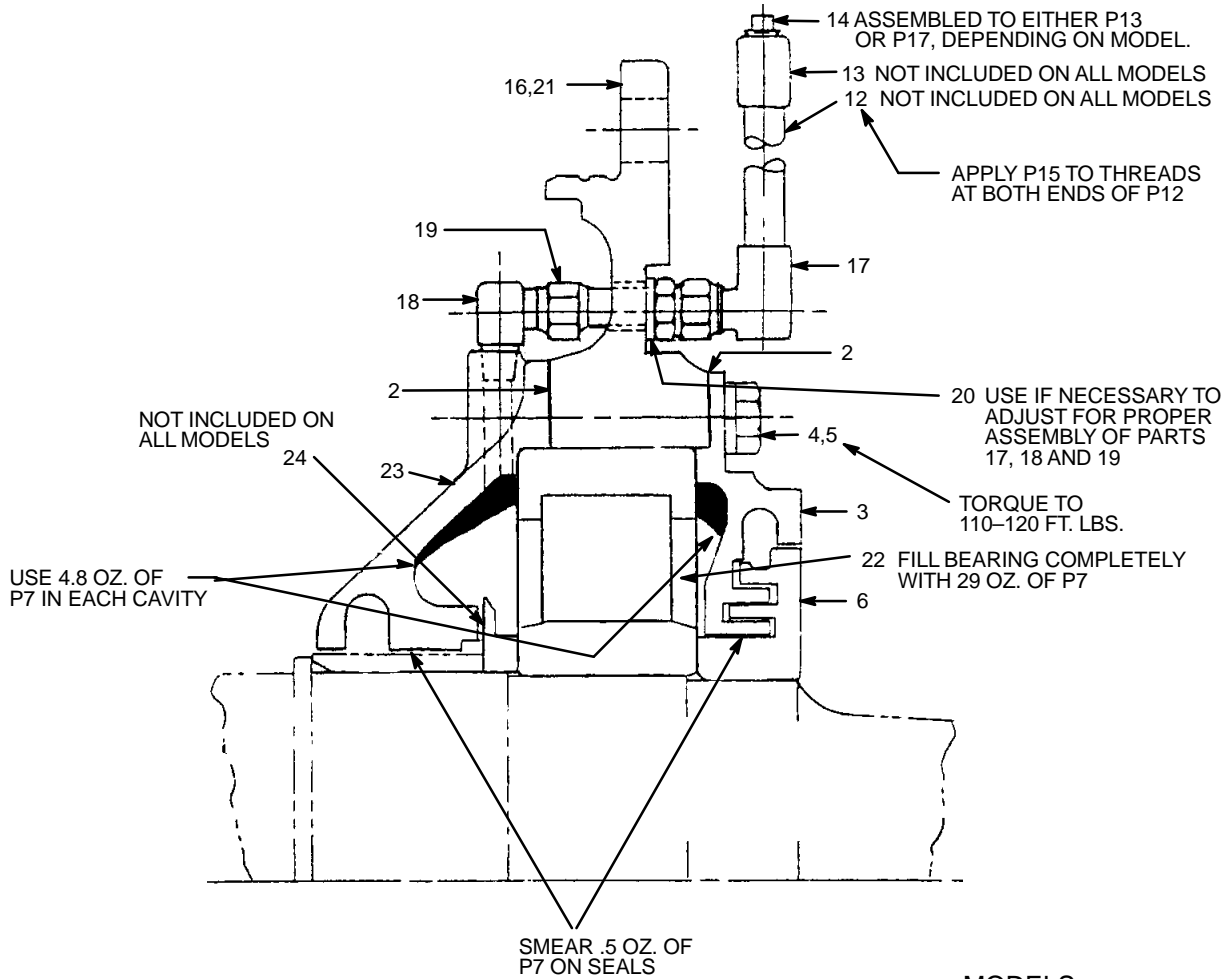
The bearing assembly will be completed when the armature is assembled into the frame.

Commutator-End Bearing

(Models US2, UP6, AUT2 and AUP5)

Refer to Fig. 39.

1. Clean and inspect the bearing and the shaft bearing fit. Remove nicks and burrs.
2. If sleeve (13) was removed, heat it to 110° C (230° F) and shrink it tight onto the shaft against the shoulder.
3. When sleeve (13) has cooled, assemble a new seal ring (5) onto the sleeve, oriented as shown in Fig. 40.
4. Pack 5.20 oz. grease into the outer circumference of the cavity of bearing housing (8).



MODELS
SEE TABLE 2, PAGE 20

REF.	DESCRIPTION	REF.	DESCRIPTION
1	FRAME HEAD	15	LOCK-TITE 497A806P36
2	GASKET	16	FRAME HEAD
3	BEARING CAP	17	FITTING 90 ELBOW
4	LOCKWASHER 5/8 N405P47P	18	FITTING 90 ELBOW
5	BOLT 5/8-11 X 3 1/2 N22P33056	19	FITTING BULKHEAD
6	SLEEVE	20	WASHER 9/16 N402P46B13
7	GREASE	21	FRAME HEAD
12	PIPE 1/4 X 6 IN.	22	ROLLER BEARING
13	COUPLING 1/4 NPT	23	BEARING CAP
14	PIPE PLUG 1/4 N5700P31	24	FLINGER

FIG. 36. DRIVE-END BEARING ASSEMBLY (41B537821, CHG. B). E-37952B

5. Heat bearing housing (2) in an oven to 100° C (212° F). While hot, assemble nilos ring (4) (oriented as shown in Fig. 40), and the ball bearing (3) into the housing firmly against the shoulder at the bottom of the bearing fit.
6. Fill all voids in the ball bearing completely with approximately 20.8 oz. of grease. Smear 0.5 oz. of grease on the bearing housing and bearing cap seals, and on the seal ring wear surface on the nilos ring (4).
7. Heat the bearing and housing assembly in an oven to 100° C (212° F). While hot, assemble it onto the shaft, with the inner race tight against sleeve (13).

CAUTION: Be sure that the nilos ring is assembled over sleeve (13), not pinched between the sleeve and the bearing.

NOTE: Do not heat the bearing and housing assembly above 100° C (212° F). Higher temperatures may cause the oil to "bleed" from the grease.

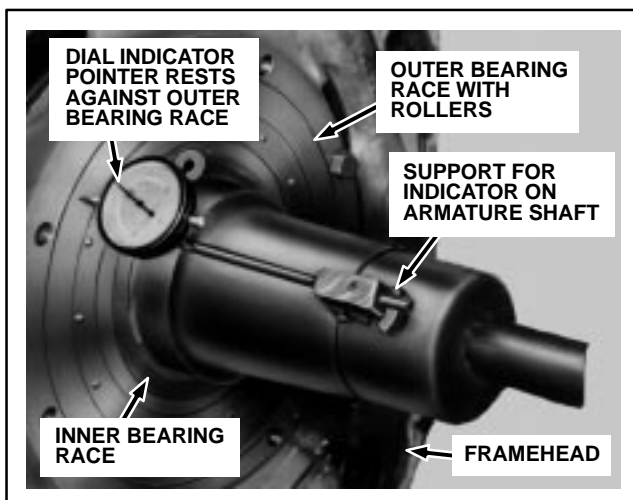


FIG. 37. CHECK ALIGNMENT OF BEARING AFTER ASSEMBLY. A-120402.

8. Heat spacer (6) to 110° C (230° F) and shrink it onto the shaft tight against the inner race of ball bearing (3).

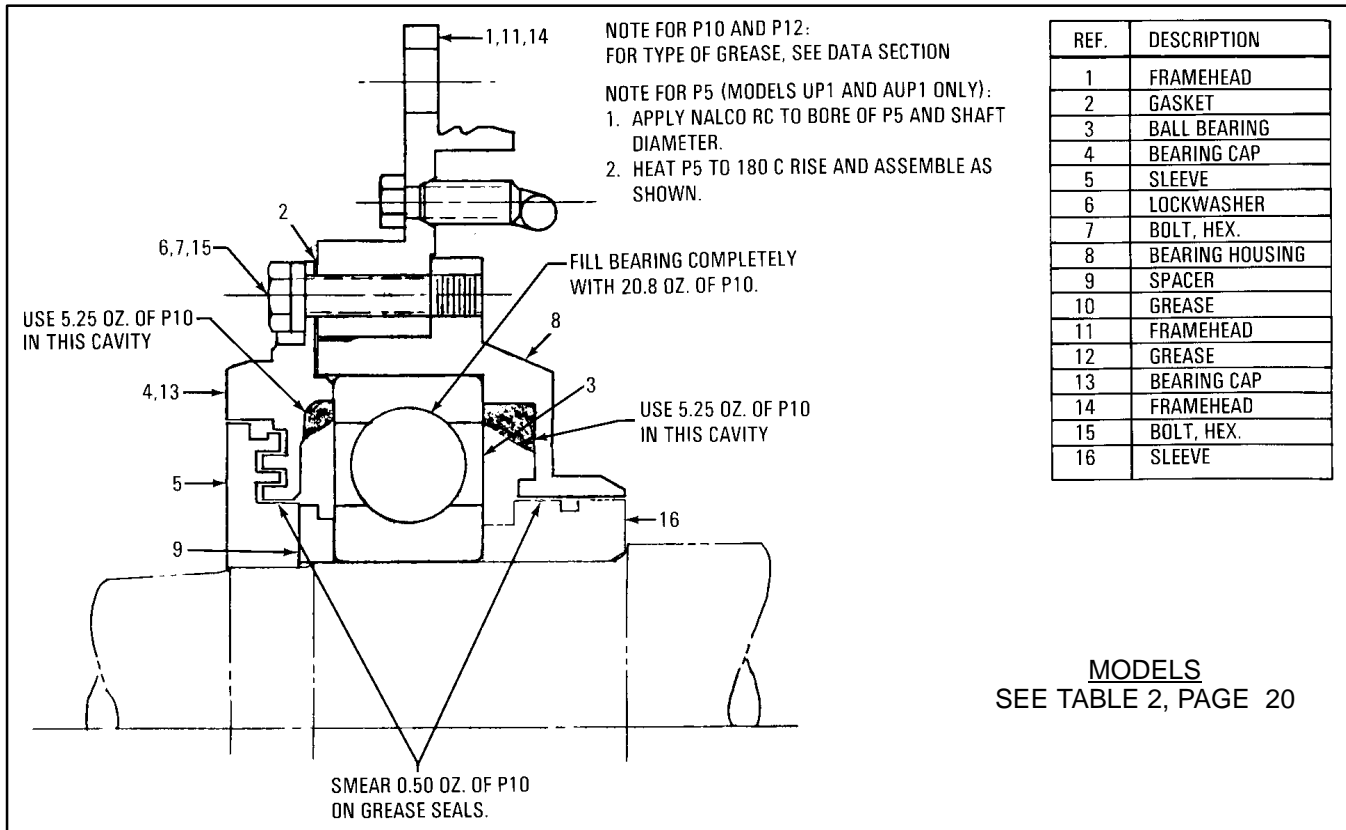
The bearing assembly will be completed when the armature is assembled into the frame.

Armature Assembly Into Frame

Models UP and AUP

Refer to Fig. 15.

1. Assemble the brushholders into the frame. Move them well back from commutator to avoid interference when installing the armature. Fasten and insulate the connections and install outgoing cables.
2. Block and level the frame in a vertical position, commutator-end down, on a heavy duty stand. Be sure there is clearance for the commutator-end shaft extension when the armature is lowered into the frame.
3. Install three guide studs in the commutator-end bearing housing bolt circle to guide the housing into the framehead fit.
4. Pack 5.25 oz. of grease in the outer circumference of bearing cap (4).
5. Lift the armature with the hoist and lifting bail at the drive end. Line up the hoist directly over the center of the cavity in the frame.
6. Lower the armature slowly into the frame, being careful not to damage the commutator. When the armature is almost fully inserted, use the guide studs to align bearing housing (46) and framehead bolt holes (56). (Position the bearing cap to accommodate the grease tubes in UP1 and AUP1 models.)
7. When the armature has reached its limit of travel, remove the guide studs and install bearing cap (4) with a new gasket (57) using bolts and washers (52). Draw the bearing housing into framehead (56). Torque bolts to 105–115 ft.lbs.



REF.	DESCRIPTION
1	FRAMEHEAD
2	GASKET
3	BALL BEARING
4	BEARING CAP
5	SLEEVE
6	LOCKWASHER
7	BOLT, HEX.
8	BEARING HOUSING
9	SPACER
10	GREASE
11	FRAMEHEAD
12	GREASE
13	BEARING CAP
14	FRAMEHEAD
15	BOLT, HEX.
16	SLEEVE

MODELS
SEE TABLE 2, PAGE 20

FIG. 38. COMMUTATOR-END BEARING ASSEMBLY (41B532745 CHG. F). E-39090A.

- 8. Install framehead bolts (10) and lockwashers (12). Torque to 440-495 lb.-ft.

CAUTION: Alternate tightening of commutator-end bearing housing and drive-end framehead bolts. Uneven tightening of bolts could damage bearings or related fitted surfaces.

NOTE: Be sure framehead bolt holes are aligned with bolt holes in inner bearing cap before assembling bolts (10) and lockwashers (12).

- 9. Install grease tubes at the drive end:
 - a. On UP1 and AUP1 models, two grease tubes are required. Clean all residual sealing RTV from the grease tube clearance hole in the frame. Then, reach into the cavity of the machine, around the drive-end inner bearing cap (51), and install these tubes to the bear-

ing cap so that they protrude through a hole in the frame. Seal around the grease tubes at their hole in the frame with RTV.

- b. On UP2 and AUP2 models, one grease tube is required. The procedure is the same as indicated in Step 9a.
- c. On all other models, one grease tube is required. This tube connects the inner bearing cap with the framehead, and should have been assembled with the drive-end bearing assembly.

NOTE: Insure that all grease tubes are packed full of grease.

- 10. Use a feeler gauge and check the radial clearance on the drive-end bearing between each bearing roller and the inner race, at the top of the bearing, Fig. 40. Place the feeler gauge between the top roller and the inner race.

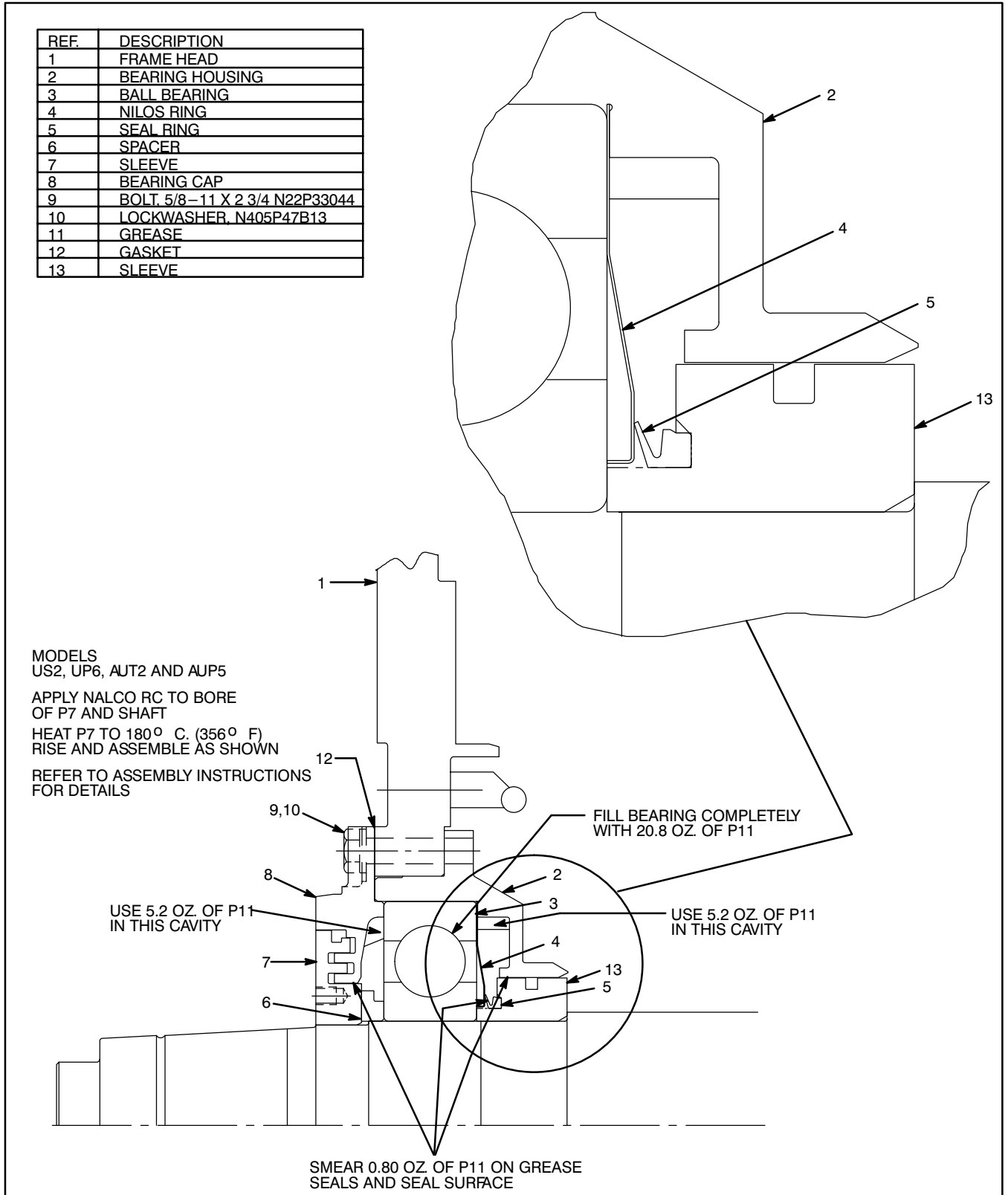


FIG. 39. COMMUTATOR-*END BEARING ASSEMBLY (41B538068 CHG. 0). E-39300.*

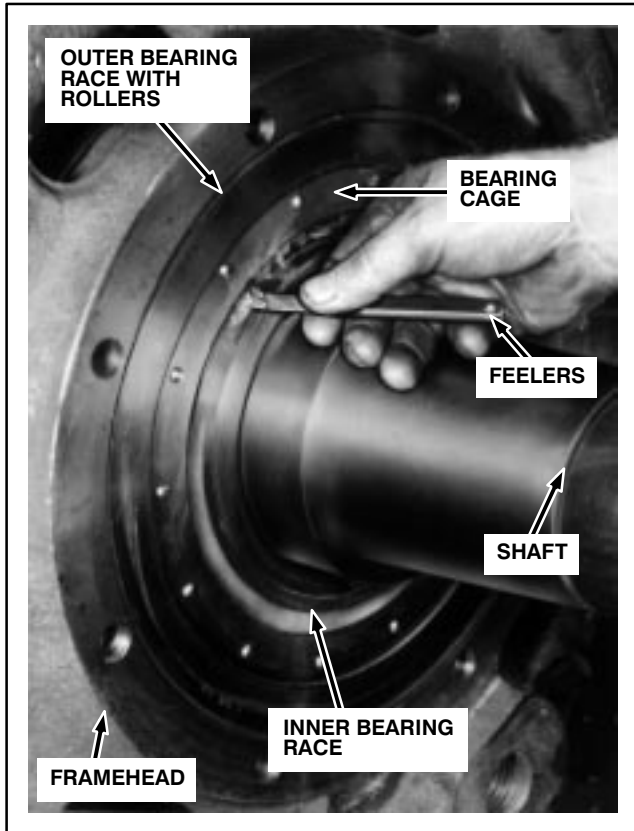


FIG. 40. CHECKING INTERNAL CLEARANCE OF BEARING. A-120403.

11. The clearance between the rollers and the inner race should measure between 0.0012 and 0.004 in. Try various gauge thicknesses until clearance can be determined by the feel of the gauge as the gauge is slowly pulled from between the roller and the inner race.
12. Pack 4.8 oz. of grease in the outer circumference of outer bearing cap (5).
13. Install a new gasket (54) and bearing cap (5) with bolts and lockwashers (53).
14. Smear seals on bearing cap (5) and sleeve (47) with grease.
15. Heat sleeve (47) to 110° C (230° F) rise and shrink it onto the shaft tight against the roller bearing inner race (48).
16. Seal the grease tubes which protrude through the hole in the frame with RTV-108.

17. At the commutator end, smear the seals on bearing cap (4) and sleeve (42) with grease.

NOTE: Prior to heating sleeve (42), apply NALCO RC* "Rail Conditioner" to the inside diameter of the sleeve and to the mating surface on the shaft. Apply the NALCO with a Scott-150 white paper towel only and allow it to dry to a thin white film on both surfaces before proceeding with Step 18.

18. Heat sleeve (42) to 180° C (356° F) rise and shrink it onto the shaft tight against the spacer (43).
19. Assemble the grease tubes to the bearing cap (4) (UP1 and AUP1 models only). Install pipe plugs in tubes and tube fittings as indicated in Fig. 15.

NOTE: Insure that grease tubes are packed full of grease.

Armature Assembly Into Frame

Models US1, AUT

Refer to Fig. 18.

1. Assemble the brushholders into the frame. Move them well back from the commutator to avoid interference when installing the armature. Fasten and insulate the connections and install outgoing cables.
2. Block and level the frame in a vertical position, commutator-end down, on a heavy duty stand. Be sure there is clearance for the commutator-end shaft extension when the armature is lowered into the frame.
3. Install three guide studs in the commutator-end bearing housing bolt circle to guide the housing into the framehead fit.
4. Pack 5.25 oz. of grease in the outer circumference of bearing cap (8).
5. Lift the armature with the hoist and lifting bail at the drive end. Line up the hoist directly over the center of the cavity in the frame.

*Product of NALCO Chemical Co.

6. Lower the armature slowly into the frame, being careful not to damage the commutator. When the armature is almost fully inserted, use the guide studs to align bearing housing (3) and framehead bolt holes (14).
7. When the armature has reached its limit of travel, remove the guide studs and install bearing cap (8) with a new gasket (11) using bolts and washers (10). Draw the bearing housing into framehead (14). Torque bolts to 110–120 ft.lbs.
8. Install framehead bolts and lockwashers(30). Torque to 440–495 lb.-ft.

CAUTION: Alternate tightening of commutator-end bearing housing and drive-end framehead bolts. Uneven tightening of bolts could damage bearings or related fitted surfaces.

NOTE: Be sure drive-end framehead bolt holes are aligned with holes in inner bearing cap before assembling bolts and lockwashers (30).

9. Use a feeler gauge and check the radial clearance on the drive-end bearing between each bearing roller and the inner race, at the top of the bearing, Fig. 40. Place the feeler gauge between the top roller and the inner race.
10. The clearance between the rollers and the inner race should measure between 0.0012 and 0.004 in. Try various gauge thicknesses until clearance can be determined by the feel of the gauge as the gauge is slowly pulled from between the roller and the inner race.
11. Pack 4.8 oz. of grease in the outer circumference of outer bearing cap (36).
12. Install a new gasket (35) and bearing cap (36) with bolts and lockwashers (34). Torque bolts to 110–120 ft.lbs.
13. Smear seals on bearing cap (36) and sleeve (37) with grease.
14. Heat sleeve (37) to 110° C (230° F) rise and shrink it onto the shaft tight against the roller bearing inner race (38).

15. Finish the assembly of grease tube fittings and washer (27) where it passes through the framehead. Tighten all fittings and hardware.
16. At the commutator end, smear the seals on bearing cap (8) and sleeve (6) with grease.

NOTE: Prior to heating sleeve (6), apply NALCO RC "Rail Conditioner" to the inside diameter of the sleeve and to the mating surface on the shaft. Apply the NALCO with a Scott-150 white paper towel only and allow it to dry to a thin white film on both surfaces before proceeding with Step 18.

17. Heat sleeve (6) to 180° C (356° F) rise and shrink it onto the shaft tight against the spacer (5).
18. Install pipe plugs in grease tubes and tube fittings as indicated in Fig. 18.

NOTE: Insure that grease tubes are packed full of grease.

BRUSHHOLDER CLEARANCE ADJUSTMENT

1. Remove the protective covering from the commutator. Place a 1/16 in. fiber spacer between the bottom of the brushholder and commutator. Loosen the brushholder clamp bolts and move the brushholders so they touch the fiber spacer. Tighten the clamp bolts to 225–250 lb.-ft. torque and remove the spacer.
2. Connect the cable leads to the brushholder terminals and tighten the terminal bolts.

BRUSH INSTALLATION

1. Install new brushes.

CAUTION: When replacing brushes, use only the GE recommended grade. Mixing of brush grades in the same motor or changing brushes to another grade will seriously affect commutation, surface film, commutator and brush life. See the DATA section for brush grade.

2. Carefully lower the spring-loaded brush lever on each brush. Do not allow the lever to snap against the brush, as the brush may chip.

3. Attach the brush–shunt terminals to the brush-holder body under the screws provided.
4. Inspect the interior of the machine for foreign objects. Install the commutator covers on the motor and check for proper fit and latch operation.
5. Clean the terminals.

HUB MOUNTING

Hub Fitting

NOTE: GE does not supply the hub for vertical drill motors. This procedure is included for customer use as a reference when installing the hub.

To prevent a hub from slipping, it should have at least 75 percent fit on the shaft; i.e., at least 75 percent of the tapered bore of the hub should be in contact with the tapered fit on the shaft. Before mounting a hub, check and correct the fit as follows:

1. Lightly cover the bore of the hub with a blueing compound such as Prussian Blue.
2. Snap the cold hub forcefully onto the shaft.
3. Mark the relative angular position of hub with respect to the shaft.
4. Remove the hub from the shaft. A convenient method of removal is by the use of two finely tapered steel wedges (hardened and ground) which are carefully driven between the hub and the bearing outer sleeve on the shaft.
5. Inspect the taper fit of the shaft; blueing of the hub bore should now show on the shaft. If at least 75 percent of shaft surface shows traces of blueing, the fit is satisfactory. If, however, only a few spots of blueing show on the shaft, the fit is not satisfactory.
6. Dress down the blue spots on the shaft very lightly with a fine emery cloth such as No. 400A Triemite.

7. Blue the hub bore again (see Step 1) and repeat Steps 2, 4, 5 and 6. Be sure to place the hub onto the shaft in the same position as marked.

Generally, the fit will be improved, but the foregoing procedure may have to be repeated several times to obtain a 75 percent fit.

Under no circumstances use a lapping compound since lapping will produce a shoulder at the large end of the tapered fit. A shoulder will prevent a perfect fit when the hub is mounted hot; i.e., when it is mounted in the advanced position.

8. After a good fit has been obtained, thoroughly clean the shaft and the hub bore to remove all blueing, oil or grease. Then mount the hub.

Hub Mounting

1. Thoroughly clean the hub fit on the shaft and bore of the hub (see the procedure in the Cleaning section). Remove any scoring on the shaft or hub bore.
2. Spot the cold hub on the shaft by hand and check for at least 75 percent fit. See the "Hub Fitting" section. If necessary, dress the shaft to obtain this fit.
3. Trial mount the cold hub onto the shaft. Measure and record the position of the hub with respect to the end of the shaft. Take measurements with a micrometer advance gauge similar to that shown in Fig. 41. Zero the gauge.

Mark points of measurement, and mark across the end of shaft and hub face so that the hub, when heated, can be mounted in exactly the same angular position, and so the advance measurement can be made from the same point.

4. Mount the hub hot onto the shaft so as to secure an advance from the cold position to the hot position along the axis of the shaft as indicated in this section. The ESTIMATED difference between shaft temperature and hub temperature (temperature rise) which will provide this advance is also given. The temperature difference is only an estimate and should be adjusted (if necessary) to provide the advance within prescribed limits.

CAUTION: Zero settings of advance gauge must not be disturbed until all readings on the hub are completed.

Heat the hub in an oven until it has reached a uniform temperature (the desired number of degrees above shaft temperature). For example, if shaft temperature is 25° C (77° F), heat hub to 25° C (77° F) + 171° C (339° F) = 196° C (385° F). This procedure should provide an advance of approximately 0.085 in.

An accurate method must be provided for measuring hub and shaft temperatures quickly before mounting the hub. This can best be done with a hand pyrometer. In using the pyrometer, place points of the gauge inside the bore of the hub, Fig. 42.

NOTE: The part must be left in the oven long enough for the heat to penetrate throughout the part.

Measure the temperature of the shaft and the hub with the same instrument.

5. Insure that the hub bore and the shaft taper are clean. Then, using adequate hand protection, quickly mount the hot hub on the shaft in the same angular position as when cold. When the

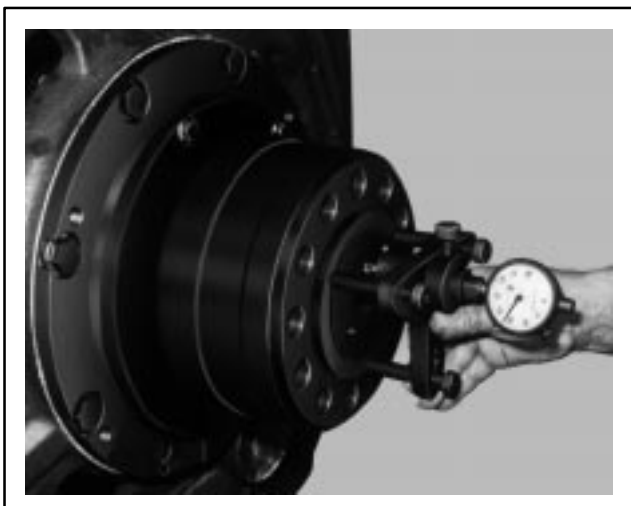


FIG. 41. METHOD OF USING ADVANCE GAUGE. E-5975A.

hub is nearly in engagement with the taper fit (not in actual contact), snap it forcibly into place with a quick push. It is important that the hot hub be instantly snapped into position before it has cooled; otherwise, it will freeze to the shaft and cannot be adjusted further.

6. Check the hot or shrunk-on position of the hub on the shaft. The advance from cold to hot position along the axis of the shaft must be held within the limits indicated. Check the actual advance with an indicator gauge, located in the same relative position as used to measure the cold position in Step 3, Fig. 41.

If the advance is not within specified limits, remove the hub and repeat the assembly procedure.

TESTING AFTER OVERHAUL

TESTING SERIES MACHINES (Models 5GE752AUP, AUT)

After the motor has been reconditioned and reassembled, make the following tests to assure it will operate satisfactorily.

Connect the motor to a d-c arc-welding generator, Fig. 7. Refer to connection diagrams, Figs. 22 and 24, for connections. Run the machine series-connected without load at 900 rpm and measure bearing temperatures.

1. Use Duxseal* putty to hold the thermometers on the drive end and commutator-end outer bear-

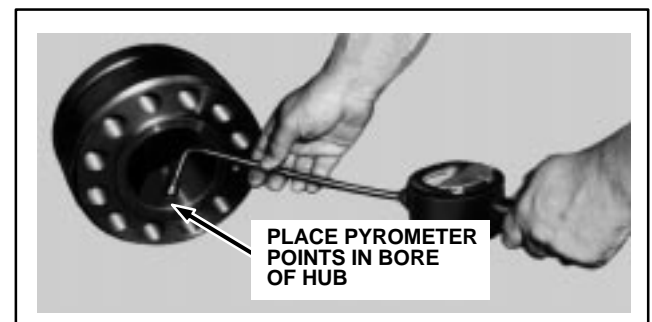


FIG. 42. MEASURING TEMPERATURE OF COUPLING HUB WITH PYROMETER. E-5976.

ing caps. Thermometers should contact the bearing caps for best results.

2. Seat the brushes and run for ten minutes at 900 rpm.

Frame temperature should not exceed 25 C rise.

3. With machine running up to speed, measure vibration. Vibration should not exceed 0.002 on commutator end. If vibration exceeds this amount, rebalance the armature.
4. Check the commutator for roughness and make sure the brushes are riding properly.
5. Use a listening rod to check for noisy bearings.
6. Stop the machine and mount an indicator on the frame. While turning the armature by hand, measure commutator runout. It should not exceed 0.001 in.
7. Measure field impedance. With 60 Hz a-c and 24 amperes through each field, measure the voltage drop across total exciting and commutating fields. See the DATA section for voltage limits.
8. Apply a high-potential test to the windings of the assembled machine, as specified in the DATA section.

WARNING: Electric shock can cause serious or fatal injury. Proper precautions should be taken and observed by personnel performing testing to avoid such injury.

TESTING SHUNT MACHINES (Models 5GE752UP and US)

After the motor has been reconditioned and reassembled for service, make the following tests to be sure it will operate satisfactorily.

Connect the motor to a d-c welding generator. Refer to connection diagrams (Figs. 21 and 23) for connec-

tions. Run the machine by separately exciting the shunt field from a 125 vdc source. From another source of power, apply voltage to the armature circuit until the desired speed is obtained.

Motor Operation

Ventilated (2300 cfm at 7.6 in. H₂O at Commutator Chamber)

Hold separate field excitation at 50.5 amperes. Vary the armature voltage to obtain the required rpm. At approximately 700 terminal volts (no load), the speed will be 900 rpm.

Unventilated

Hold the separate field excitation at 10 to 15 amperes. Vary the armature voltage to obtain the required rpm. At approximately 338 terminal volts (no load), the speed will be 900 rpm.

1. Run the motor for five minutes at 450 rpm. Increase the speed to 900 rpm and run for two hours. Bearing temperatures should not exceed 70° C (158° F). Run until the bearing temperature remains constant for 30 minutes. Increase the speed to 1300 rpm and hold it while performing Steps 2, 3 and 4. Then shut down the motor. Do not exceed 1300 rpm.
2. Measure vibration when running the motor up to speed. Vibration should not exceed 0.004 in. If excessive, rebalance the armature.
3. Check the commutator for roughness. Be sure brushes are riding properly.
4. Listen for noisy bearings with a listening rod.
5. Stop the motor and mount an indicator on the frame. Turn the armature by hand and measure commutator runout. Runout should not exceed 0.001 in.
6. Measure the insulation resistance of the windings with a megohmmeter. If the resistance measures not less than one megohm, apply an a-c high-potential test to ground for one minute as outlined in the DATA section.

*Product of Johns Manville Co.

WARNING: Electric shock can cause serious or fatal injury. To avoid such injury, personnel should take and observe proper precautions during the high-potential testing.

REMOVING ARMATURE LOCKING ARRANGEMENT

(See Fig. 43)

1. Remove the two shipping bolts (1) from the bearing cap. These bolts are longer and can be identified from the factory by their yellow heads.
2. Install the two regular bolts which are in a bag attached to one of the shipping bolts.
3. Torque the regular bolts to 115 lb.-ft.

NOTE: The shipping bolts and bag should be saved for future armature locking requirements.

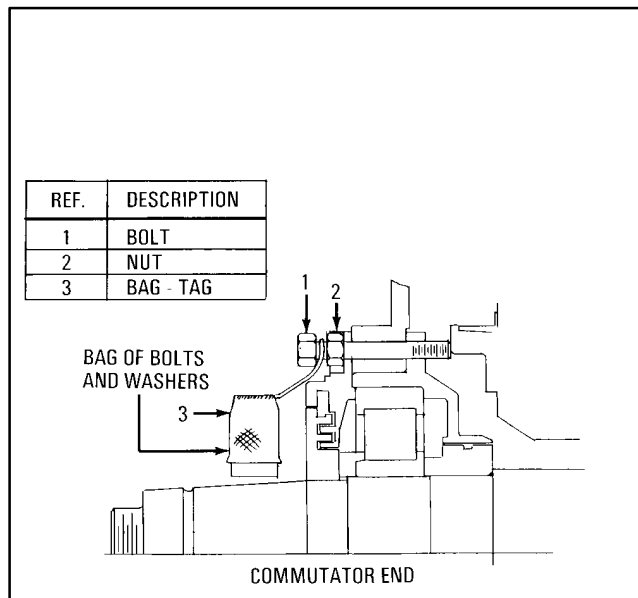


FIG. 43. ARMATURE LOCKING ARRANGEMENT (41B535748 CHG. 0). E-28735A.

LOCKING THE ARMATURE FOR SHIPMENT

(See Fig. 43)

1. Remove two diametrically opposite bolts in the commutator end bearing cap.
2. Install shipping bolts (1) (painted yellow) with jam nuts (2) applied. Torque bolts to 30 lb.-ft. and tighten the jam nuts.

CAUTION: Do not rotate the armature when the locking bolts are in place. Bearing and commutator damage may result.

3. Attach the two regular bolts and bag-tag (5) to one of the locking bolts (1).

SHIPPING

Whenever drilling motors are to be shipped, they must be properly skidded and secured to prevent any damage in transit. The photographs and drawings which follow illustrate a proven method of skidding these machines for handling and shipment.

HANDLING

To avoid damage to the machine during handling, review the following cautionary statements:

1. Do not lift motors by the shaft extension of the armature.
2. Do not allow the armature to bump another object.
3. Do not tighten coupling assembly bolts with an air wrench or by pounding.
4. Do not remove armature end-play by any other means than axial blocking.
5. Do not load the armature radially (strap down) for shipment.

CLEANING AND SLUSHING

Before skidding the machine for shipment, all exposed finished surfaces not already painted should be cleaned and slushed as follows:

1. Remove all corrosion.
2. Wipe off the surface with clean rags and wet with petroleum spirits GE-D5B8.
3. Follow with a clean rag wet with methanol, then wipe dry. **DO NOT** touch the cleaned surface with bare hands.
4. Slush immediately after cleaning with GE-D6C6A1 slushing compound.

SKIDDING

Use yellow pine timbers large enough to support the weight of the machine. The recommended size is illustrated in Fig. 44.

PROTECTION

When any apparatus is shipped in the open, it should be fully protected from rain, snow, dirt, etc., by covering with some suitable weatherproof material.

ARMATURES

To prepare drilling motor armatures for shipment or storage, clean, slush and wrap the armature. Then, se-

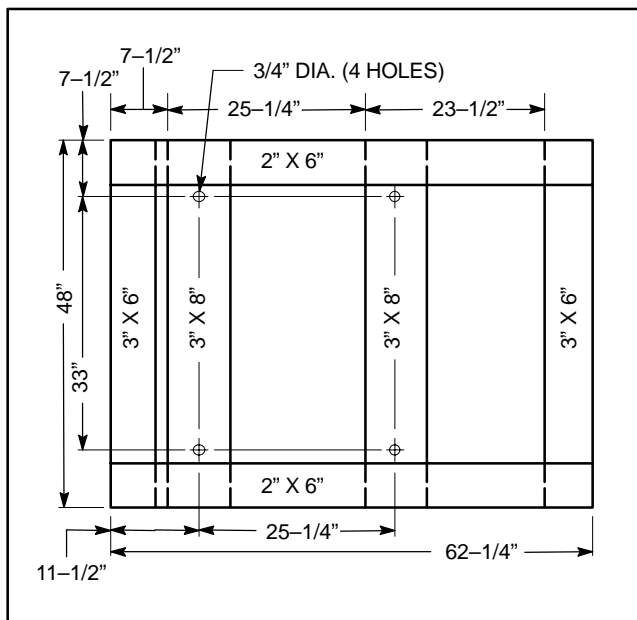


FIG. 44. CONSTRUCTION DETAILS. E-7754.

curely support and enclose the armature in a totally enclosed wooden box of sufficient strength to protect the it from damage.

1. Clean the armature by removing dirt, oil or grease from its surface.
2. Treat all unpainted, exposed finished surfaces as follows:
 - a. Remove any corrosion.
 - b. Wipe off the surface with a clean cloth dipped in petroleum spirits, GE-D5B8.
 - c. Wipe off the surface with a clean rag, dipped in methanol, and wipe dry. **DO NOT** touch the cleaned surfaces with bare hands.
 - d. Immediately after cleaning, slush the cleaned surface with GE-D6C6A1 shushing compound.
3. Wrap heavy paper or cardboard around the commutator for protection.
4. Wrap and secure waterproof paper around armature punchings. This will prevent saddle timber moisture from condensing on the core punchings.
5. Wrap both ends of the shaft with Grade C, Type 1, wax treated cloth and tape it securely into place.

NOTE: Wherever metal parts come in contact with the wood, insert a good grade of waterproof paper between metal and wood. This will prevent rust formation from the condensation of moisture on the metal.

PREPARATION OF BOX

1. Make a suitable box from yellow-pine lumber using timbers of proper size to support the weight of each armature. See Fig. 45.
2. Make 4 saddle blocks of 3 by 6 in. timber cut out to fit circumference of armature core. Nail two to the bottom of the box in the proper position to

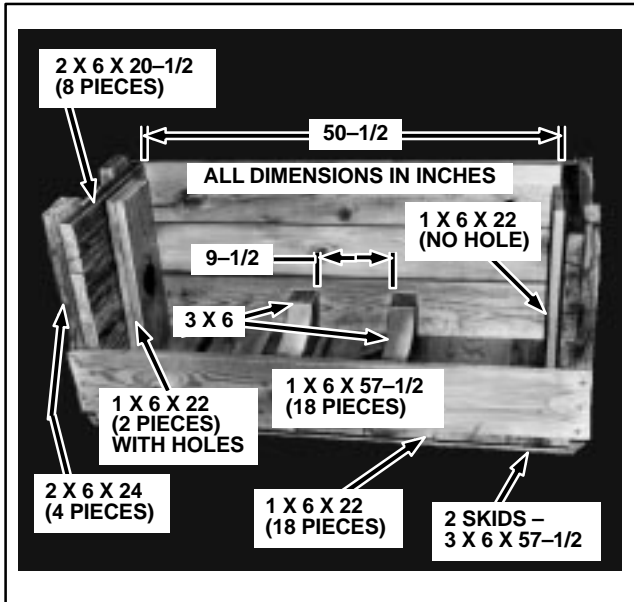


FIG. 45. BOX FOR SHIPPING ARMATURES. E-3782A.

support the armature on core punchings.

CAUTION: Locate the saddle blocks so they do not project beyond the punchings; otherwise, scuffing of coil insulation could occur.

- Support the commutator-end of the shaft by two 1 X 6 in. boards nailed to the end of the box. Drill a hole in the two boards just large enough for the end of the shaft. See Fig. 45. The end of the shaft will fit in this hole against the end of the box to prevent movement.
- After the armature has been placed in the box, insert a board of proper thickness between the end of the shaft and the end of the box. Securely nail it in place. This will prevent any lateral movement of the armature in the box.

BOXING THE ARMATURE

- Prepare the armature as specified in the foregoing.
- Place it in the box. Support it on two saddle blocks under the punchings and secure it against lateral movement. See Fig. 46.

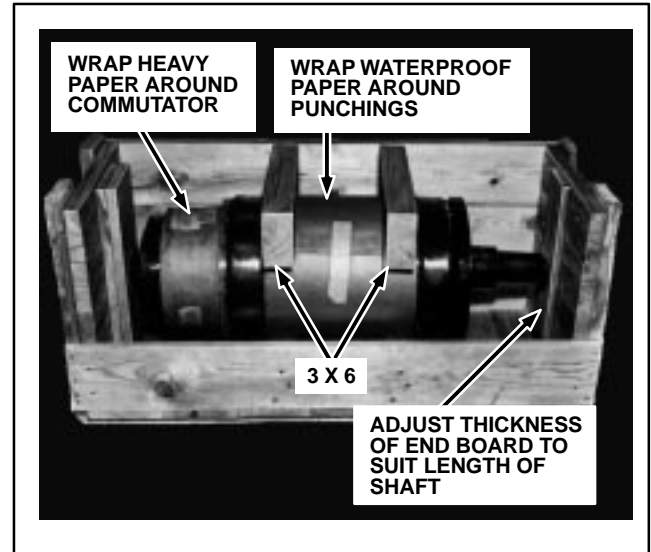


FIG. 46. ARMATURE PLACED IN SHIPPING BOX. E-3783.

- Place two saddle blocks over the core punchings, as shown in Fig. 46, and nail them to the side boards. If the box is the correct size, the top of the saddles will be flush with the top of the side boards. See Fig. 47.
- Nail the top cover in place. Also nail through to the top saddle blocks to prevent them from moving.

STORAGE

PLACING INTO STORAGE

When placing GE drilling motors into storage, the following preparations should be performed to prevent damage to the equipment as a result of the storage.

- Machines should be placed on a pallet and stored indoors if possible. A clean, dry ambient of 60°F is preferred. In a high humidity environment, an ambient of 70°F is recommended. Every attempt should be made to avoid widely varying temperatures and high humidity.
- If it is necessary to store outdoors, a protective cover should be used to prevent entrance of rain, dust, etc.
- All exposed machined steel parts and surfaces should be slushed. These areas are slushed prior to shipment from the factory, but should be

examined for rust. Any rust found should be removed using fine abrasive paper, after the old slushing compound has been removed with mineral spirits (GE-D5B8). Methanol should be used to remove all residue.

WARNING: Cleaning solvents may be toxic and/or inflammable. They can cause serious or fatal injury if used without proper precautions. For safety:

1. **Do not inhale solvent fumes.**
2. **Use solvents only in adequately ventilated areas.**
3. **Avoid contact of solvent with the skin.**
4. **Do not expose solvent to flame or sparks.**
5. **Observe caution statements issued by the manufacturer of the solvent.**

Extreme care should be exercised not to damage critical machined surfaces such as the tapered shaft surface while removing rust. The surfaces should be reslushed with GE-D6C6A1



FIG. 47. SHIPPING BOX WITH ARMATURE, LESS COVER. E-3784.

slush compound, Kendell Grade 5, or the equivalent.

4. Brushes should be removed from their holders and clamped under the spring clips to prevent corrosion of the commutator surface as a result of moisture absorption by the carbon.
5. Do not completely seal the motor, but cover major vent areas with a waterproof shipping tape. Leave enough opening so the machine can breathe – i.e., moist air is not trapped. The intention is to prevent entrance of water, dust, small animals, etc., but not to seal airtight. GE does not recommend the use of a silica gel or dehydrating agent.
6. Since the lubricant drains from the top half of bearings during storage, this area is subject to corrosion. The shaft should be rotated periodically to redistribute a protective film. If stored inside, rotate every three months. If outside, every month. Before placing the machine back into service after prolonged storage (1 year or more) bearings should be inspected and repacked with new grease meeting the recommended GE lubrication specification.
7. The machine should be meggered when placed into storage and periodically while in storage (3-month intervals). Keep a record of these megger readings as a rapid decrease in insulation resistance indicates the machine condition is deteriorating and the storage conditions inadequate.

Before placing a stored motor back into service, refer to the applicable instruction “Removing Motors From Storage”.

REMOVING FROM STORAGE

Before placing a stored motor in service, perform the following:

1. Blow dust and dirt accumulation out of the windings with clean, dry air.
2. Visually inspect for spring corrosion, sticking brushes in brushholders and general defects.

3. Check winding insulation continuity to ground with a 500 volt megger. If the megger reading is less than 2 megohms, the winding should be baked or dried until the moisture content is sufficiently reduced to raise the megger reading to 2 megohms.
4. An electrical source of heat is best for drying as it can be easily regulated and is clean. Proceed as follows:
 - a. Remove the armature from the frame and remove bearings from the armature shaft.
 - b. Heat the frame and armature until dried sufficiently to obtain the 2 megohm reading.
 - c. Pack bearings with new grease. Refer to the DATA table for the proper grease. Refer to the appropriate bearing illustration for the proper amount of grease.
 - d. Reassemble the motor.
 - e. If facilities are available, give the reassembled machine a running test to check the bearings.

NOTE: Before drying windings, consideration must be given to bearings and lubricants. Not only can bearing lubricants be damaged by heat, but they can also deteriorate with age. For this reason, it is usually best to remove bearings before drying and repack with new grease before reassembly.

Refer to Figs. 48 and 49 for outline drawings.

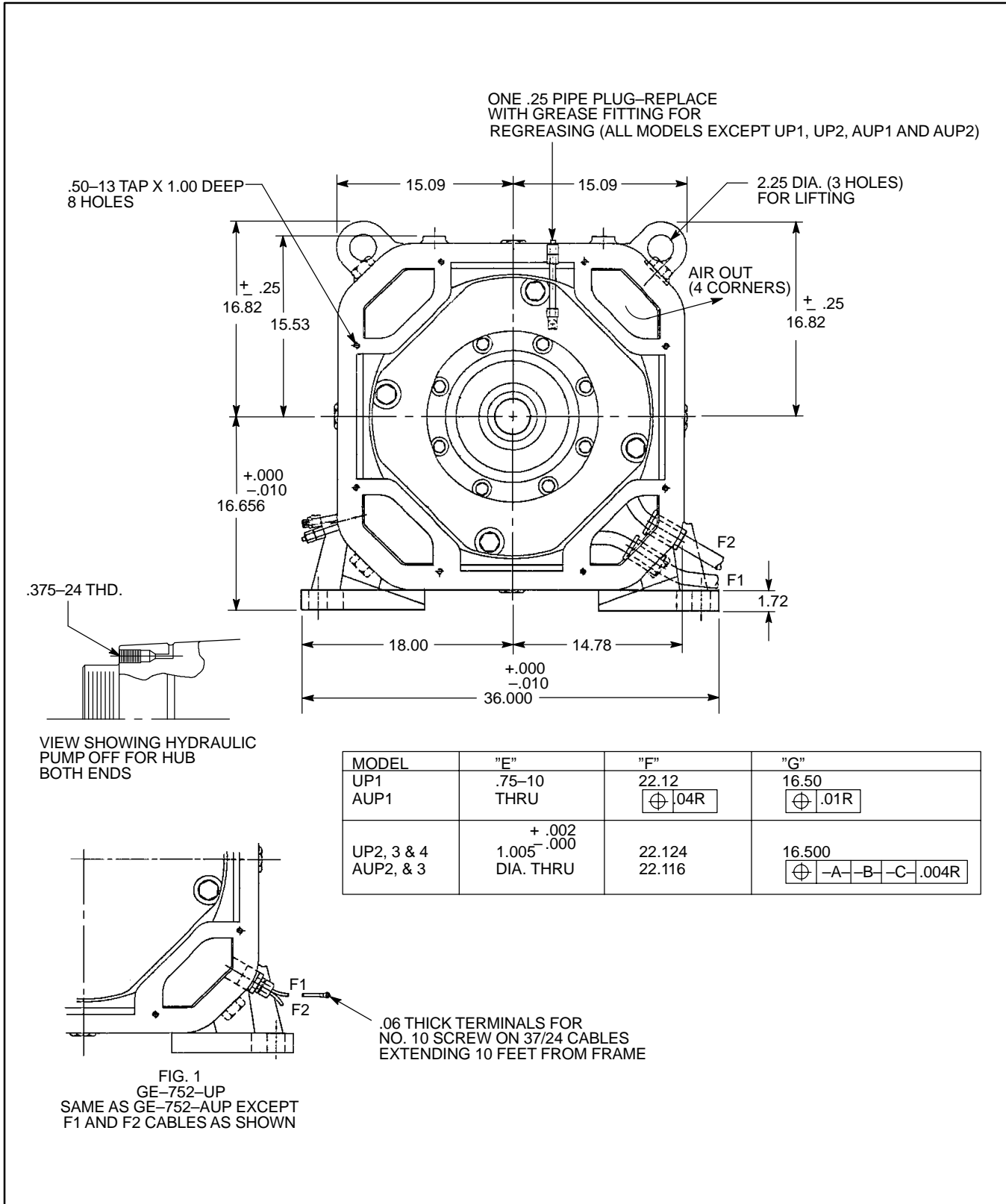


FIG. 48. OUTLINE, UP AND AUP (41E903631 CHG. H). E-28755B.

Vertical Drilling Motor, Type GE752, GEK-91584D

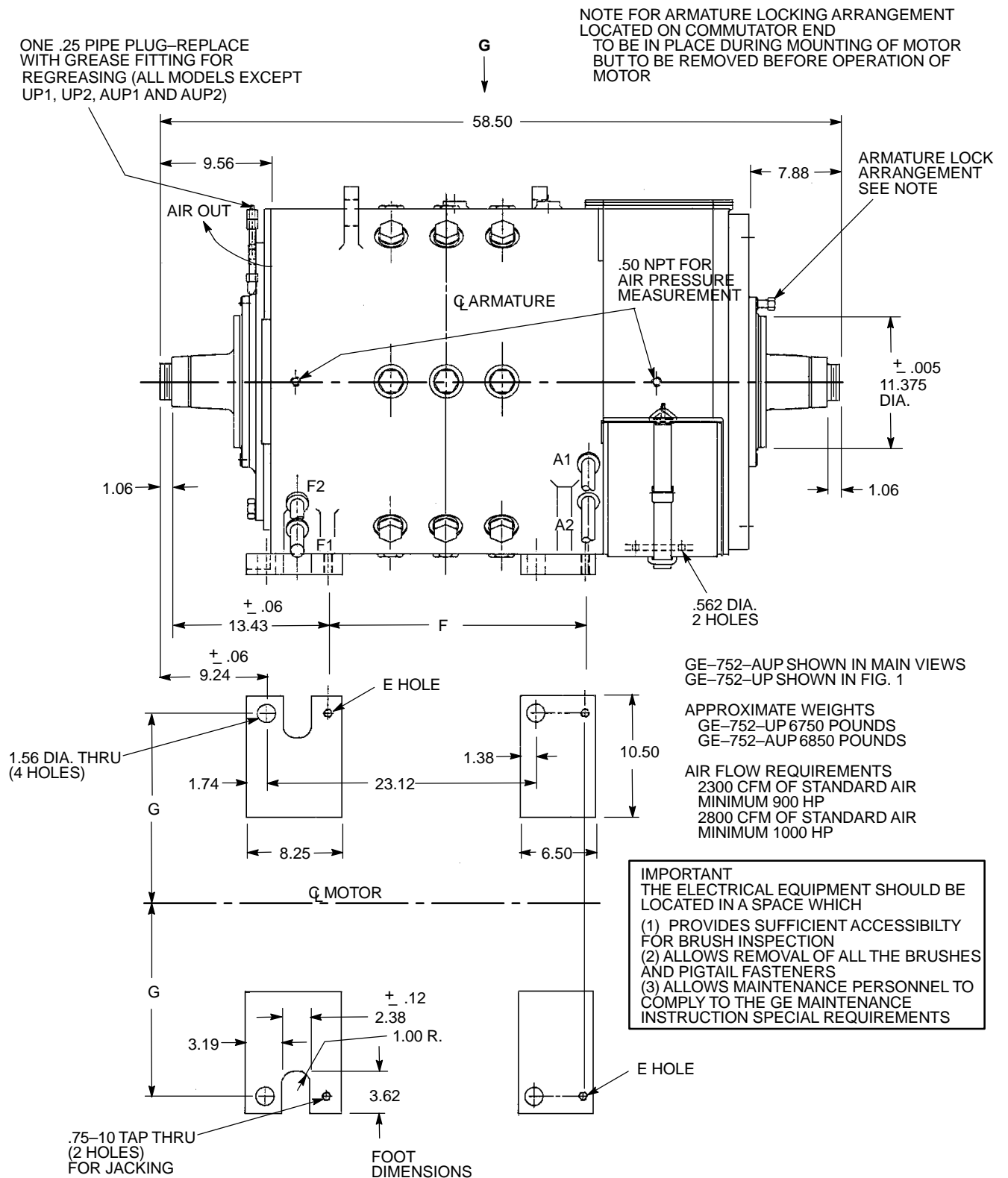


FIG. 48. OUTLINE, UP AND AUP (41E903631 CHG. H). E-28755B.

GEK-91584D, Vertical Drilling Motor, Type GE752

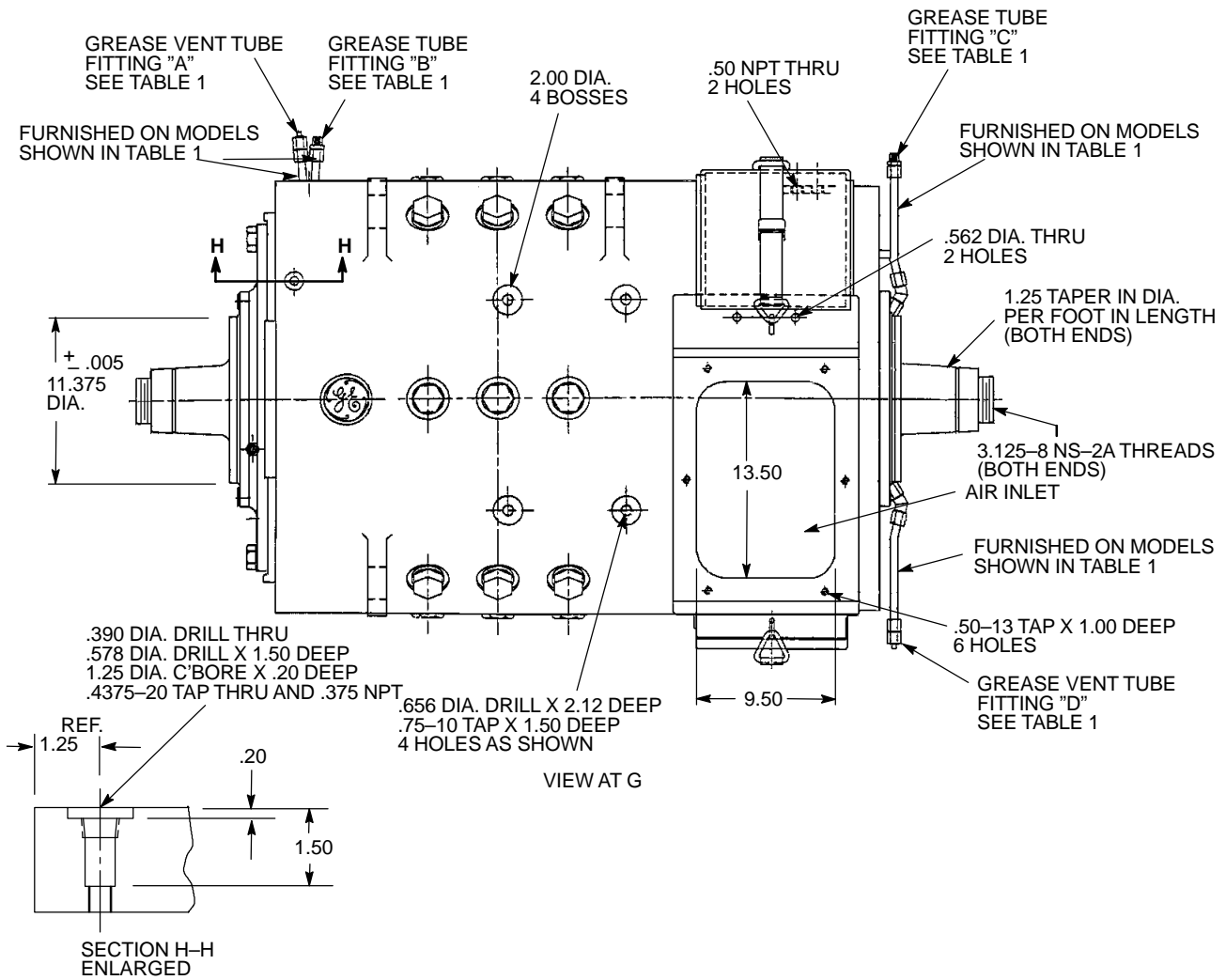


TABLE 1

FITTING	MODELS UP1, AUP1	MODELS UP2, AUP2	MODELS (SEE NOTE)
"A"	.25 PIPE PLUG	.NOT FURNISHED	NOT FURNISHED
"B"	.25 MALE NPT	.25 PIPE PLUG	NOT FURNISHED
"C"	.25 MALE NPT	NOT FURNISHED	NOT FURNISHED
"D"	.25 PIPE PLUG	.25 PIPE PLUG	NOT FURNISHED

NOTE: ALL MODELS EXCEPT UP1, UP2, AUP1 AND AUP2)

FIG. 48. OUTLINE, UP AND AUP (41E903631 CHG. H). E-28755B.

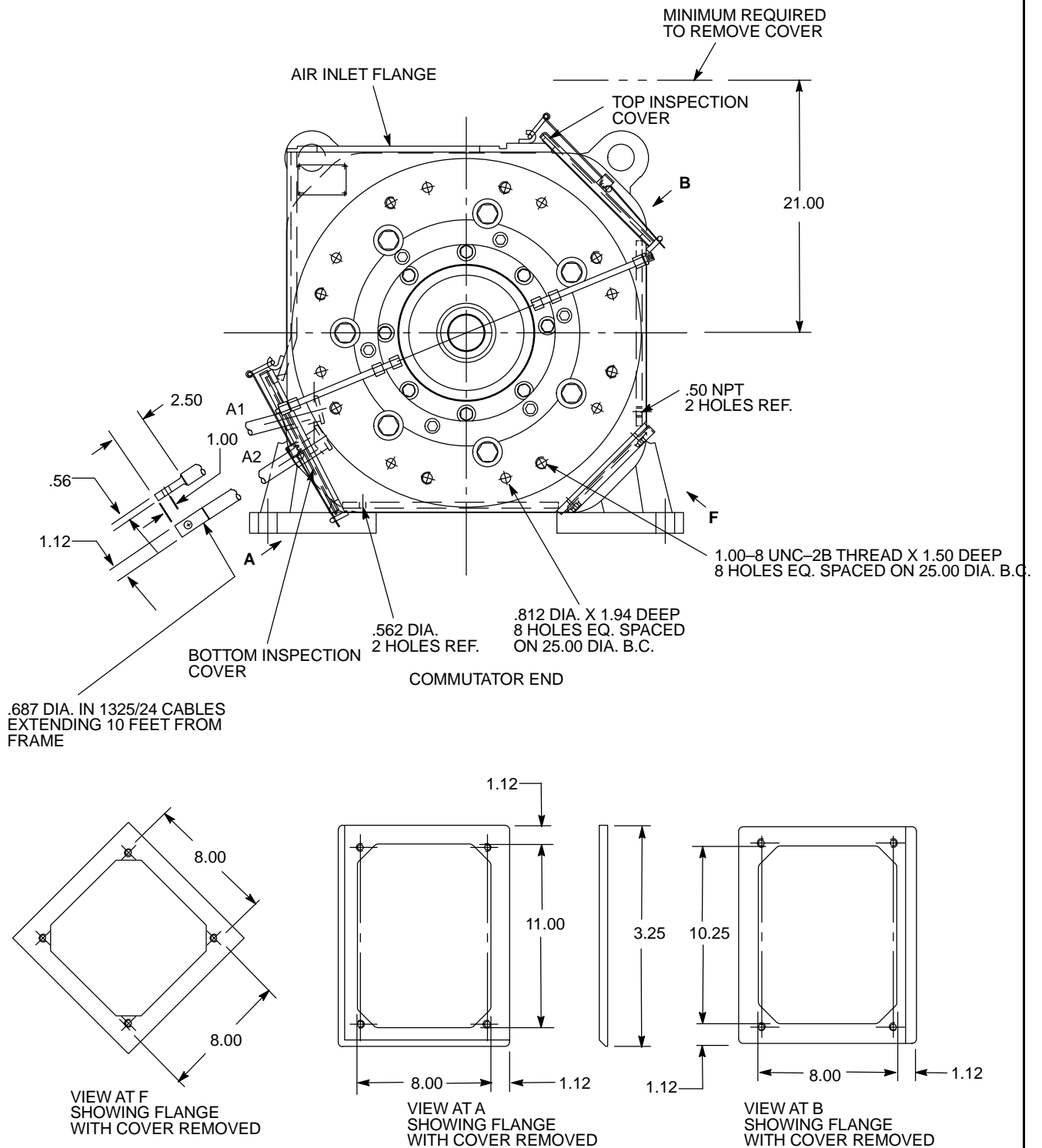


FIG. 48. OUTLINE, UP AND AUP (41E903631 CHG. H). E-28755B.

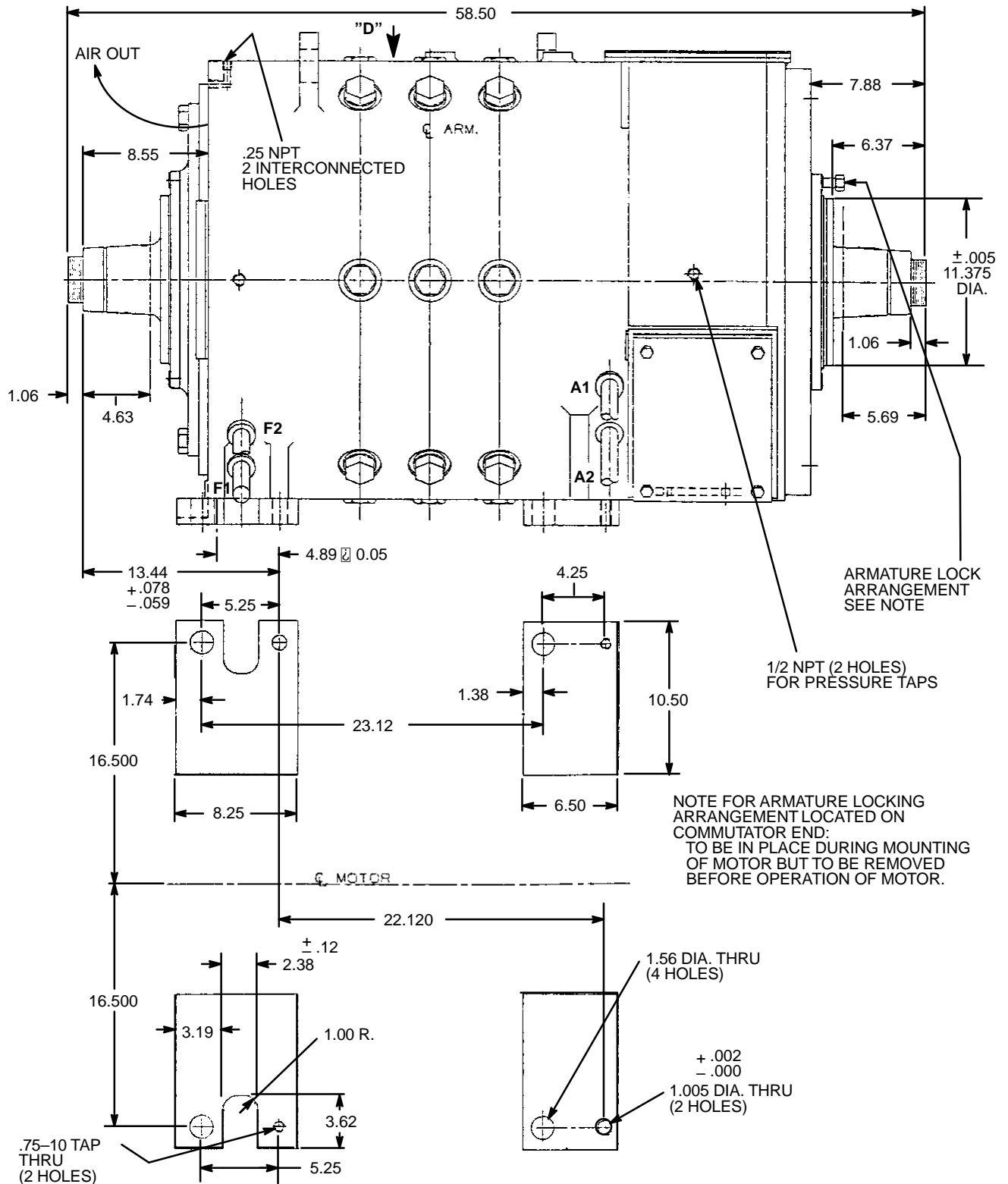


FIG. 49. OUTLINE, US1, AUT (41E903745, CHG. A). E-37954B

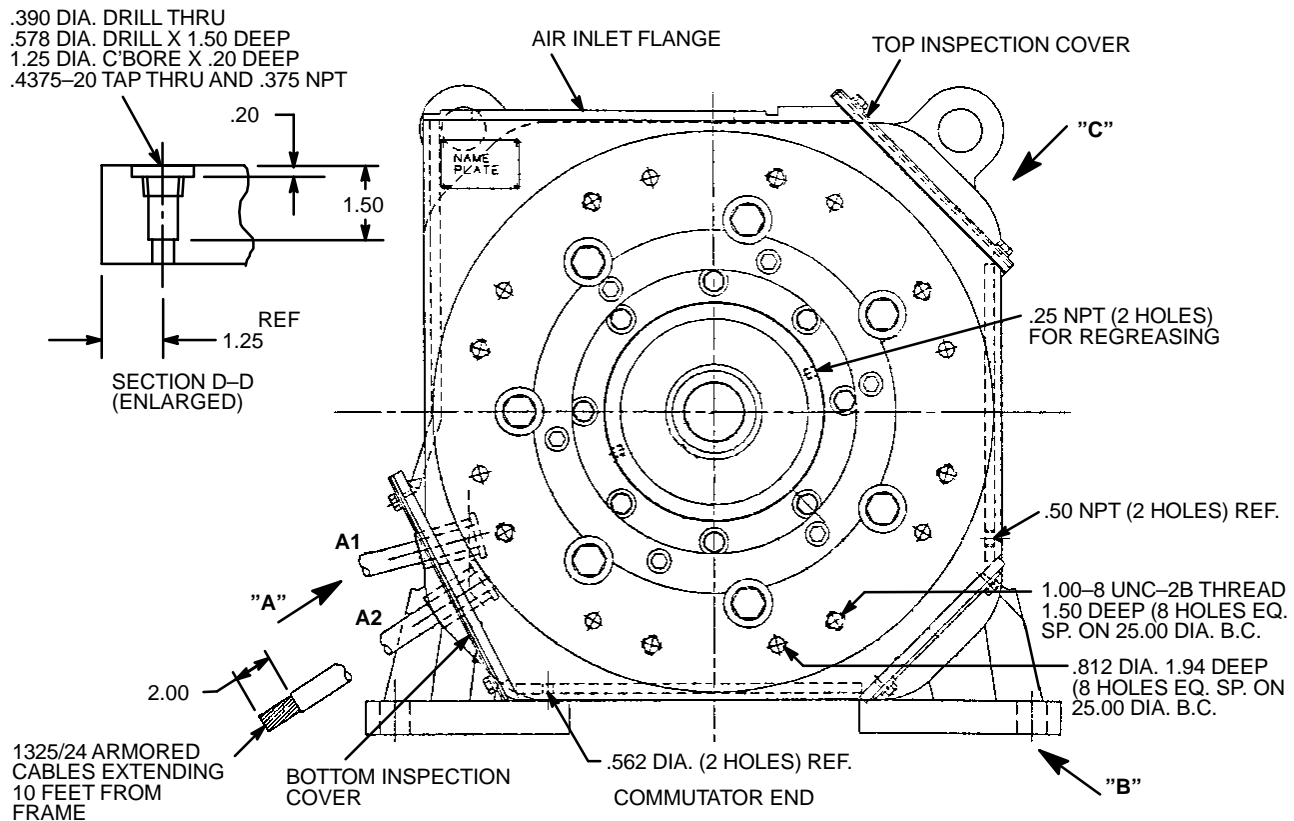
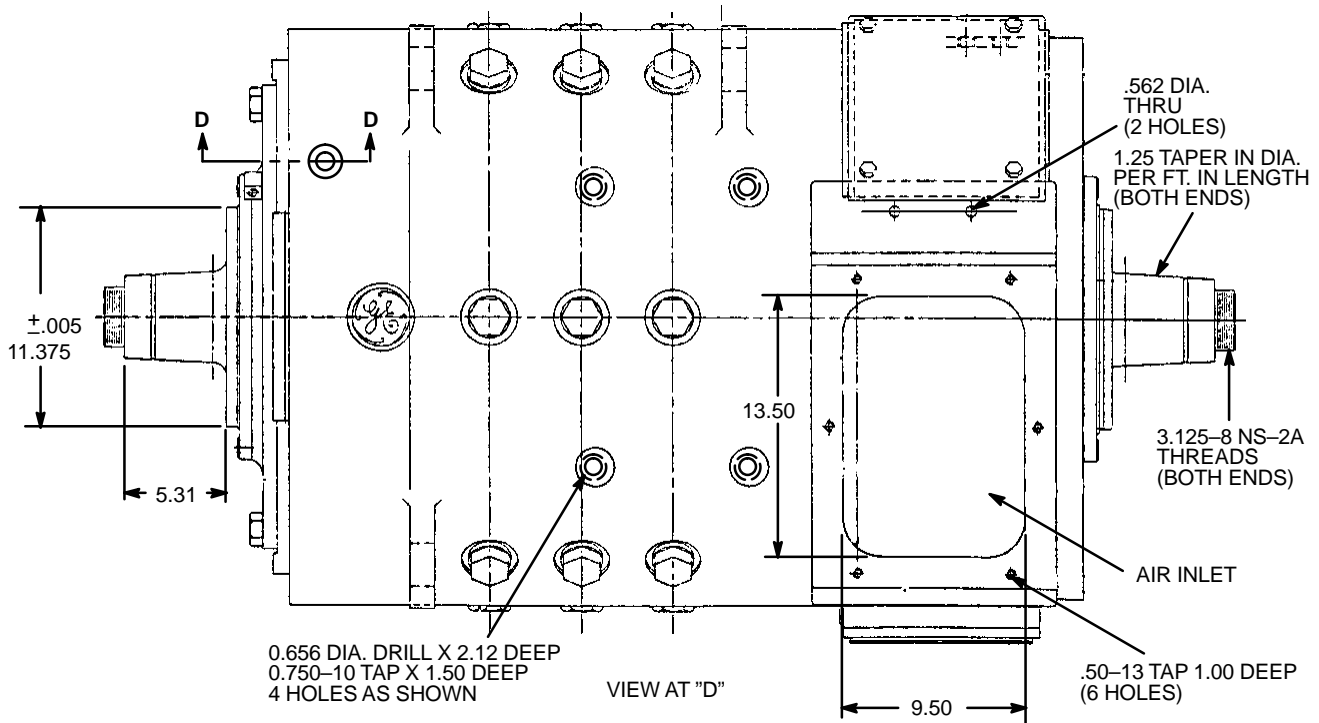


FIG. 49. OUTLINE, US1, AUT (41E903745, CHG. A). E-37954B

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