Safran Power USA
Twinsburg Technical Publications

3CPE0

COMPONENT MAINTENANCE MANUAL WITH ILLUSTRATED PARTS LIST

23081 SERIES I

LIST OF PART NUMBERS

DC STARTER-GENERATOR

23081-001	23081-011	23081-022	23081-043	23081-070
23081-002	23081-011-1	23081-022A	23081-056	23081-072
23081-003	23081-012	23081-023	23081-057	23081-073
23081-004	23081-012-1	23081-023A	23081-059	
23081-007	23081-017	23081-024	23081-063	
23081-008	23081-018	23081-042	23081-069	

DC GENERATOR

23081-078

TITLE PAGE

EXCLUSIVE DISTRIBUTORS

1. Contact Information

A. Customer Portal

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http://www.safran-electrical-power.com/?lang=en and Click on the “Support and Services” link.

HIGHLIGHTS

TO: Holders of Component Maintenance Manual with IPL for DC Starter-Generator Models 23081-001, -002, -003, -004, -007, -008, -011, -011-1, -012, -012-1, -017, -018, -022, -022A, -023, -023A, -024, -042, -043, -056, -057, -059, -063, -069, -070, -072, -073 and DC Generator model 23081-078.

Attached to this transmittal letter is Revision 12 of the Component Maintenance Manual with IPL (basic issue dated February 1, 1977).

REVISION 13, DATED JANUARY 30, 2023

Remove the complete existing manual and replace with this full revision of the manual. Retain the Highlights page(s) in the front of the manual for future reference.

This Component Maintenance Manual has been fully revised to include the latest engineering information and also to include Temporary Revision(s) as listed in the Record of Temporary Revisions in the front of the manual.

The contents of this revision has technical changes individually identified with revision bars. Also, the new format of the Safran Power' manuals was significantly changed to be more consistent with current standards set by the Air Transport Association of America Specifications ATA-100 and ATA-2100.

Key items included in this revision:

- Changes in Testing and Fault Isolation section:
  - Added Figure 1010 reference in the procedure of Continuous Operating Speed, Equalizing Voltage and Minimum Speed Test.
- Changes in Assembly section:
  - Updated title of Figure 7013 to add effect code GA.
- Changes in Fits and Clearance section:
  - Updated the title of Figure 8004 to correct the P/N of terminal block from 23081-1530 to 23032-1530.
- Changes in IPL section:
  - Corrected stator and housing assembly from P/N 23081-353 to 23032-353 in the IPL 10001.
  - Corrected terminal block P/N from 23081-1530 to 23032-1530 in the IPL 10004.

The technical changes in this revision are individually identified with revision bar.

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RECORD OF REVISIONS

Revision Number	Date Issued	Date Inserted into CMM	Initials
Original Issue	Feb 1/77	Feb 1/77	SP
1	May 1/81	May 1/81	SP
2	Jun 15/84	Jun 15/84	SP
3	Aug 15/86	Aug 15/86	SP
4	Feb 29/96	Feb 29/96	SP
5	May 22/96	May 22/96	SP
6	Jan 31/02	Jan 31/02	SP
7	Sep 15/04	Sep 15/04	SP
8	Oct 17/08	Oct 17/08	SP
9	Dec 17/13	Dec 17/13	SP
10	Feb 03/16	Feb 03/16	SP
11	Apr 26/19	Apr 26/19	Safran
12	Jul 23/19	Jul 23/19	Safran
13	Jan 30/23	Jan 30/23	Safran

Revision Number	Date Issued	Date Inserted into CMM	Initials

Retain this record in the front of the CMM. On receipt of revisions, insert affected pages into the manual. Record revision number, date issued, date inserted into the CMM, and initials on this page.

RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Number Pages	Date Issued	Date Inserted	Initials	Date Removed	Initials
24-01	11	6/10/02	6/10/02	SP	Sep 15/04	SP
24-02	13	11/8/02	11/8/02	SP	Sep 15/04	SP
24-03	3	11/8/02	11/8/02	SP	Sep 15/04	SP
24-04	2	11/8/02	11/8/02	SP	Sep 15/04	SP
24-05	3	11/8/02	11/8/02	SP	Sep 15/04	SP
24-06	3	11/8/02	11/8/02	SP	Sep 15/04	SP
24-07	3	11/26/02	11/26/02	SP	Sep 15/04	SP
24-08	3	08/17/07	08/17/07	SP	Oct 17/08	SP
24-09	9	01/31/08	01/31/08	SP	Oct 17/08	SP
24-10	1	04/10/13	04/10/13	SP	Dec 17/13	SP
24-11	1	07/22/13	07/22/13	SP	Dec 17/13	SP
24-12	2	07/22/13	07/22/13	SP	Dec 17/13	SP
24-13	1	07/22/13	07/22/13	SP	Dec 17/13	SP
24-14	2	07/22/13	07/22/13	SP	Dec 17/13	SP
24-15	1	07/22/13	07/22/13	SP	Dec 17/13	SP
24-16	1	07/22/13	07/22/13	SP	Dec 17/13	SP
24-17	1	07/22/13	07/22/13	SP	Dec 17/13	SP
24-18	1	01/23/15	01/23/15	SP	Feb 03/16	SP
24-19	1	01/23/15	01/23/15	SP	Feb 03/16	SP
24-20	1	02/20/15	02/20/15	SP	Feb 03/16	SP
24-21	1	07/19/16	07/19/16	Safran	Apr 26/19	Safran
24-22	1	07/19/16	07/19/16	Safran	Apr 26/19	Safran
24-23	1	11/30/16	11/30/16	Safran	Apr 26/19	Safran

Temporary Revision Number	Number Pages	Date Issued	Date Inserted	Initials	Date Removed	Initials
24-24	1	11/30/16	11/30/16	Safran	Apr 26/19	Safran
24-25	1	11/30/16	11/30/16	Safran	Apr 26/19	Safran
24-26	1	11/30/16	11/30/16	Safran	Apr 26/19	Safran

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SERVICE BULLETIN LIST

Service Bulletin Number	Status	Rev	Date Issued	Service Bulletin Number	Status	Rev	Date Issued
23081-01	Incorporated	-	06/15/84				
23081-02	Incorporated	-	10/05/87				
23081-0XX-24-03	Superseded	1	07/10/91				
23081-0XX-24-04	Superseded	2	04/22/94				
23081-0XX-24-05	Incorporated	1	11/22/94				
23081-002-24-01	Incorporated	-	08/03/06				
23081-018-24-01	Superseded	1	9/15/14				
23081-023-24-04	Incorporated	-	10/15/89				
23081-023-24-05	Incorporated	-	11/22/94				
23081-04X-24-01	Superseded	1	04/22/94				
23081-04X-24-02	Incorporated	2	09/25/13				
23081-043-24-01	Incorporated	1	05/04/07				
23081-056-24-01	Incorporated	-	08/11/03				
23081-057-24-01	Incorporated	2	09/25/13				
23081-063-24-01	Superseded	1	04/03/06				
23081-0XX-24-06	Incorporated	-	07/30/13				
23081-1710-24-01	Active	1	12/12/12				
23081-018-24-02	Incorporated	-	9/15/14				
23081-0XX-24-07	Incorporated	-	9/01/14				
23081-004-24-01	Incorporated	1	1/23/15				
23081-073-24-01	Incorporated	-	11/11/16				
23081-072-24-01	Incorporated	-	11/11/16				

Service Bulletin Number	Status	Rev	Date Issued	Service Bulletin Number	Status	Rev	Date Issued

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SERVICE INFORMATION LETTER LIST

Service Information Letter Number	Status	Rev	Date Issued	Service Information Letter Number	Status	Rev	Date Issued
02-5600	Valid	4	7/7/2015				
03-6009-XX-01	Valid	-	05/02/95				
23072-1400-01	Valid	1	02/07/94				
23081-0XX-01	Valid	1	04/10/00				
23081-018-01	Limited Dist.	-	02/07/96				
23081-023-01	Limited Dist.	-	02/14/95				
23081-043-24-01	Valid	-	08/27/07				
23081-057-24-02	Limited Dist.	-	06/22/04				
23081-057-24-03	Limited Dist.	1	02/28/06				
23081-057-24-01	Limited Dist.	-	06/22/04				
23703	Valid	-	01/24/97				
GSIL 2004-01	Limited Dist.	-	06/26/04				
GSIL 2006-01	Valid	-	09/26/06				
GSIL 2006-02	Valid	1	02/10/09				
GSIL 2007-01	Valid	-	07/30/07				
GSIL 2008-01	Valid	-	02/29/08				
GSIL 2009-01	Valid	1	11/18/15				
GSIL 2011-01	Valid	-	12/16/11				
GSIL 2015-01	Valid	-	05/08/15				
23032-1910-24-01	Valid	0	02/26/16				

Service Information Letter Number	Status	Rev	Date Issued	Service Information Letter Number	Status	Rev	Date Issued

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INTRODUCTION

1. Purpose

This Component Maintenance Manual (CMM) provides detailed instructions for overhaul and service repair of the 23081 Series I Models. Line maintenance is supported by Maintenance Manual (MM) 23700. A model overhaul includes:

- replacement of non-reusable parts such as bearings, brushes and miscellaneous hardware.
- cleaning of subassemblies.
- detailed inspection of parts, electrical check of all electromagnetic parts (including; insulation integrity check), Non-Destructive Test (NDT) inspections, and complete acceptance testing.

  NOTE: Magnetic particle inspection of the parts as specified in the CHECK section is only required when an overhaul of the generator assembly is being done.

- check of brush holder alignment.
- commutator refinishing and check balance.
- reconditioning of surface finishes as required.
- repair/rework of parts as required.
- re-certification including final assembly, records, and release tags.

Only an overhaul and an acceptance test authorize assignment of zero operating hours time since overhaul (TSO) to the model. Repairs done that are partial of an overhaul do not affect TSO and equipment is released on a continue time basis.

An illustrated parts list is included at the back of this CMM for component identification and ordering of approved replacement parts. The structure and content of this manual is in general accordance with requirements established by the Air Transport Association of America (ATA) for aircraft CMMs. This manual is formatted to conform to ATA Specification No. 100.

Give careful attention to applicable warnings and cautions. Before starting an overhaul procedure, become thoroughly familiar with the capabilities and limitations of the equipment. Make sure all necessary safety equipment, test equipment, repair materials, special tools, and fixtures are on hand.

If errors, omissions, or other technical discrepancies exist in CMM, fill out a Technical Publication Comment Form. Send a copy of form to: lps.twn.techpubs@safrangroup.com.

Publications can be obtained by going to the Technical Publications web portal. Go to https://techpubsdistribution.labinal-power.com.

2. User Qualification and Certification Requirements

The information contained in this manual is intended for persons authorized to do maintenance, preventative maintenance, rebuilding, and alterations in accordance with Federal Aviation Regulation (FAR), Part-43.3.

3. Quality Assurance Requirements

The repair stations quality assurance activity is responsible for the correct performance of all tests and inspections specified in this manual. The quality assurance activity will also be responsible for maintaining all necessary test, inspection, and maintenance records for each unit received for service.

All instrumentation and inspection equipment must be calibrated and controlled in accordance with International Standards Organization (ISO) standard 10012, with all standards traceable to the National Bureau of Standards or an equivalent standards regulatory authority.

The quality assurance activity will be responsible for certifying that personnel, skills, and materials meet the requirements of the work to be performed. Components of the model undergoing overhaul that are recovered as products of disassembly must be examined 100% to determine serviceability.

The quality assurance activity must maintain documented evidence that specifications applicable to special processes such as soldering, nondestructive testing (NDT), plating, etc. have been complied with during repair and/or overhaul of the model.

4. Safety Advisory

This manual describes physical and chemical processes that require the use of chemicals or other commercially available materials that require precautionary attention.

The user of this manual should obtain Material Safety Data Sheets and Occupational Safety and Health Act (OSHA) Form 20 or equivalent from the manufacturers or suppliers of materials to be used. The user must become completely familiar with and follow all manufacturer/supplier procedures, recommendations, warnings, and cautions for the safe use, handling, storage, and disposal of these materials. Users of this manual are also advised to refer to applicable safety information contained in the “NIOSH Occupational Guideline for Chemical Hazards” published by the United States Department of Labor.

Give careful attention to applicable warnings and cautions. Before starting any procedure, become thoroughly familiar with the capabilities and limitations of the equipment. Make sure all necessary safety equipment, test equipment, repair materials, special tools, and fixture are on hand.

Warnings, Cautions and Notes are used throughout the text to highlight and emphasize important points, as they become necessary. Warnings give information that must be followed precisely to avoid personal injury and/or possible death. Cautions contain information that must be followed to avoid damage to equipment. Notes assist the reader and make the technician's job easier.

WARNING: **ALERT OPERATING AND MAINTENANCE PERSONNEL TO POTENTIAL HAZARDS THAT COULD RESULT IN PERSONAL INJURY; THEY DO NOT REPLACE THE MANUFACTURER'S RECOMMENDATIONS.**

CAUTION: ALERT OPERATING AND MAINTENANCE PERSONNEL TO CONDITIONS THAT COULD RESULT IN EQUIPMENT DAMAGE.

5. Materials List

The materials listed in this section are necessary for processes throughout this manual. A warning and/or caution will precede the use of materials listed in Table i.

WARNING: **BEFORE USING ONE OF THE FOLLOWING MATERIALS, BE AWARE OF ALL HANDLING, STORAGE, AND DISPOSAL PRECAUTIONS RECOMMENDED BY THE MANUFACTURER OR SUPPLIER. FAILURE TO COMPLY WITH MANUFACTURER OR SUPPLIER RECOMMENDATIONS CAN RESULT IN SERIOUS INJURY, PHYSICAL DISORDER, OR DEATH.**

Material	Used in
Acrylic Coating	ASSEMBLY
Anti-Seize Compound	ASSEMBLY
Chemical Film Solution	REPAIR
Corrosion Preventive	CLEANING
Detergent	CLEANING
Grease	ASSEMBLY, STORAGE
Isopropyl Alcohol	ASSEMBLY, CHECK, CLEANING, DISASSEMBLY, REPAIR
Loctite Grade E	ASSEMBLY
Lubricating and Assembly Paste	ASSEMBLY
Lubricating Oil	REPAIR
Red Insulating Enamel	ASSEMBLY
Thread Sealing Compound	ASSEMBLY
Zinc Chromate Primer	REPAIR
Zinc Phosphate Coating	REPAIR

Table i - Material Table

6. Non-Safran Power Authorized Components and Processes Policy

Safran Power authorizes the use of genuine Safran Power spare parts which meet stringent engineering design specifications and quality standards, and have traceability to having been procured and certified to these specifications by the Safran Power Quality Assurance incoming and in-process inspection systems. The Safran Power spares portal is the only authorized distributor of genuine Safran Power replacement parts and complete units.

It is the obligation of all repair and service facilities to provide the FAA, or an other in-country air authority, with proper traceability documentation indicating approval of all spare parts, materials, and processes to make sure configuration compliance and continued airworthiness.

The use of any non-Safran Power authorized parts, or any parts not having been submitted to the Safran Power Quality Assurance inspection system will invalidate any and all factory warranties. All Safran Power warranties are automatically voided on any Safran Power designed unit that has been modified by the installation of any unauthorized parts, materials or unapproved processes supplied by other outside services. The repair station's quality assurance activity shall assume product liability for all units that have been modified in this fashion.

Damage resulting from the use of non-Safran Power replacement parts, materials or processes is not covered by the Safran Power warranty or service policy for any product or for any application.

7. Abbreviations and Acronyms

The following is a list of the abbreviations and acronyms used in this document.

A	- Ampere
ADE	- Anti-Drive End
AR	- As Required
Assy.	- Assembly
ATA	- Air Transport Association of America
CMM	- Component Maintenance Manual
DC	- Direct Current
DE	- Drive End
dia.	- Diameter
ETSO	- Extended Time Since Overhaul
FAA	- Federal Aviation Administration
FAR	- Federal Aviation Regulation

ft	- Feet
GCU	- Generator Control Unit
GSIL	- General Service Information Letter
Hz	- Hertz
IAW	- In Accordance With
ID	- Identification
in.	- inch(es)
in./rev	- Inch per revolution
IPL	- Illustrated Parts List
ISO	- International Standards Organization
kg	- Kilogram
kPa	- Kilopascal(s)
kW	- Kilowatt
lb.ft	- Pound force feet
lbf.in	- Pound force inch
lbs.	- Pound
m	- Meter
mA	- Milli Ampere
max.	- Maximum
MHz	- Mega Hertz
MIL	- Military specification
min.	- Minimum
mm	- Millimeter
m/min.	- Meter per minute
MOD	- Modification
MSD	- Material Safety Data
mV DC	- Milli Voltage direct current
µFd	- Micro Farad
N/A	- Not Applicable

NBS	- National Bureau of Standards
NDT	- Non-Destructive Test
NOM.	- Nominal
No.	- Number
Nm	- Newton meter
OD	- Outside Diameter
OSHA	- Occupational Safety and Health Act
P/N	- Part Number
PSIG	- Pounds per square inch gage
QAD	- Quick Attach/Detach
RADII	- Radius
REF.	- Reference
RMS	- Root mean square
rpm	- Revolutions per minute
SB	- Service Bulletin
S/G	- Starter-Generator
SIL	- Service Information Letter
SP	- Safran Power
SPD	- Standard Practice Document
TIR	- Total Indicator Reading
TR	- Temporary Revision
TSO	- Time Since Overhaul
UUT	- Unit Under Test
V	- Volt or Voltage
Vac	- Voltage Alternating Current
v/cm	- Voltage per centimeter
V DC	- Voltage Direct Current
V/sec	- Voltage per second
©	- Copyright

+	- Plus or Positive
-	- Minus or Negative
±	- Plus or Minus
Ω	- Ohm
kΩ	- Kiloohm
kΩ/cm	- Kiloohm per centimeter
%	- Percentage
°	- Degree
Ø	- Diameter
°C	- Degree Celsius
°F	- Degree Fahrenheit

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DESCRIPTION AND OPERATION

1. Introduction

NOTE: The term “Series I” does not refer to the equipment covered in this manual. The term “Series I” distinguishes this manual from other Component Maintenance Manuals covering similar equipment.

The 23081 Series I models (See Figure 1) operates as a motor to provide torque for engine starting and as a generator to provide DC electrical power after engine starting is complete. Refer to Paragraph 2. of this section for performance and equipment characteristics.

NOTE: The model 23081-078 operates only as a “generator” and not as a “starter-generator”. It is mainly used as a backup on the auxiliary drive pad.

The model consists of an armature that is enclosed by, and rotates within a stator and housing assembly. The armature is supported by two bearings. At the drive end (DE) of the armature, a bearing is supported by a drive end bearing support assembly. At the anti-drive end (ADE) of the model, the second bearing is supported by the bearing and brush support assembly.

The model’s drive shaft is installed in the armature shaft which is hollow. The armature shaft and drive shaft have mating splines that engage at the anti-drive end of the model. At the drive end, a dampener assembly absorbs torsional vibration generated by changes in engine gearbox speed and electrical load conditions. The dampener assembly is made up of a dampener backplate, a friction ring and a dampener plate. Also, on applicable models, at the drive end of the model is a speed pickup that provides a signal to the generator control unit (GCU) for starter cutoff.

A fan is attached to the anti-drive end of the drive shaft. The fan supplies forced air cooling for on-ground operation. Fins in the bearing and brush support assembly improve cooling by distributing airflow through the generator. In flight, the model is blast-cooled through the air inlet and the user’s air ducting system in addition to the fan.

A QAD kit eases model installation and removal, to and from the aircraft. A QAD kit is comprised of a mounting adapter that attaches to the engine gear box accessory drive pad, and a V-band clamp which secures the model to the mounting adapter.
The 23081 Series I DC Starter-Generator / DC Generator and associated parts are listed in the ILLUSTRATED PARTS LIST section.

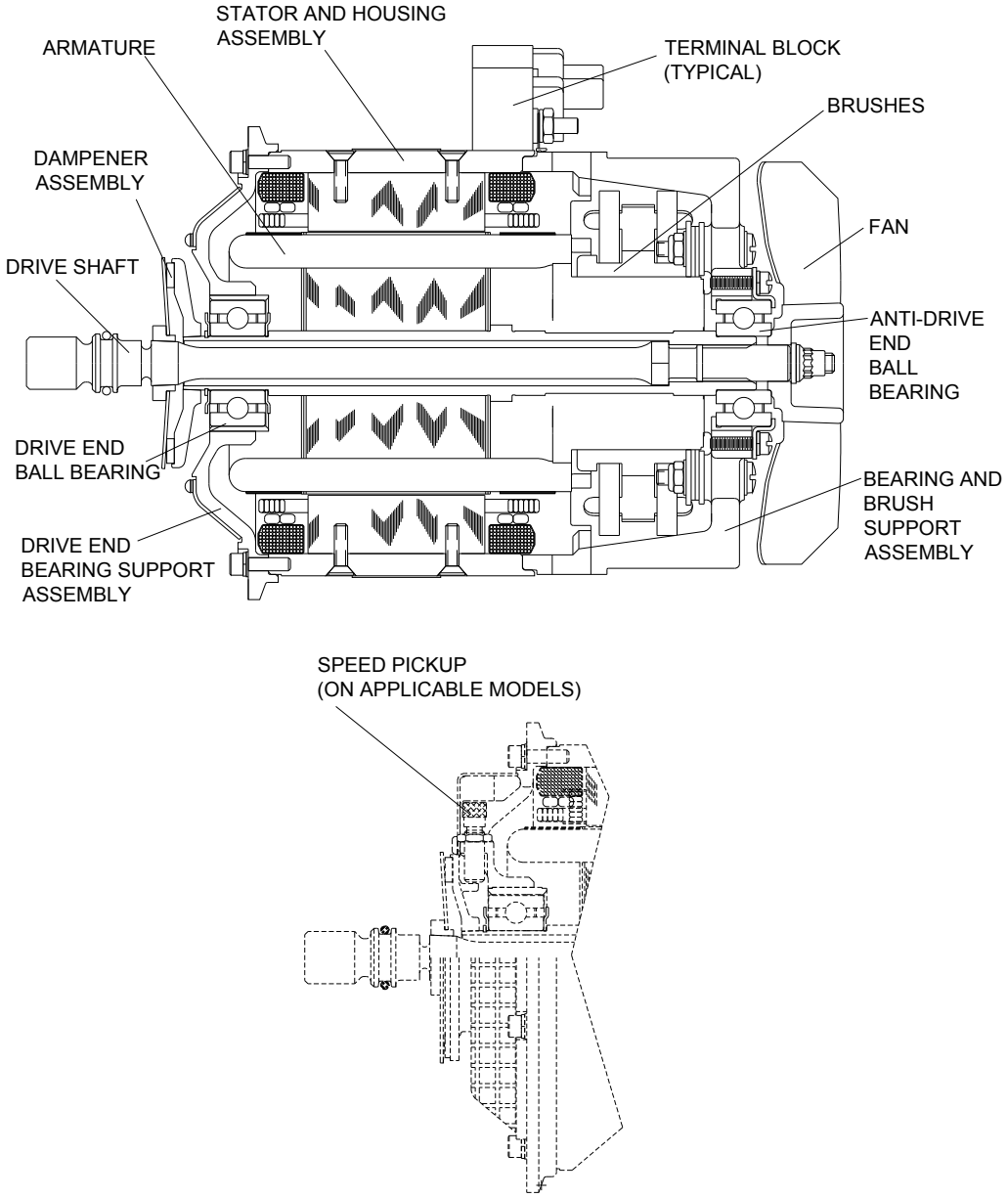


Figure 1 - Typical Model 23081 Series I DC Starter-Generator / DC Generator Features

2. Equipment Specifications

Details of equipment specifications are contained in this section.

Characteristic	Model Number(s)	Specification
Rated Power Output	All models	6 kW
Rating for continuous load within speed range	23081-056	200 A, 30 V DC, 7,050* to 13,000 rpm (* 27 V DC with 0.4 Ω in field circuit).
	23081-059	200 A, 30 V DC, 7,050* to 12,300 rpm (* 27 V DC with 0.4 Ω in field circuit).
	23081-063	200 A, 30 V DC, 7,500* to 12,000 rpm (* 26 V DC with 0.4 Ω in field circuit).
	23081-069, -070	200 A, 30 V DC, 7,500* to 13,000 rpm (* 26 V DC with 0.4 Ω in field circuit).
	23081-072, -073	200 A, 30 V DC, 7,050* to 12,000 rpm (* 26 V DC with 0.4 Ω in field circuit).
	23081-078	200 A, 30 V DC, 8,100 to 12,634 rpm with 0.5 Ω in shunt field circuit.
	All other models	200 A, 30 V DC, 7,050* to 12,000 rpm (* 27 V DC with 0.4 Ω in field circuit).
External starting power supply limitations	All models	Self-limiting current load of 1000 A maximum @ 28 V DC
Direction of Rotation	All models	Counterclockwise (viewed from drive end)
Air Inlet Opening	23081-024	2.12 in. X 3.50 in. (53,8 mm X 88,9 mm) oval opening,
	23081-017, -018, -056, -057, -059, -063, -073, -078	3.97 in. (100,8 mm) diameter
	All other models	3.00 in. (76,2 mm) diameter
Cooling	All models	Self-cooled on ground. Combination cooling in flight.

Table 1 - Electrical Performance and Physical Characteristics

Characteristic	Model Number(s)	Specification
Terminal Designations	23081-007, -008, -011 -011-1, -012, -012-1, -022 -022A, -023, -023A, -024, -056, -059, -069, -070	Shunt Start: B+ Positive E- Negative A+ Shunt Field D Equalizer
	23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073	Series Start: B+ Positive E- Negative A+ Shunt Field D Equalizer C+ Starting
	23081-078	Shunt Start: B+ Positive E- Negative A+ Shunt Field D Equalizer C Not used

Table 1 - Electrical Performance and Physical Characteristics (Continued)

Characteristic	Model Number(s)	Specification
Starter-Generator Maximum Total Weight Includes QAD kit	23081-001, -002, -042, -043, -072	22.3 lbs. (10,1 kg)
	23081-007, -008, -022, -022A, -023, -023A, -056, -069, -070	21.5 lbs. (9,75 kg)
	23081-003, -004, -011, -011-1, -012, -012-1, -017, -018, -024, -063	22.2 lbs. (10,07 kg)
	23081-057, -073	22.1 lbs. (10,02 kg)
	23081-059	21.5 lbs. (9,75 kg)
DC Generator Maximum Total Weight Includes QAD kit	23081-078	22.2 lbs. (10,07 kg)
QAD Kit Maximum Weight	All Models	1.1 lbs. (0,5 kg)

Table 2 - Overhung Moment, Weight and Torque for QAD Mount DC Starter-Generators / DC Generator

Characteristic	Model Number(s)	Specification
Overhung Moment with QAD kit	23081-003, -004, -024, -057, -072, -073	78 lbf.in. (8,81 Nm) max.
	23081-007, -008, -022 -022A, -023, -023A, -056, -059, -069, -070	75 lbf.in. (8,47 Nm) max.
	23081-001, -002, -011, -011-1, -012, -012-1, -017, -018, -042, -043, -063, -078	80 lbf.in. (9,05 Nm) max.

Table 2 - Overhung Moment, Weight and Torque for QAD Mount DC Starter-Generators / DC Generator (Continued)

Characteristic	Model Number(s)	Specification
Mounting Flange & Drive Shaft Specification	23081-003, -004, -011, -012, -011-1, -012-1, -024, -057, -059, -073	S/G's QAD Mounting Features conform to AND10261-XI-B. Mates with AND20001. Spline conforms to AS972 (0.600 P.D.)
	23081-001, -002, -007, -008, -017, -018, -022, -022A, -023, -023A, -042, -043	S/G's QAD Mounting Features conform to MS3326-2. Spline conforms to AS972A.
	23081-056	S/G's QAD Mounting Features conform to MS3326-2. Spline conforms to AS972B.
	23081-063, -069, -070, -072	S/G's QAD Mounting Features conform to MS3331-1P, and Mates with MS3326-2 Drive Pad. Spline conforms to AS972B.
	23081-078	DC Generator QAD Mounting Features conform to MS3331-1P, and Mates with MS3326-2 Drive Pad. Spline conforms to AS972B.

Table 3 - Mounting Flange and Drive Shaft Specifications

Characteristic	Model Number(s)	Specification
Drive Shaft	23081-001, -002, -007, -008, -017, -018, -022, -022A, -023, -023A, -056, -063, -069, -070	Shear Torque: 1100 lbf.in. (124,28 Nm max.) Number of Teeth: 12 Pitch Diameter: 0.600 in. (15,24 mm)
	23081-059	Shear Torque: 1460 to 1590 lbf.in. (164,96 to 179,65 Nm max.) Number of Teeth: 12 Pitch Diameter: 0.600 in. (15,24 mm)
	23081-042, -043, -057, -072, -073	Shear Torque: 800 lbf.in. (62,14 Nm max.) Number of Teeth: 12 Pitch Diameter: 0.600 in. (15,24 mm)
	23081-003, -004, -011, -012, -011-1, -012-1, -024	Shear Torque: 1400 lbf.in. (158,17 Nm max.) Number of Teeth: 12 Pitch Diameter: 0.600 in. (15,24 mm)
	23081-078	Shear Torque: 340 to 395 lbf.in. (38,41 to 44,63 Nm) Number of Teeth: 12 Pitch Diameter: 0.600 in. (15,24 mm)

Table 3 - Mounting Flange and Drive Shaft Specifications (Continued)

3. Equipment Improvements and Modifications

Model 23081 Series I DC Starter-Generators / DC Generator (See Figure 1) can incorporate one or more modifications. A modification of a particular model is indicated by a letter in the MOD status box on the identification plate or modification status label. Information regarding modifications of 23081 Series I models is detailed in various service bulletins listed in the SERVICE BULLETIN LIST at the front of this CMM and also referenced by model number effectivity in the ILLUSTRATED PARTS LIST section of this CMM.

A. MOD Status

See Table 4 for the latest MOD level of each model:

Model(s)	MOD	Part Number	Description
23081-001, -002, -003, -004, -007, -008, -011, -011-1, -012, -012-1	A	03-6009-19	Bearings
	B	03-6009-23	Bearings
23081-001, -002	C	23081-1834	Brushes (Field use only, non-production)
	D	23081-1833	Brush (Field use only, non-production)
		23081-1092	Air Inlet (Field use only, non-production)
		23081-303	Bearing and Brush Support Assembly
23081-003, -004, -007, -008, -011, -012, -022, -023	-	30300-1380	Brushes
	C	23081-1850	Brushes
23081-017, -018, -022, -023, -024	A	03-6009-19	Bearings
	B	03-6009-23	Bearings
23081-017, -018	C	23081-1834	Brushes (Field use only, non-production)
	D	23081-1833	Brushes (Field use only, non-production)
		23081-1571 or 23081-1576	Air Inlet (Field use only, non-production)
		23081-307 or 23081-303	Bearing and Brush Support Assembly
	E	23081-1851	Brushes (Field use only, non-production)
	F	23081-1854	Brushes (Field use only, non-production)
23081-022A, -023A	B	23081-1810	Brushes
	C	03-6009-23	Bearings
23081-042, -043	A	03-6009-18	Bearings
	B	03-6009-23	Bearings
	C	23081-1834	Brushes (Field use only, non-production)
23081-057	A	23081-306 or 23081-309	Bearing and Brush Support Assembly
23081-056, -059, -063, -069, -070, -078	No Mods		
23081-072	-	23081-1831	Brushes
	A	23081-1854	Brushes

Table 4 - MOD Status Chart

Model(s)	MOD	Part Number	Description
23081-073	A	23081-303	Bearing and Brush Support Assembly
	B	23081-306	Bearing and Brush Support Assembly
	C	23081-309	Bearing and Brush Support Assembly
	D	23081-1854	Brushes

Table 4 - MOD Status Chart (Continued)

4. Model Operation (Refer Figure 2, Figure 3 and Figure 4)

Electromagnetic interaction between the armature and stator produces output torque during engine starting and DC electrical power during engine operation.

A. Starter Operation

Dependent upon the starter-generator model, the 23081 Series I of DC Starter-Generators operate as either a shunt starter motor or a series starter motor to start the engine.

(1) Shunt Start

During the engine start cycle, the aircraft power bus applies DC voltage across terminals B+ and E-, supplying current to the armature and stator windings. At the same time, a voltage is applied to shunt field terminals A+ and E- from a Generator Control Unit (GCU). Starting power can be supplied by aircraft batteries or a ground power source. See Figure 2.

(2) Series Start

During the engine start-cycle, the aircraft power bus applies DC voltage across terminals C+ and E-, supplying current to the armature and stator windings. Starting power can be supplied by aircraft batteries or a ground power source. See Figure 3.

B. Generator Operation

Following starter operation the GCU will “build up” the output voltage from the generator residual voltage. During generator operation, the machine provides a DC output (terminals B+ and E-) regulated by the generator shunt field current (terminal A). By quickly reacting to changes in generator operating conditions such as engine speed or electrical load, the GCU regulates the current level provided to the generator shunt field (terminal A). By regulating the shunt field current the system voltage is maintained at a nominally per Table 1.

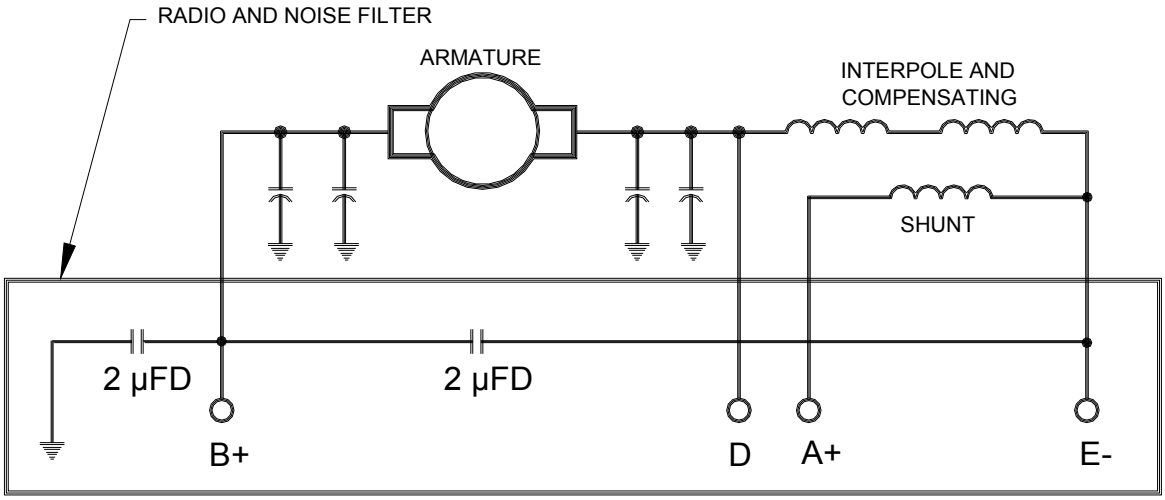


Figure 2 - 23081 Series I DC Starter-Generator Schematic Diagram, Shunt Start

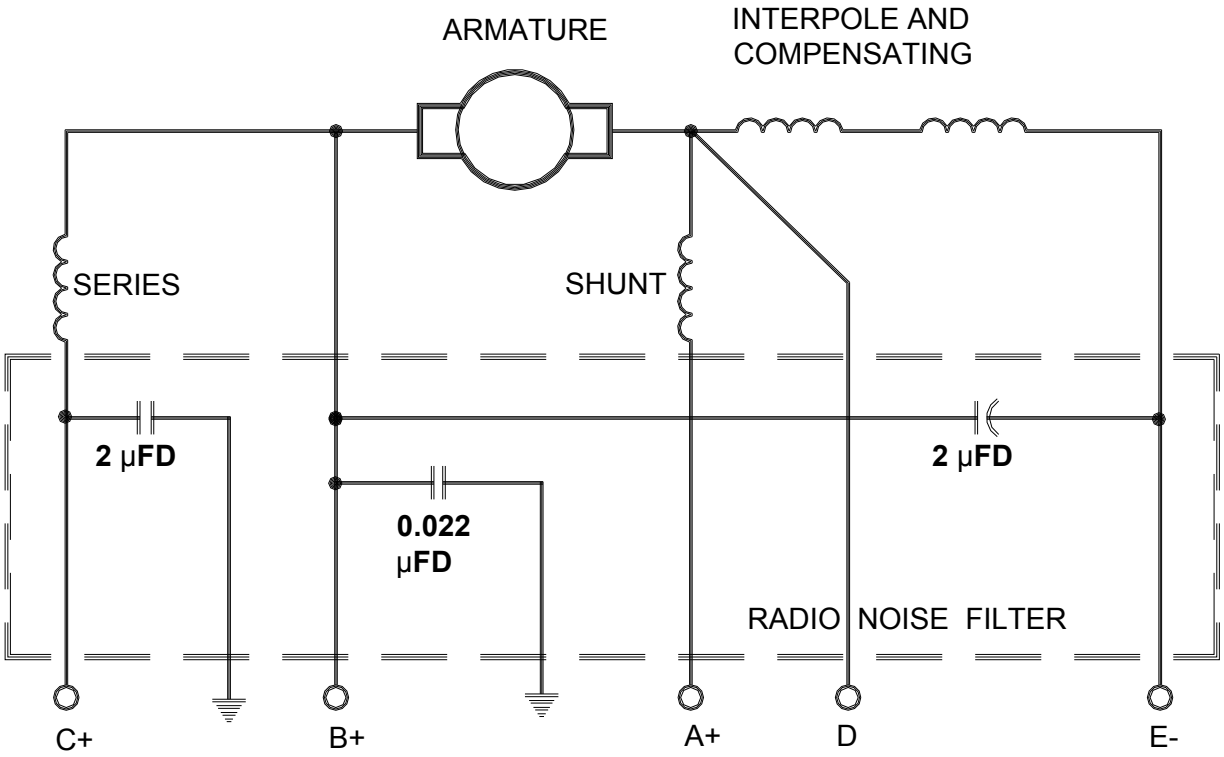
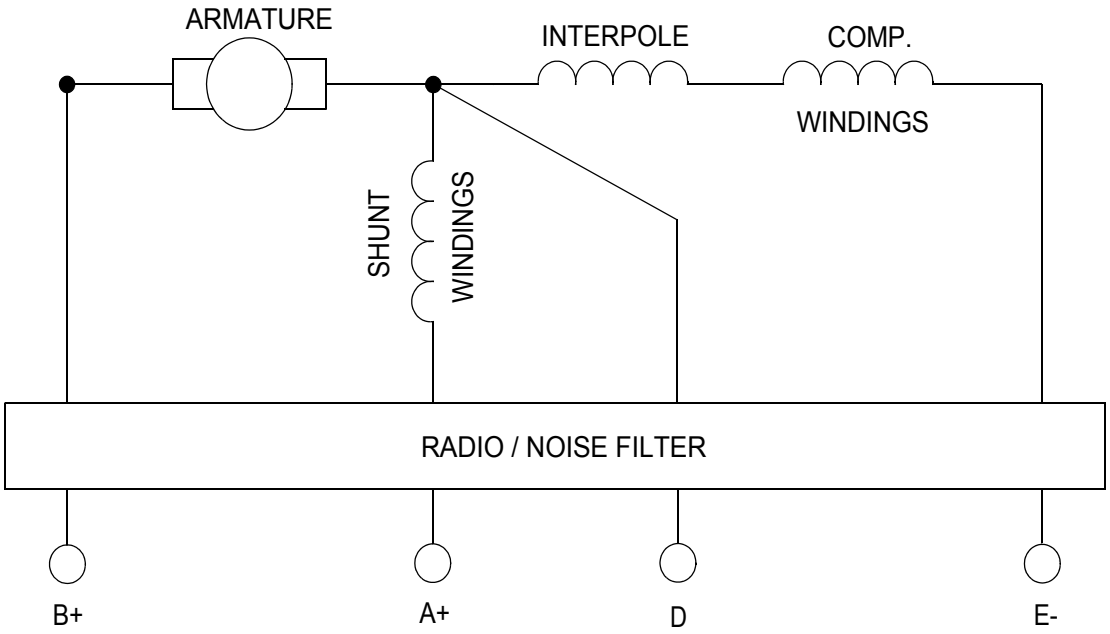


Figure 3 - 23081 Series I DC Starter-Generator Schematic Diagram, Series Start



TERMINALS A+ AND D #10-32 STUDS
TERMINALS E- AND B+ 3/8-24 STUDS

Figure 4 - 23081-078 DC Generator Schematic Diagram

MODEL NO.	"A" DIA.	"B"	"C"
		WET SPLINE	DRY SPLINE
23081-004	3.249 in.(82,525 mm) 3.247 in.(82,474 mm)	------	1.120 in.(28,448 mm) 1.000 in.(25,400 mm)
23081-003			
23081-001	3.185 in.(80,899 mm) 3.183 in.(80,848 mm)	1.640 in.(41,656 mm) 1.520 in.(38,608 mm)	------
23081-002			

NOTE: These models 23081-001 with QAD kit. 23081-003

NOTE: These models 23081-002 without QAD kit. 23081-004

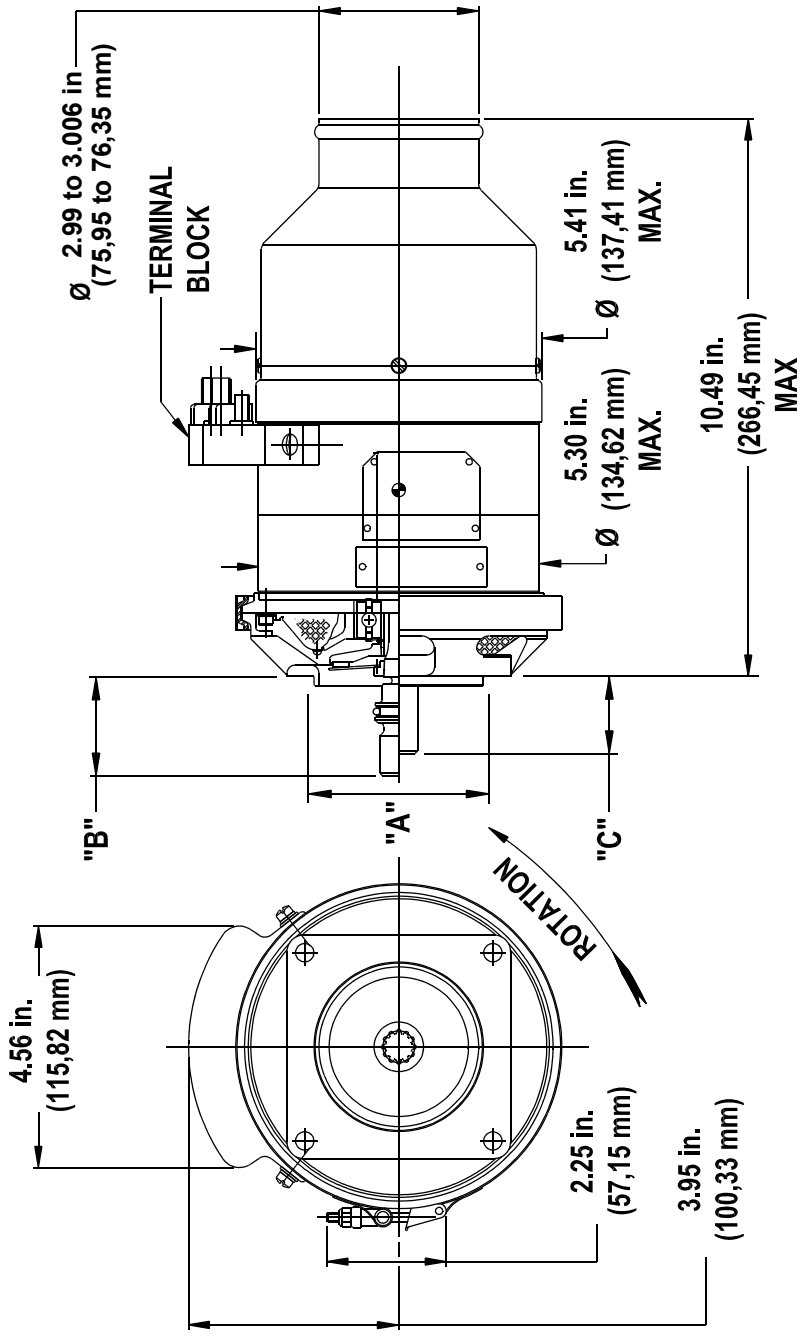


Figure 5 - Outline Drawing 23081-001, -002, -003, -004

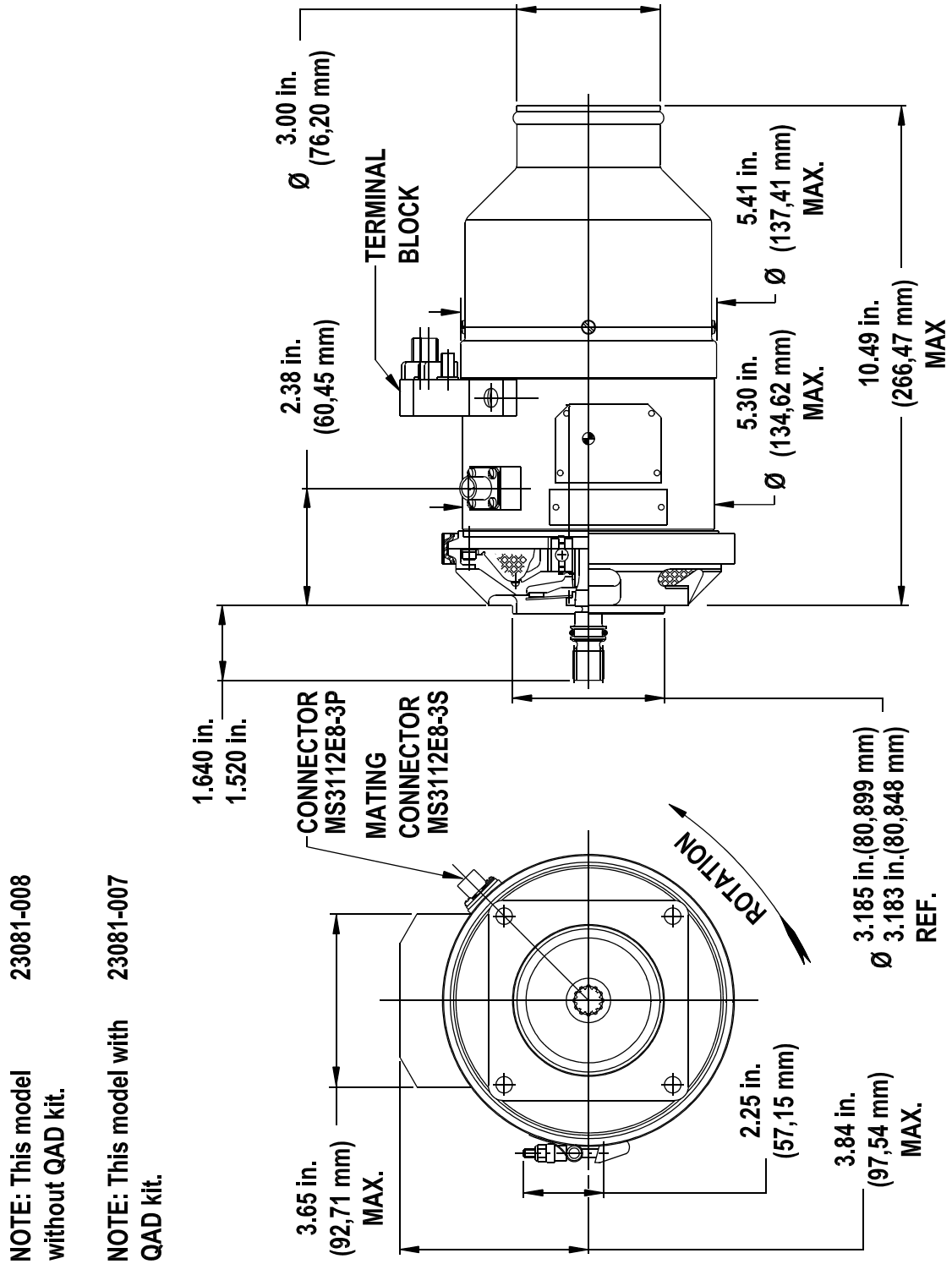


Figure 6 - Outline Drawing 23081-007, -008

MODEL NO.	"A" DIA.	"B" WET SPLINE	"C" DRY SPLINE
23081-012-1	3.249 in.(82,525 mm) MAX. / 3.247 in.(82,474 mm) MIN.	------	1.120 in.(28,448 mm) MAX. / 1.000 in.(25,400 mm) MIN.
23081-011-1			
23081-012	3.249 in.(82,525 mm) MAX. / 3.247 in.(82,474 mm) MIN.	------	1.120 in.(28,448 mm) MAX. / 1.000 in.(25,400 mm) MIN.
23081-011			

NOTE: These models 23081-011 with QAD kit. 23081-011-1

NOTE: These models 23081-012 without QAD kit. 23081-012-1

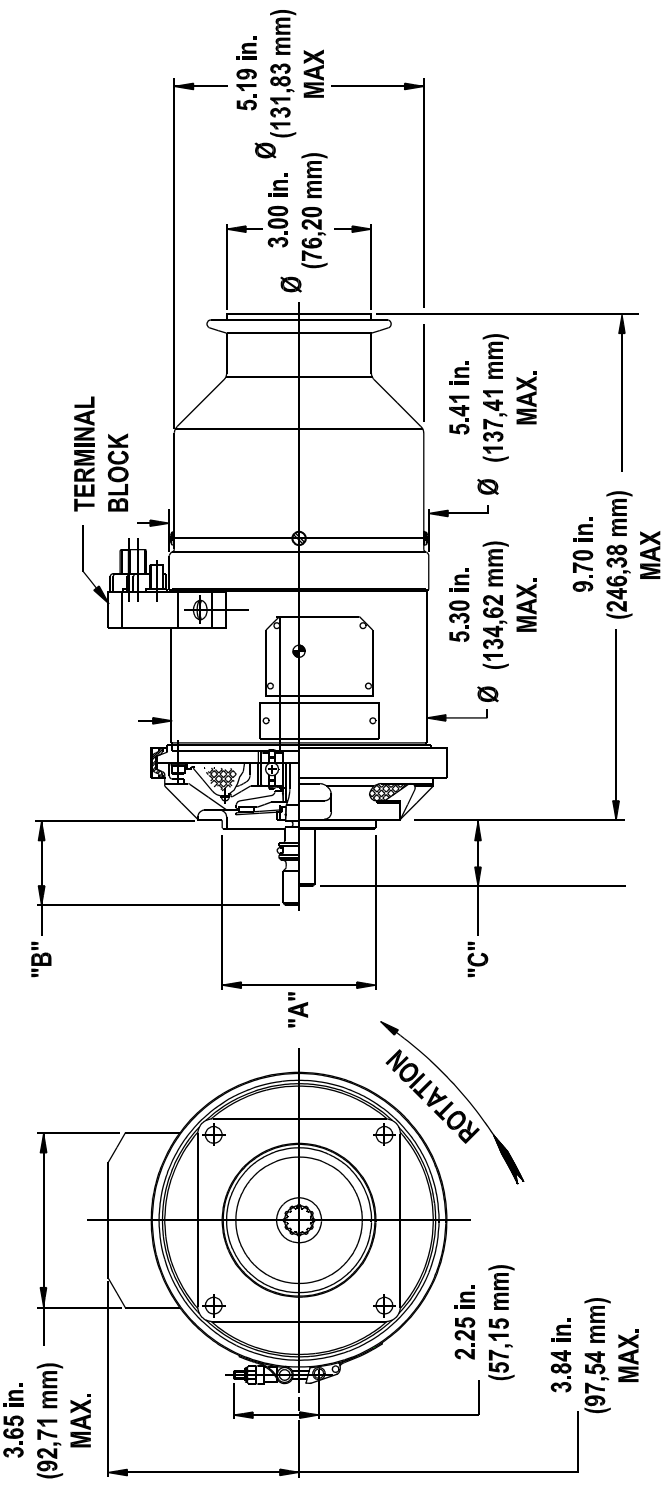


Figure 7 - Outline Drawing 23081-011, -011-1, -012, -012-1

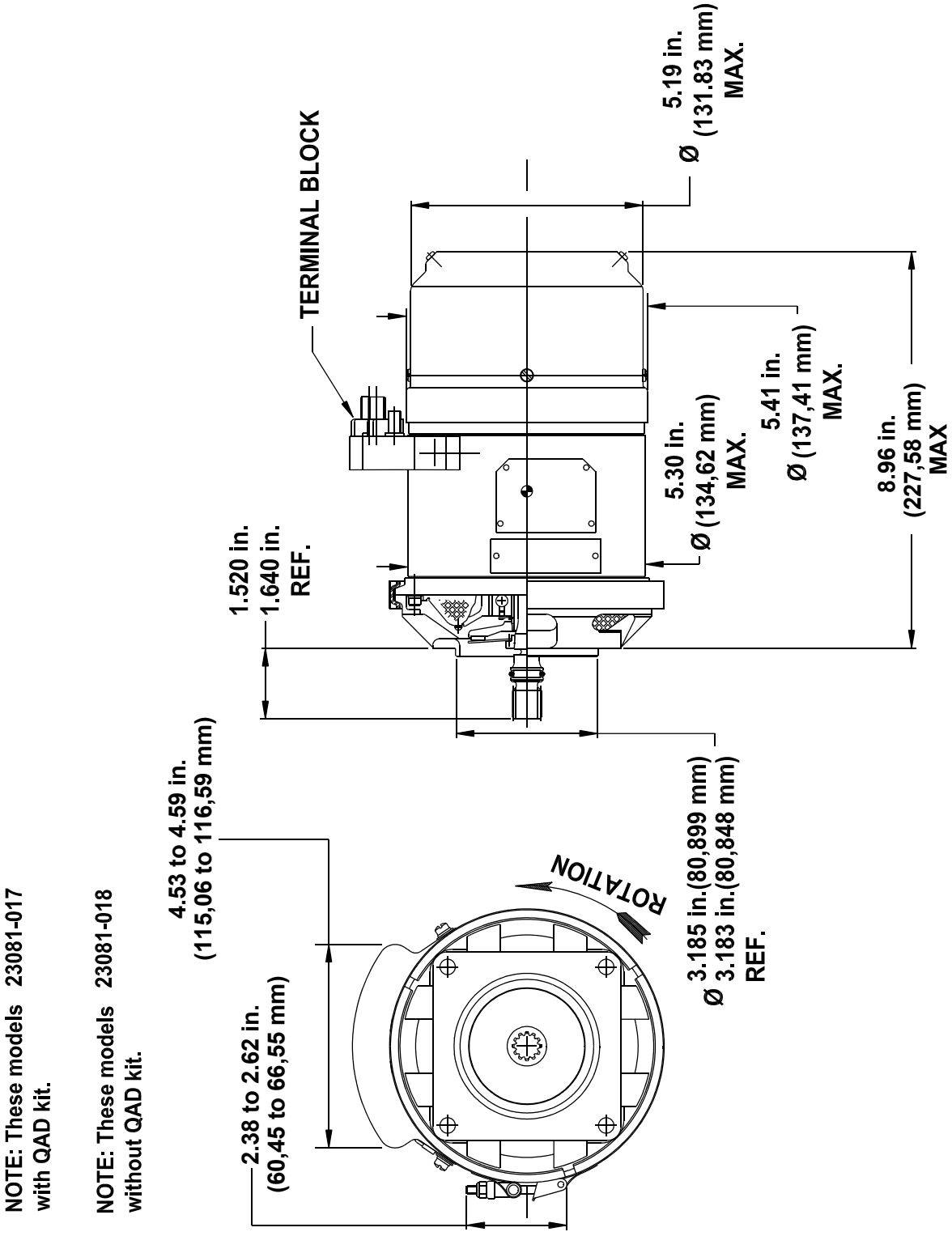


Figure 8 - Outline Drawing 23081-017, -018

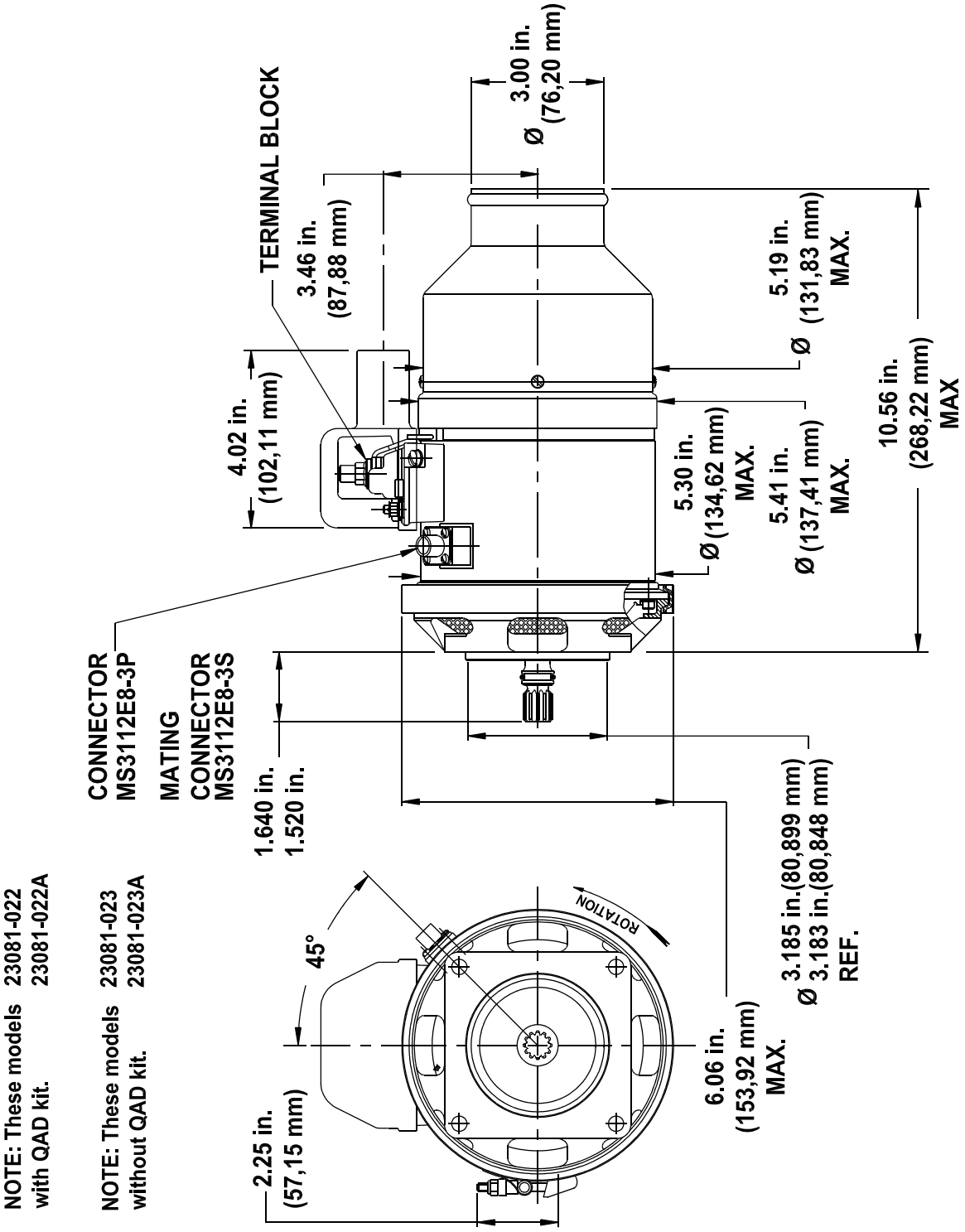


Figure 9 - Outline Drawing 23081-022, -022A, -023, -023A

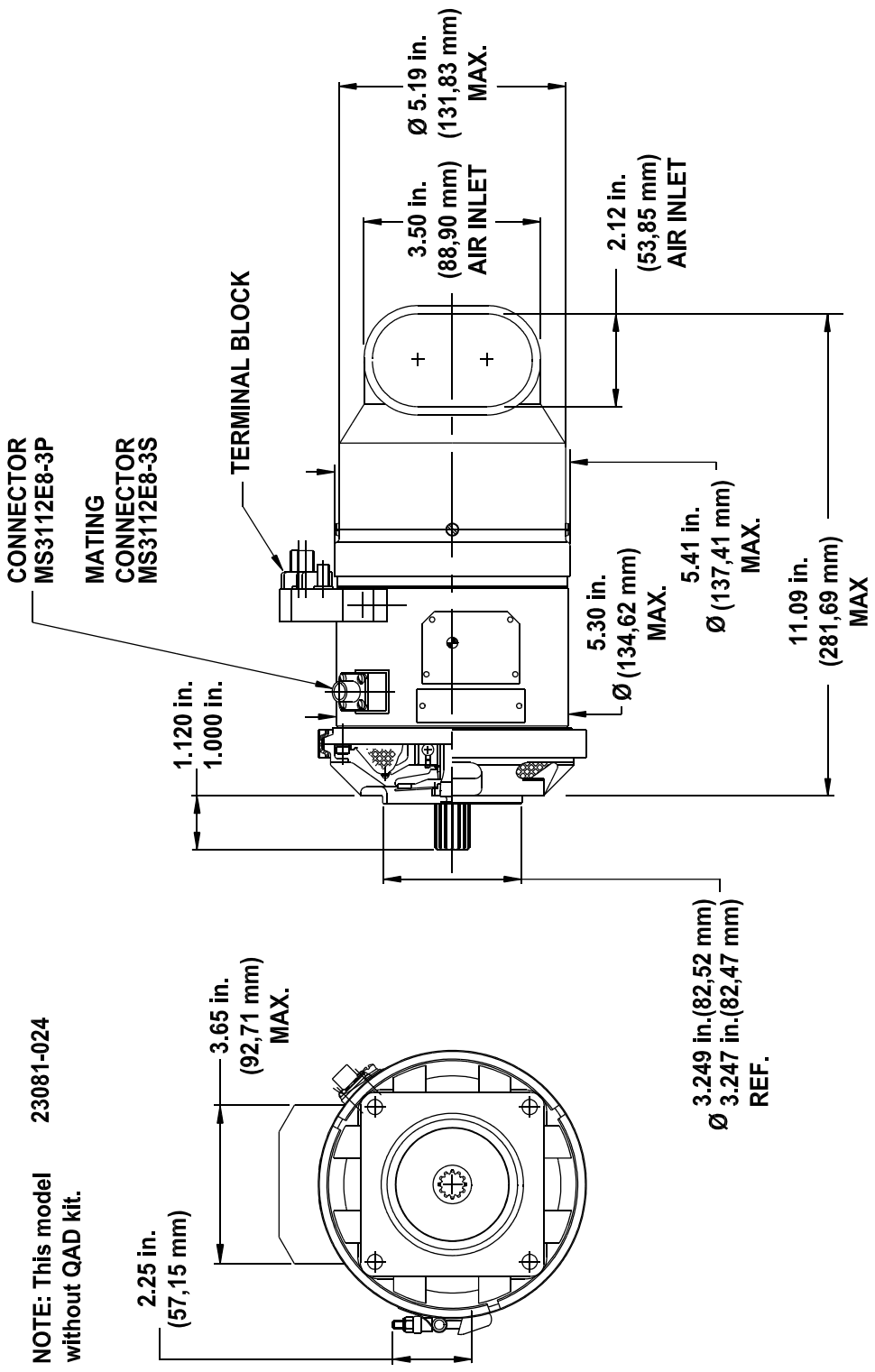


Figure 10 - Outline Drawing 23081-024

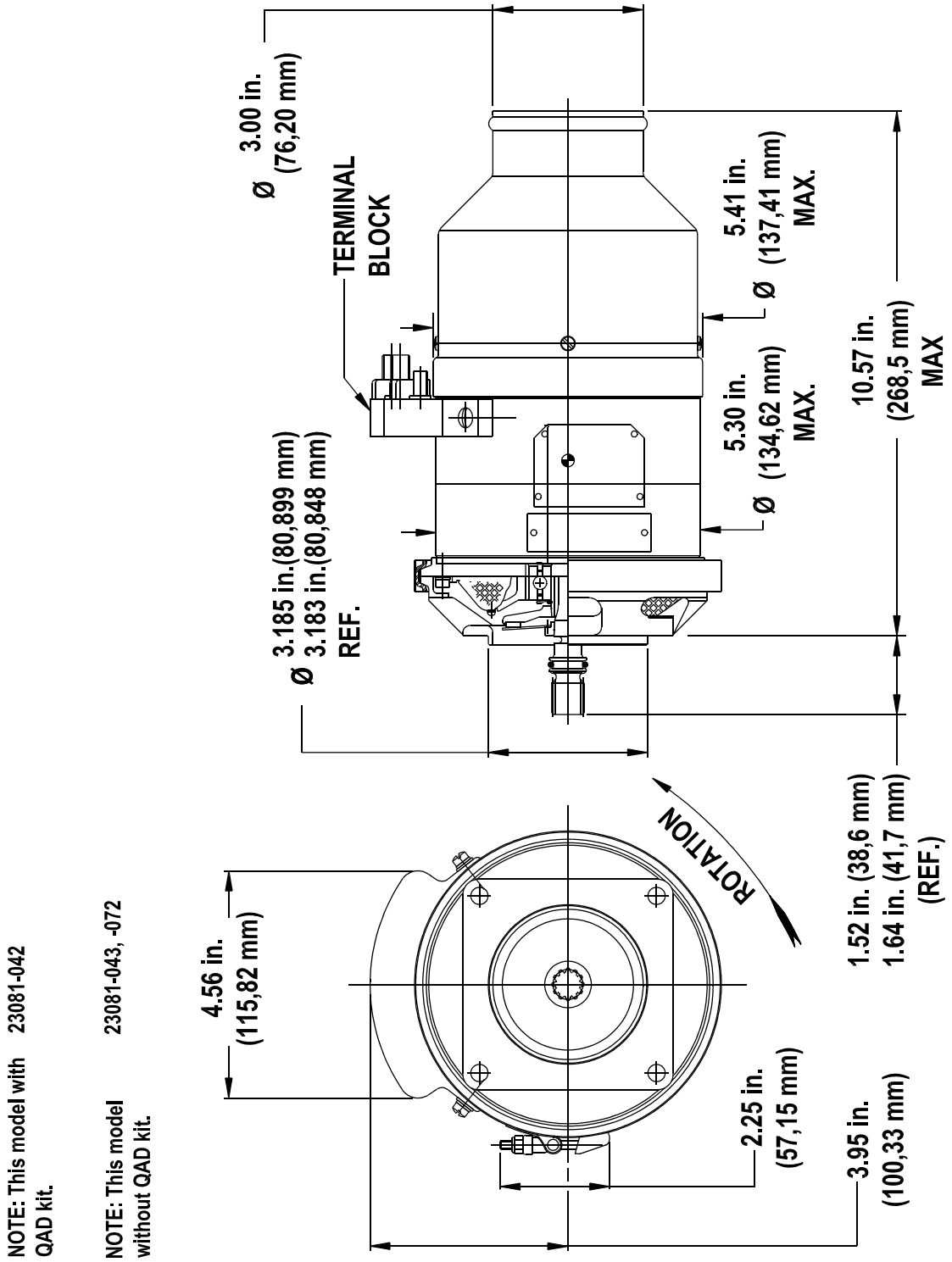


Figure 11 - Outline Drawing 23081-042, -043, -072

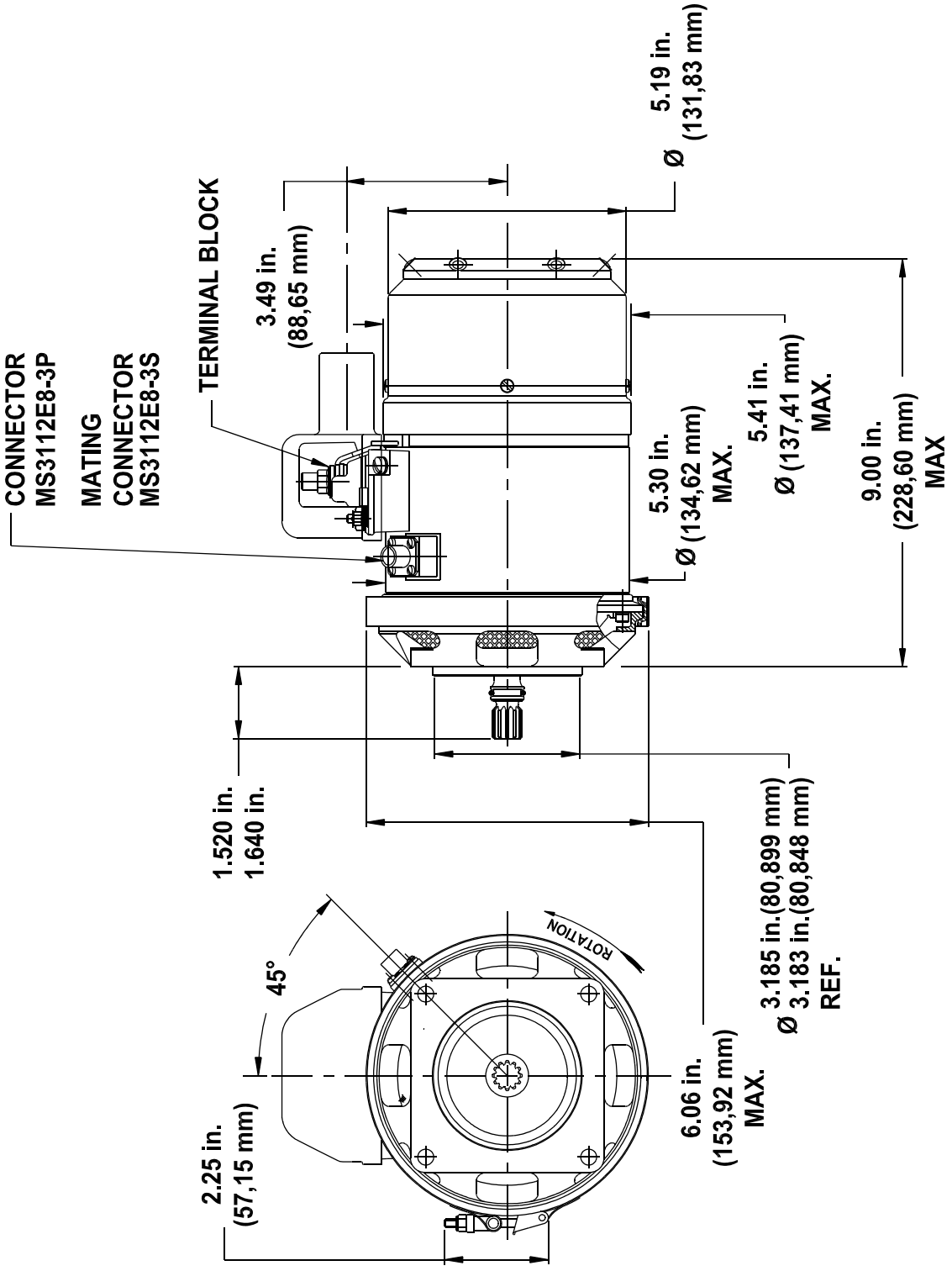


Figure 12 - Outline Drawing 23081-056

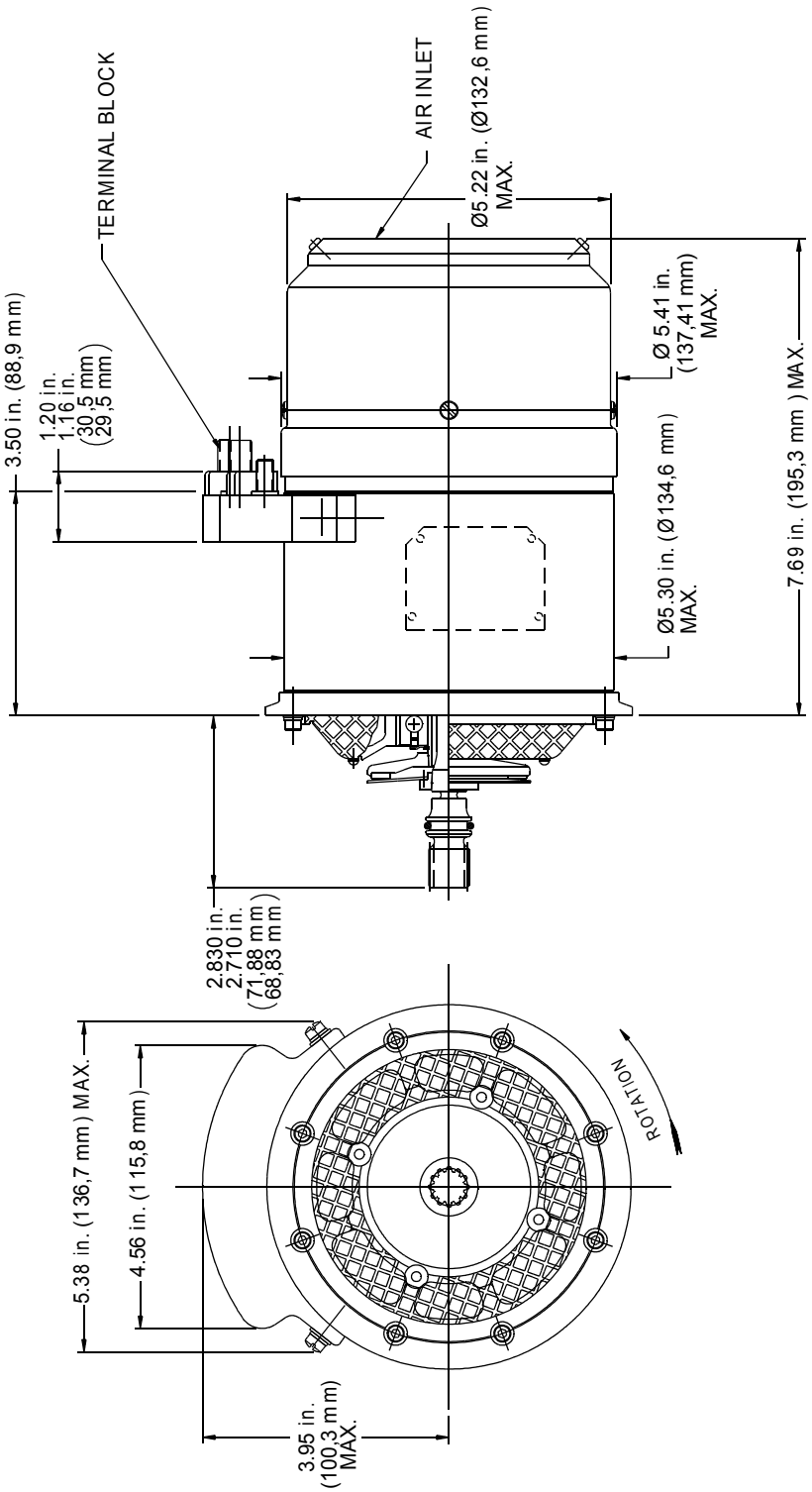


Figure 13 - Outline Drawing 23081-057, -073

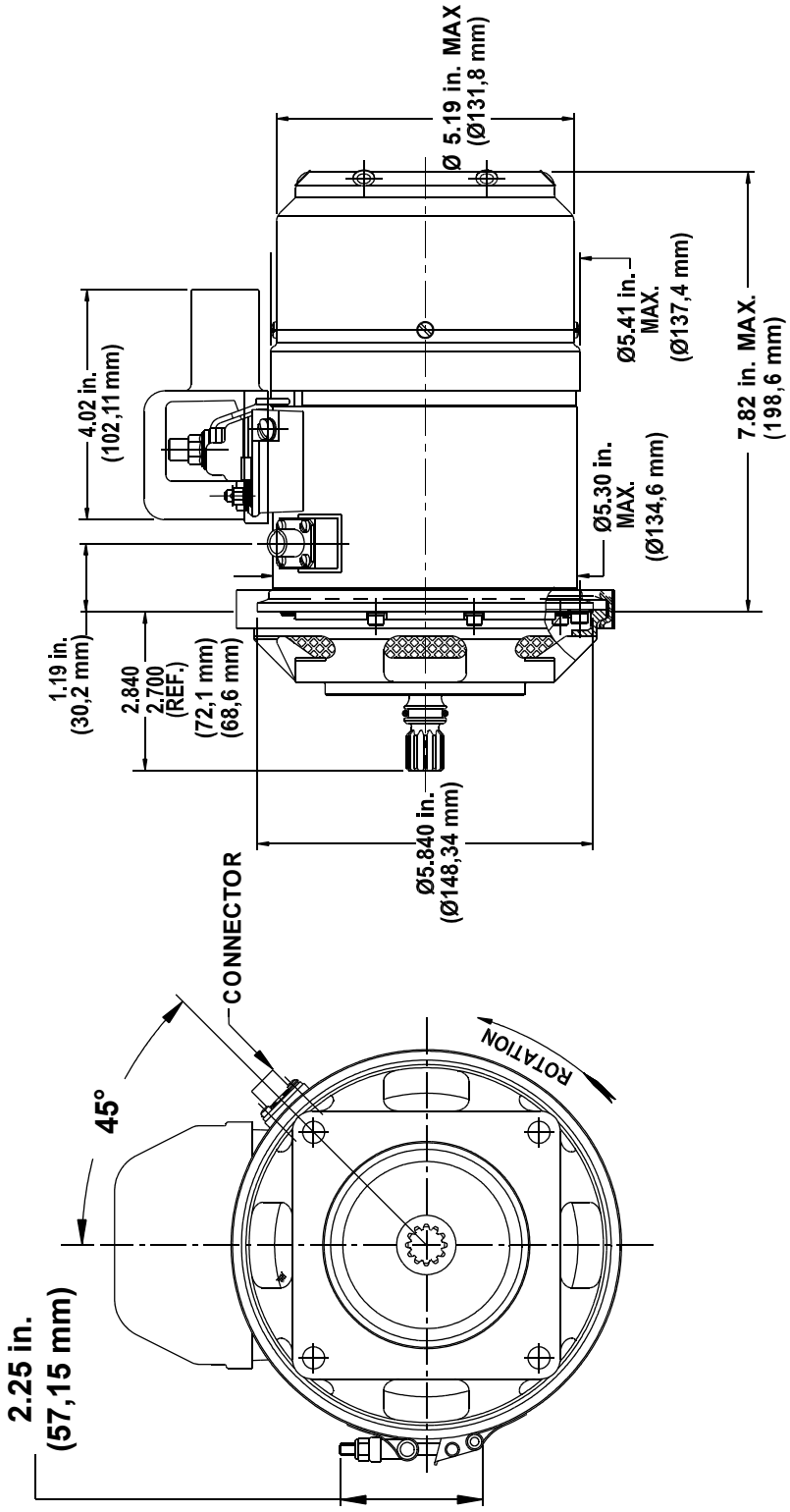


Figure 14 - Outline Drawing 23081-059

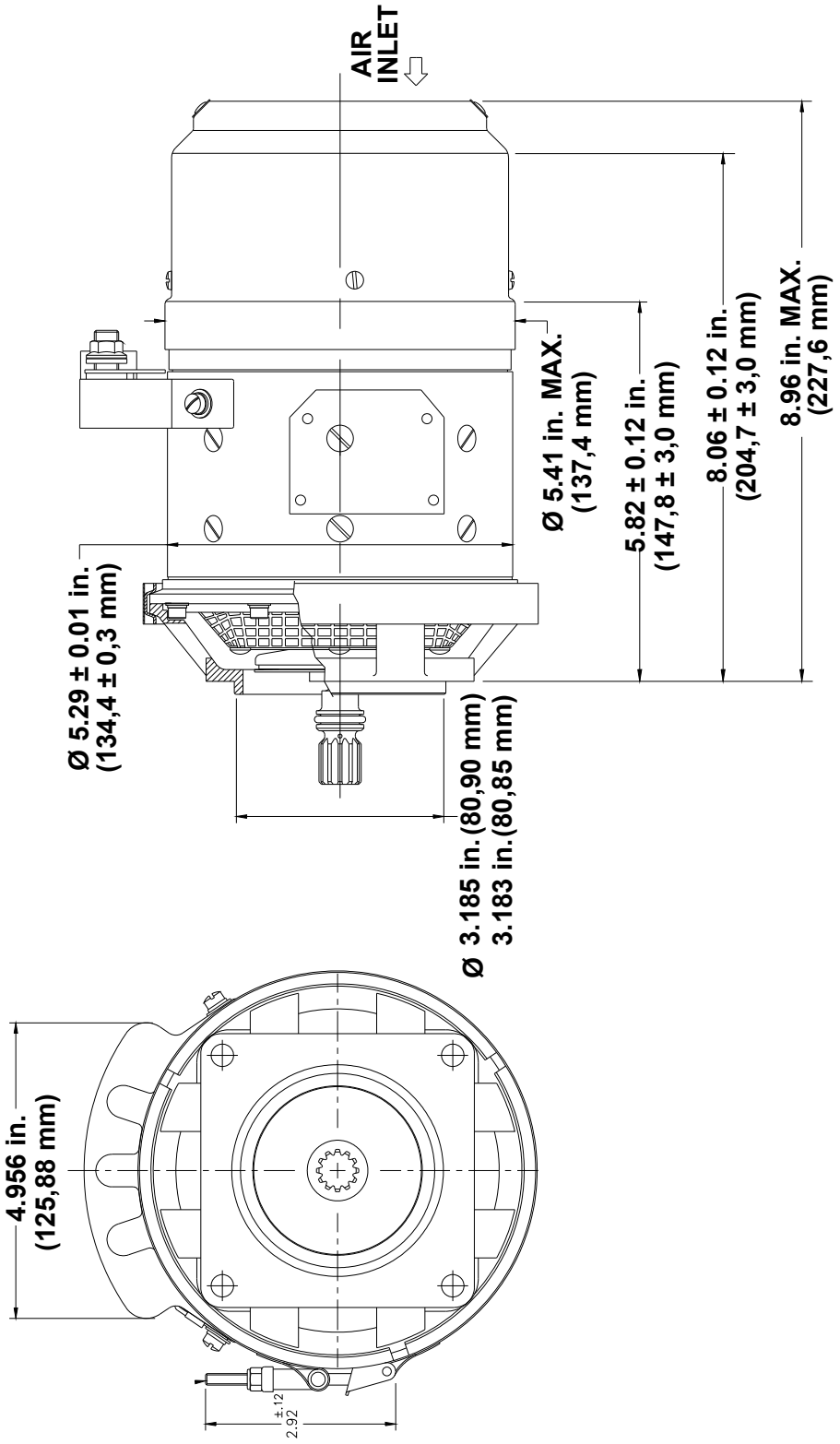


Figure 15 - Outline Drawing 23081-063

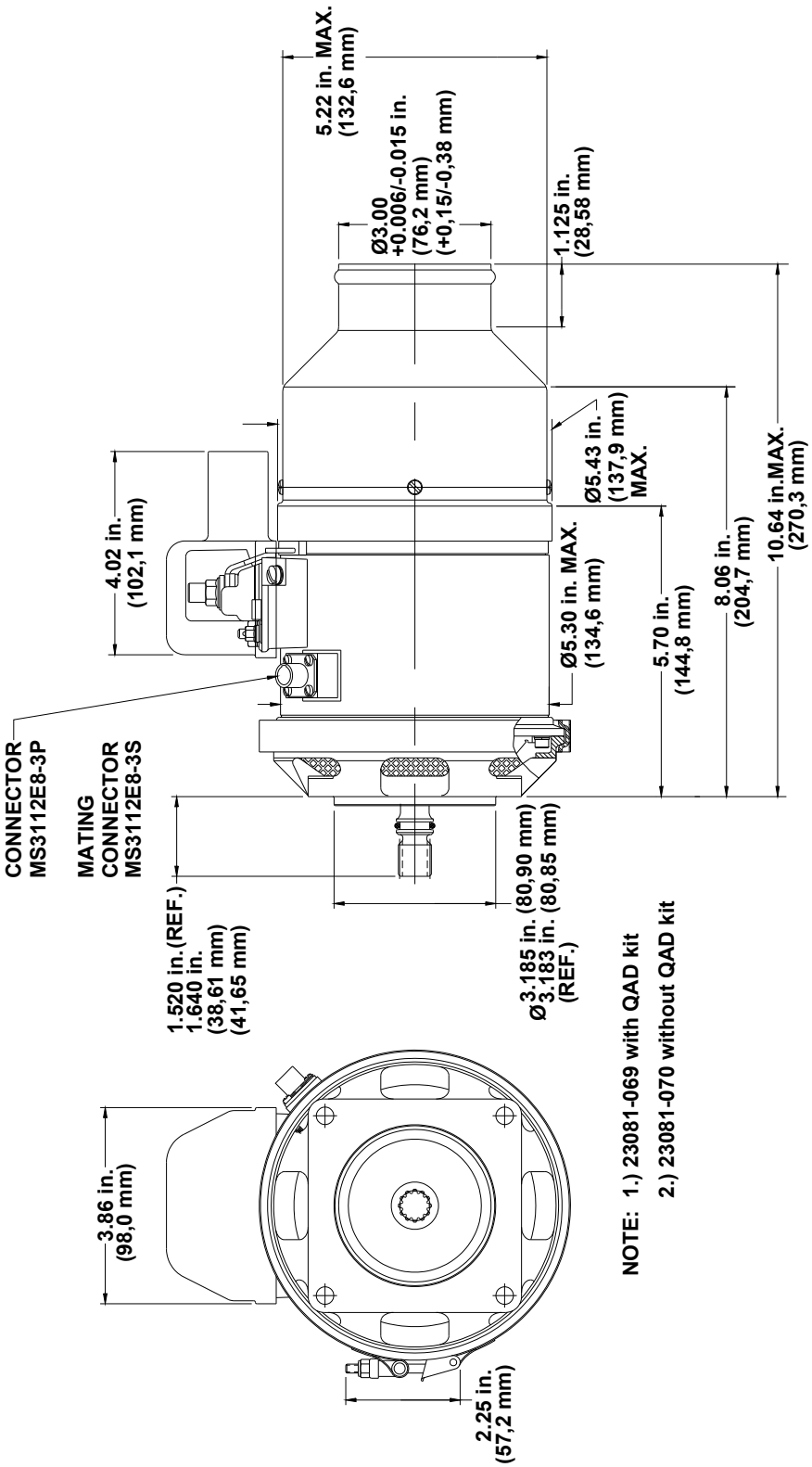


Figure 16 - Outline Drawing 23081-069, -070

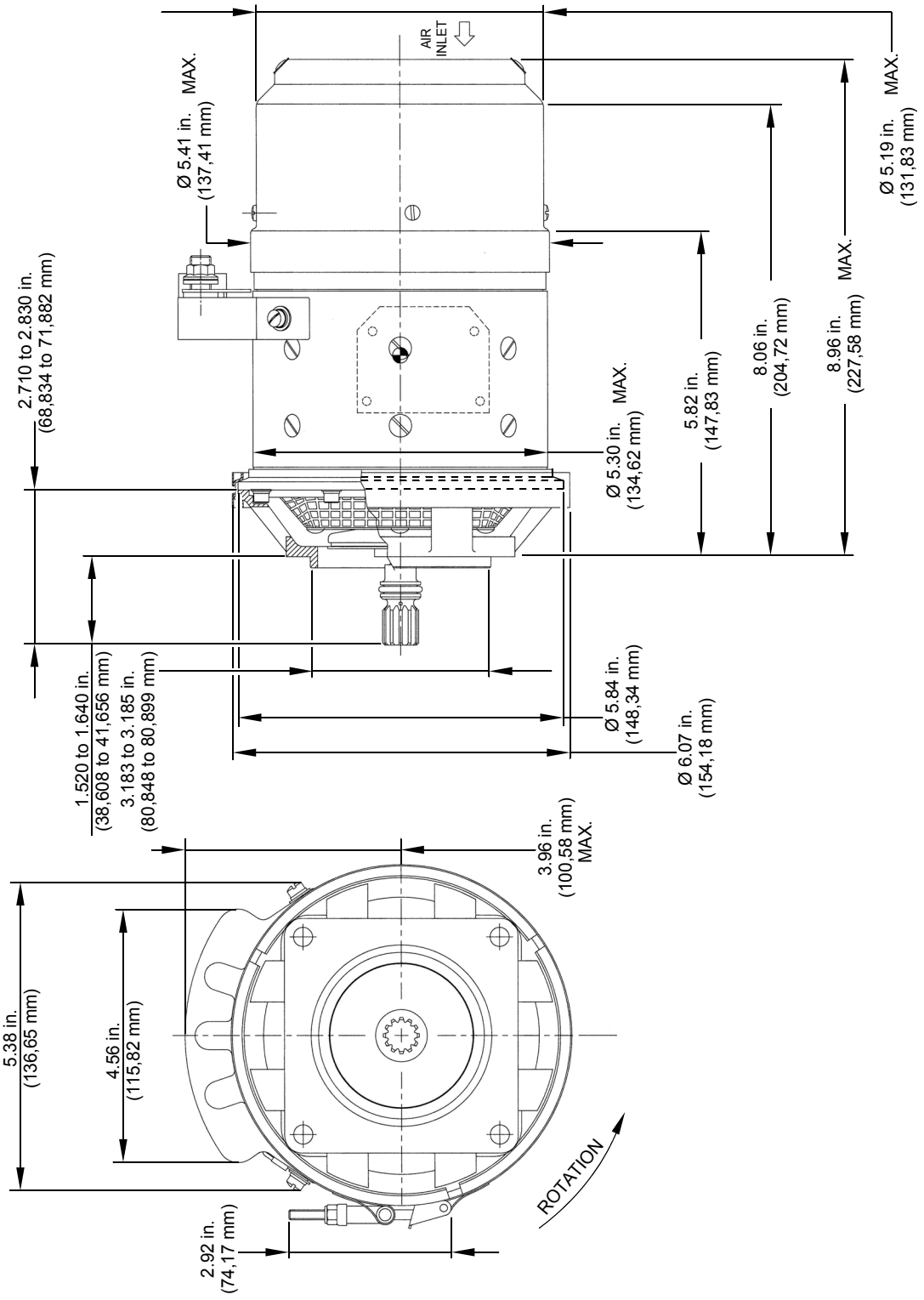


Figure 17 - Outline Drawing 23081-078

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TESTING AND FAULT ISOLATION

1. Introduction

WARNING: THE UNIT CAN PRODUCE HIGH OUTPUT CURRENT CAPABLE OF CAUSING SEVERE SHOCK OR DEATH. MAKE SURE ALL POWER IS SHUT OFF TO GENERATOR BEFORE REMOVING OR REPLACING TEST EQUIPMENT, INSTRUMENTS, OR ASSEMBLIES. TAKE EXTREME CARE WHEN PERFORMING "LIVE CIRCUIT" TESTS AND FAULT ISOLATION PROCEDURES.

The procedures provided in this section are performance tests and are classified as either verification tests or acceptance tests. A verification test is conducted to assist in fault isolation or to confirm the cause for removal before the repair or overhaul of the model. An acceptance test is conducted after the repair or overhaul of the unit. Reference the data sheet(s) provided at the end of this section.

NOTE: Due to differences in test requirements between certain 23081 Series I models, two data sheets are provided. The data sheets are labeled with the applicable model numbers at the top.

Verification Testing: A model must be examined for removal or have a test done for qualification for continued service. The inspection is found in the CHECK section before testing can start. A model that passes the initial inspection can have a verification test done which is an acceptance test not including dielectric tests. A verification test can be used to pass the performance tests or isolate a fault. When a fault is identified during a test, refer to the fault isolation tables in this section to find the possible cause.

Acceptance Testing: A unit that is overhauled must have a test done before you send the unit back to service. The tests must be in accordance with this section to make sure the minimum performance standards are in specification. When an acceptance test is done, zero operating hours time since overhaul (TSO) is given to an overhauled unit. Repaired units are continued time.

2. Test Conditions

Refer to Table 1001 for a list of performance test conditions. Unless otherwise specified, all of the parameters in Table 1001 apply to a test.

Parameter	Operating Condition
Ambient Temperature	77° ± 27 °F (25° ± 15 °C)
Barometric Pressure (For all models except 23081-078)	Ambient pressure, 30 ± 3 in. (762 ± 76 mm) of mercury, at sea level up to 1,500 feet (457,2 m).
Barometric Pressure (For model 23081-078)	Ambient Atmospheric pressure at sea level up to 6000 feet (1828,8 m).

Table 1001 - Performance Test Conditions

Parameter	Operating Condition
Brush Seating Procedures	Refer to Safran Power Standard Practice Document (SPD) 1006 for brush installation, seating, and run-in procedures.
Forced Cooling Air	None. The 23081 SI models are self-cooled
Physical Mounting	Drive shaft must be in horizontal position.

Table 1001 - Performance Test Conditions (Continued)

3. Required Test Equipment

Refer to Table 1002 for a list of special tools, fixtures, and equipment needed for testing and fault isolation. Equivalent substitutes can be used for items listed.

NOTE: Airflow meters and pressure gauges used in the testing of this unit should be certified and calibrated in accordance with ISO10012-1 or should have current calibration traceable to a National Bureau of Standards (NBS) standard. If properly calibrated equipment is not available, the Unit Under Test (UUT) should be sent to an authorized Safran Power repair facility for all the procedures in this manual.

Equipment	Range and Accuracy or Equipment Rating	Ref. Des.
Commutation Viewing Adapter	SPECIAL TOOLS, FIXTURES, AND EQUIPMENT section	See Figure 9003
DC Ammeter	Range: 0 to 10 A Accuracy: ±1% of reading	A_1
DC Variable Power Supply	Range: 0 to 30 V DC	Power Supply
DC Voltage Regulator	Range: 0 to 30 V DC	Voltage Regulator
DC Voltmeter (2 req'd)	Range: 0 to 50 V DC Accuracy: ±1% of reading	V_2, V_3
DC Voltmeter (Generator)	Range: 0 to 50 mV DC Accuracy: ±1% of reading.	V_1
DC Voltmeter (Starter)	Range: 0 to 100 mV DC Accuracy: ±1% of reading.	V_1
DC Voltmeter	Range: 0 to 10 V DC Accuracy: ±1% of reading	V_4
Generator Drive Stand	Range: 4,000 to 15,000 rpm, 36 V DC rated load	Not Illustrated

Table 1002 - Test Equipment

Equipment	Range and Accuracy or Equipment Rating	Ref. Des.
Locked Rotor Stand	Rating: Capable of measuring a locked rotor torque of 13 lb.ft. and having a power supply capacity of 400 A at 12 V DC.	Not Illustrated
Generator Load Switch	Rating: 30 V DC, 300 A	SW_1
High Potential Tester	Rating: 300 V AC RMS, commercial frequency	Not illustrated
Manometer	Range: 0 to 12 inch (0 to 305 mm) H_20 Accuracy: ±5% of reading	Not illustrated
Oscilloscope	Digital: Band width of 100 MHz Sampling rate of 100 MS/s Analog: Bandwidth of 60 to 100 MHz	Not illustrated
Precision Shunt (Generator)	Rating: 500 A; 50 mV DC	SH_1
Precision Shunt (Starter)	Rating: 1000 A; 100 mV DC	SH_1
Shunt Field Switch	Rating: 30 V DC, 10 A	SW_3
Terminal Block (Non-serviceable)	Use a terminal block with blown capacitors during dielectric testing to avoid damaging a serviceable terminal block.	Terminal Block
Resistor	Rating: 0.0 Ohm	Not Illustrated
Thermometer (or other temperature measuring device)	Range: 65° to 300 °F (18° to 150 °C) Accuracy: ±1 °F (0,5 °C)	Not illustrated
QAD Mounting Kit	P/N: Refer to Figure 10001	Not Illustrated
Variable Load Bank	Rating: 30 V DC, 0 to 300 A	Variable Load Bank
Voltage Regulator Switch	Rating: 30 V DC, 10 A	SW_2
V-Block or Cradle Support	N/A	Not illustrated

Table 1002 - Test Equipment (Continued)

4. Generator Thermal Stabilization

Stabilization is reached when either of the following conditions is met:

- Temperature of shunt field winding (A-E), as determined by its resistance, rises no more than 2 °F (1,1 °C) in five minutes.
- Frame temperature measured on side opposite terminal block, does not rise more than 2 °F (1,1 °C) in five minutes.

5. Test Condition Setpoint Tolerances

Test condition setpoint must be set within tolerances indicated in Table 1003, exclusive of measurement accuracy.

Parameter	Test Condition Setpoint Tolerance
Speed (rpm)	±20 rpm
DC Voltage	±0.1 V DC
DC Current	±2.5 A
Cooling Air Pressure	±0.2 inch (5,1 mm) - water
Torque	±1.0 lb.ft.(± 1,36 Nm)
Time (0-30 seconds)	0 to 1 second
Time (greater than 30 seconds)	0 to 15 seconds

Table 1003 - Setpoint Tolerances

6. Test Set Up

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers in Figure 10001 of the ILLUSTRATED PARTS LIST.

A. Do Initial Inspection

Examine the model in a brightly lit work area. Refer to procedures in CHECK section. Inspection results determine whether disassembly and repair are required before testing.

B. Check Brush Seating

NOTE: In the model being prepared for verification testing, installed brushes may or may not require brush seating.

CAUTION: THE UNIT MUST BE SUPPORTED AT ALL TIMES DURING INSTALLATION AND REMOVAL. DO NOT ALLOW THE UNIT TO HANG UNSUPPORTED. EXCESSIVE BENDING LOADS ON THE DRIVE SHAFT CAN DAMAGE THE SHEAR SECTION.

(1) Make sure all brushes (10001-210) are correctly seated according to procedures in SPD 1006.

C. Install Commutation Viewing Adapter

WARNING: DURING OPERATION, THE MODEL CAN PRODUCE A HIGH OUTPUT CURRENT CAPABLE OF CAUSING SEVERE SHOCK OR DEATH. MAKE SURE ALL POWER IS OFF TO UNIT BEFORE REMOVING OR REPLACING TEST EQUIPMENT, INSTRUMENTS, OR ASSEMBLIES. TAKE EXTREME CARE WHEN PERFORMING "LIVE CIRCUIT" TESTS AND FAULT ISOLATION PROCEDURES.

CAUTION: DC UNIT MUST BE SUPPORTED AT ALL TIMES DURING INSTALLATION OR REMOVAL. DO NOT ALLOW UNIT TO HANG UNSUPPORTED. TOO MUCH BENDING LOAD ON DRIVE SHAFT CAN DAMAGE SHEAR SECTION.

(1) Remove air inlet (10001-150).

(2) Install commutation viewing adapter.

D. Attach Dummy Terminal Block to Model or Remove Terminal Block Grounding Lead

CAUTION: THE UNIT MUST BE SUPPORTED AT ALL TIMES DURING INSTALLATION AND REMOVAL. DO NOT ALLOW THE UNIT TO HANG UNSUPPORTED. EXCESSIVE BENDING LOADS ON THE DRIVE SHAFT CAN DAMAGE THE SHEAR SECTION.

CAUTION: MAKE SURE THAT YOU USE A DUMMY TERMINAL BLOCK OR REMOVE THE TERMINAL BLOCK GROUNDING LEAD FOR ACCEPTANCE TESTING. THE TEST VOLTAGE CAN DAMAGE THE FILTER CAPACITOR IN THE TERMINAL BLOCK.

(1) Refer to DISASSEMBLY section and ASSEMBLY section for details.

NOTE: If the grounding lead is removed, make sure to cover the lead with electrical tape before doing a dielectric test.

NOTE: Terminal block P/N: 23069-1236 has the lead grounded by the terminal block mounting screw (10004-60). The lead is located between terminals B and D. By removing the single mounting screw, the grounding lead will be isolated.

E. Install Model on Drive Stand

NOTE: The model mounts to the mounting adapter (part of the QAD kit) that is attached to the drive stand.

NOTE: Some 23081 Series I models included in this CMM are not supplied with a QAD kit. QAD kits must be ordered separately and used during acceptance testing. Refer to the ILLUSTRATED PARTS LIST for QAD kit part numbers.

CAUTION: THE UNIT MUST BE SUPPORTED AT ALL TIMES DURING INSTALLATION OR REMOVAL. DO NOT ALLOW UNIT TO HANG UNSUPPORTED. TOO MUCH BENDING LOAD ON DRIVE SHAFT CAN DAMAGE SHEAR SECTION.

(1) Install mounting adapter on drive stand.

(2) While supporting anti-drive end of model, align and install drive end to mounting adapter plate.

(3) Make sure that drive stand and model mating splines are properly engaged.

(4) Install V-retainer coupling (10001-20) on mounting adapter and model. To secure, tighten nut to a torque of 50 lbf.in. (5,7 Nm).

F. Connect Model to Electrical Test Circuit

(1) Turn all power OFF at model drive stand.

(2) Connect model to test circuit as shown in Figure 1001, Figure 1002 or Figure 1003 depending on model number.

(3) Assemble terminal block hardware to terminal block. Refer to ASSEMBLY section for details.

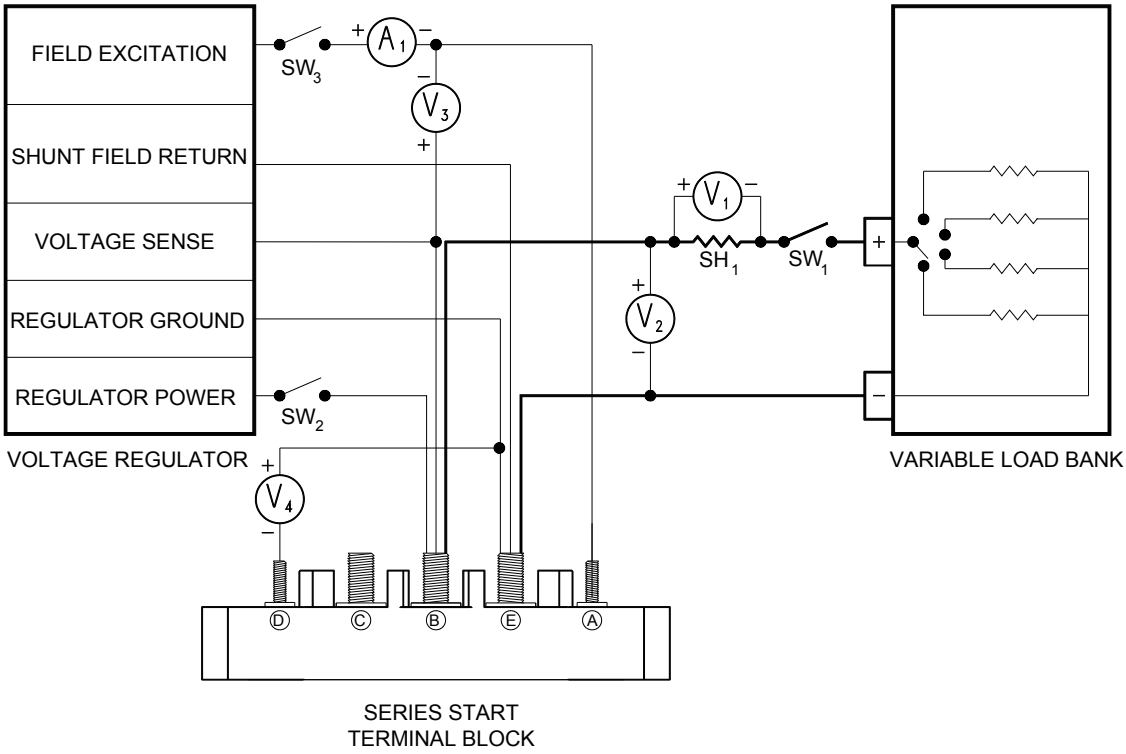

Figure 1001 - DC Starter-Generator / DC Generator Test Connection Diagram
Models 23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073, -078

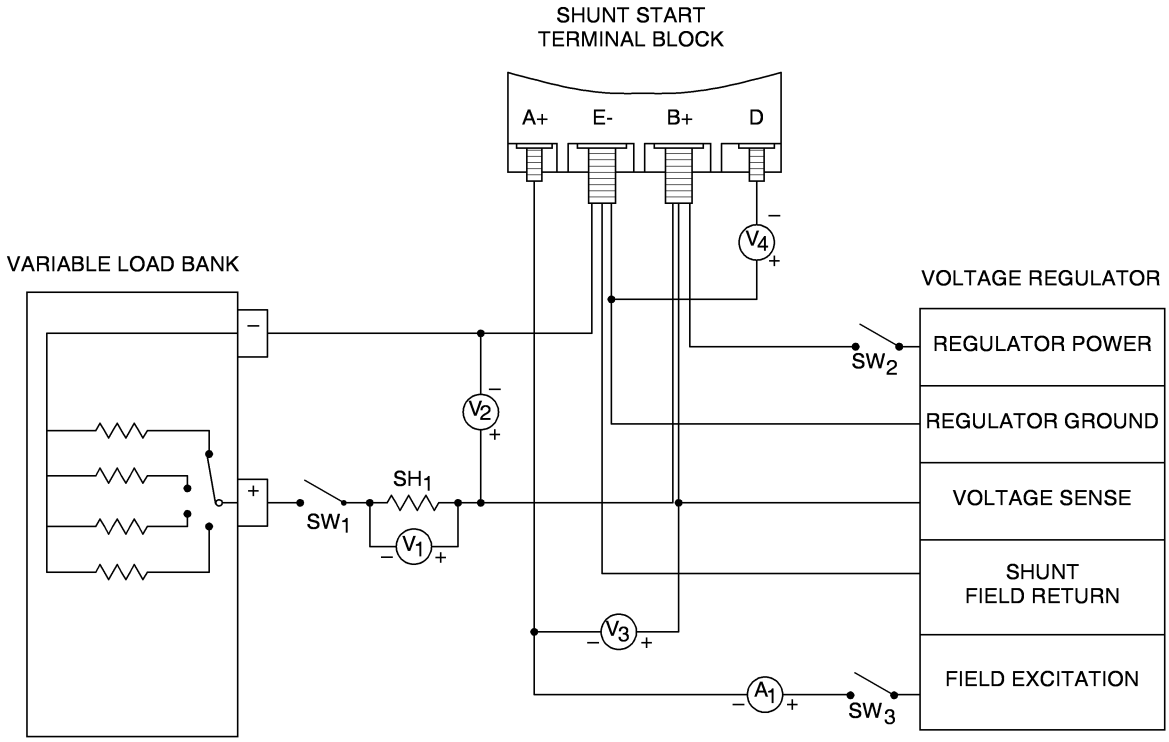

Figure 1002 - DC Starter-Generator Test Connection Diagram
Models 23081-022, -022A, -023, -023A, -056, -059, -069, -070

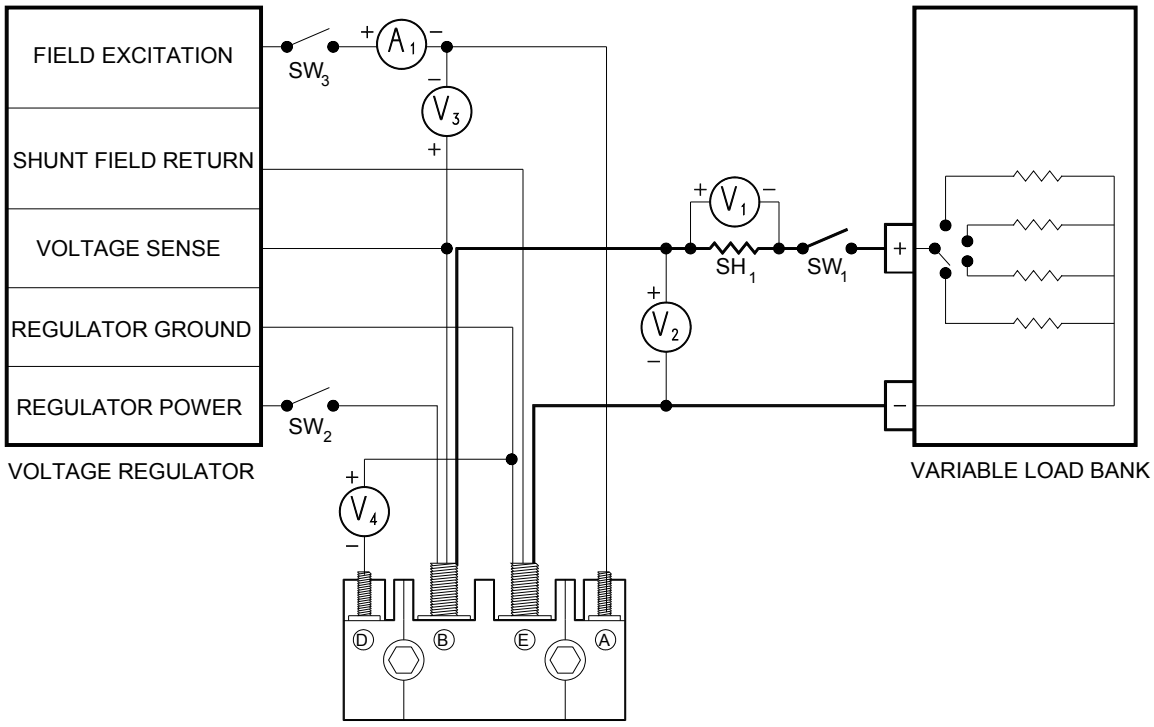

Figure 1003 - DC Starter-Generator Test Connection Diagram
Models 23081-007, -008, -011, -011-1, -012, -012-1, -024

7. Acceptance Test Procedure

NOTE: Refer to IPL Figure 1001 for an illustration. Numbers in parentheses ( ) refer to item numbers on the illustration, unless otherwise specified.

CAUTION: IF AN ACCEPTANCE LIMIT IS EXCEEDED BY EVEN A SMALL MARGIN, DO NOT CONTINUE FURTHER TESTING OF UNIT. BE AWARE THAT TESTING OF A UNIT BY ANY LIMIT AFTER IT HAS EXCEEDED THAT LIMIT CAN DAMAGE THE UNIT.

This paragraph contains the required performance tests and the sequence in which they are to be accomplished.

WARNING: MAKE SURE THAT ALL POWER IS SHUT OFF TO THE UNIT BEFORE REMOVING OR REPLACING COMPONENTS OR ASSEMBLIES. TAKE EXTREME CARE WHEN PERFORMING "LIVE" CIRCUIT TESTS AND TROUBLESHOOTING PROCEDURES. DURING OPERATION, THE UNIT PRODUCES A VERY HIGH AMPERAGE OUTPUT THAT CAN CAUSE SEVERE SHOCK OR DEATH.

A. Maximum Speed for Regulation (For Models 23081-007, -008, -011, -011-1, -012, -012-1, -024 and -078 only)

(1) With regulator connected to the model, operate the model at 13,000 rpm, self-excited at voltage given below and no load.

NOTE: Stabilization is not required.

- 28.5 V DC (V_2) (For models 23081-007,-008, -011, -011-1, -012, -012-1, -024).
- 30.0 V DC (V_2) on terminals B (+) and E (-) (For model 23081-078).

(2) Measure and record voltage between terminals B and A (V_3) and the field current at terminal A (A_1).

(3) Calculate resistance between terminals B and A by dividing the B and A voltage (V_3) by the field current (A_1).

(a) The calculated external field circuit resistance must not be greater than 35 Ω.

B. Continuous Operating Speed, Equalizing Voltage and Minimum Speed Test

(1) Install a thermocouple (or other temperature measuring device) to the outside of the stator and housing assembly in an area adjacent to a stator main pole.

(2) Install a second thermocouple in air inlet opening.

(3) For all models except 23081-078:Operate the model at 12,000 rpm and stabilize as listed below, 30 V DC (V_2), 200 A (V_1/SH_1). Refer to Paragraph 4.

NOTE: Stabilization is reached when the temperature of the shunt field winding, as determined by the stator and housing field temperature, rises no more than 2 °F (1,1 °C) for the time listed below:

- Stabilize for 5 minutes (For Models: 23081-007, -008, -011, -011-1, -012, -012-1, -022, -022A, -023, -023A, -024, -056, -059, -069, -070 only).
- Stabilize for 15 minutes (For Models: 23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073 only).

(4) For model 23081-078: Operate the model at 12,634 rpm, 30 V DC on terminals B(+) and E(-) (V_2), 200 A (V_1/SH_1) with room ambient air until stabilized as mentioned in the note below. Refer to Paragraph 4.

NOTE: Stabilization is reached when the temperature of the shunt field winding, as determined by the stator and housing field temperature, rises no more than 2 °F (1,1 °C) in 5 minutes.

(5) Measure and record the voltage between terminals D and E (V_4).

(6) Measure and record cooling air temperature.

(7) Measure and record winding or frame temperature.

(8) For all models except 23081-078: Immediately operate the model at the minimum speed for regulation at the speed listed below, 27 V DC (V_2), and 200 A (V_1/SH_1).

NOTE: Stabilization is not required.

- 7,200 rpm (For model 23081-063).
- 7,050 rpm (For all models, except 23081-063 and -078).

(9) For model 23081-078: Immediately operate the model at the minimum speed for regulation at 8100 rpm, 30 V DC (V_2), and 200 A (V_1/SH_1).

NOTE: Stabilization is required.

(10) Measure and record the terminal “B” to terminal “A” voltage.

(11) Measure and record field current (A_1).

(12) Calculate and record external field circuit resistance between terminals B and A by dividing the B to A voltage (V_3) by the field current (A_1).

(13) Acceptance Limits:

(a) Field current:

1 Not to be more than 10 A.

(b) External field circuit resistance:

1 Must not be less than 0.4 Ω (For all models, except 23081-078).

2 Must not be less than 0.5 Ω (For model 23081-078).

(14) The D to E voltage must be in the limits of Figure 1004, Figure 1005, Figure 1006, Figure 1007, Figure 1008, Figure 1009 and Figure 1010.

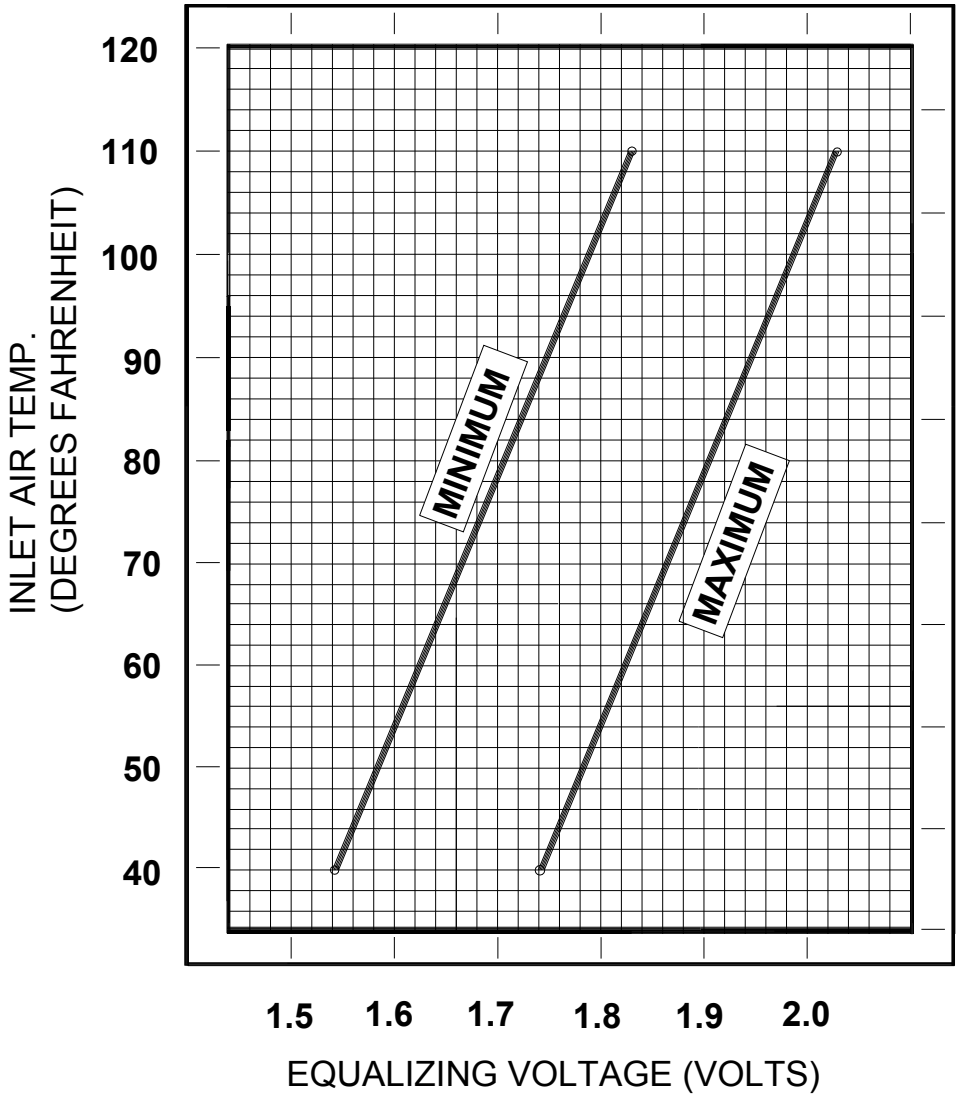

Figure 1004 - Equalizing Voltage Acceptance Limits
Models 23081-001, -002, -003, -004, -017, -018, -042, -043, -072

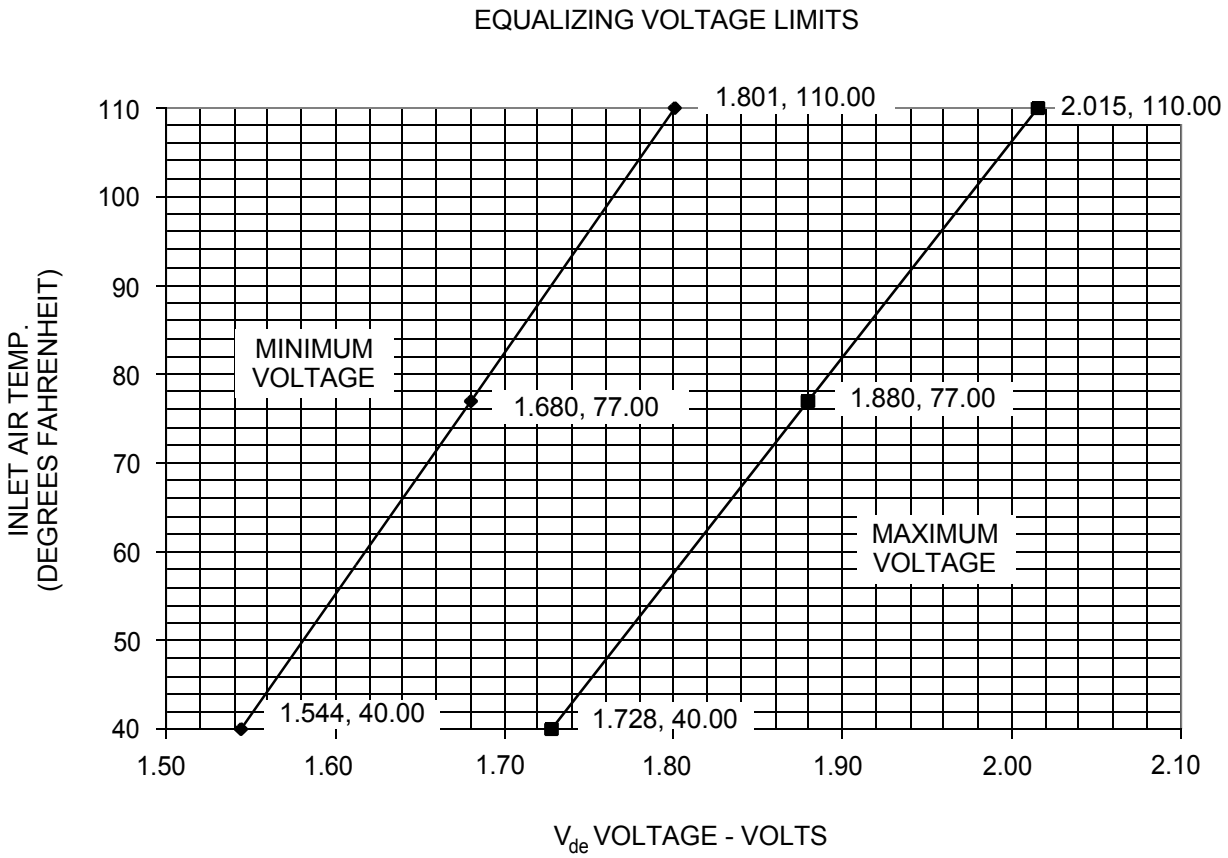

Figure 1005 - Equalizing Voltage Acceptance Limits
Models 23081-057, -073

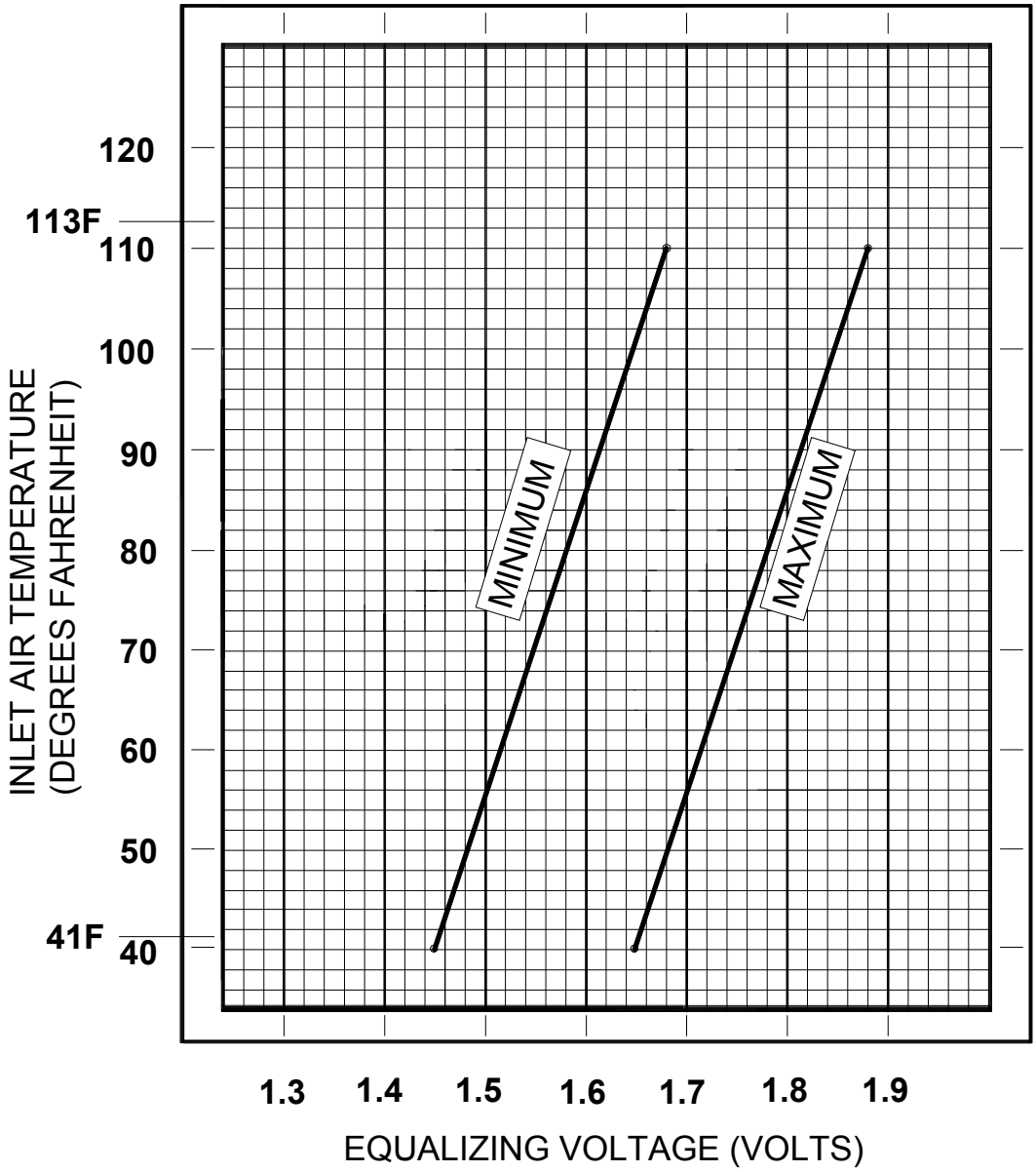

Figure 1006 - Equalizing Voltage Acceptance Limits
Models 23081-007, -008, -011, -011-1, -012, -012-1, -024

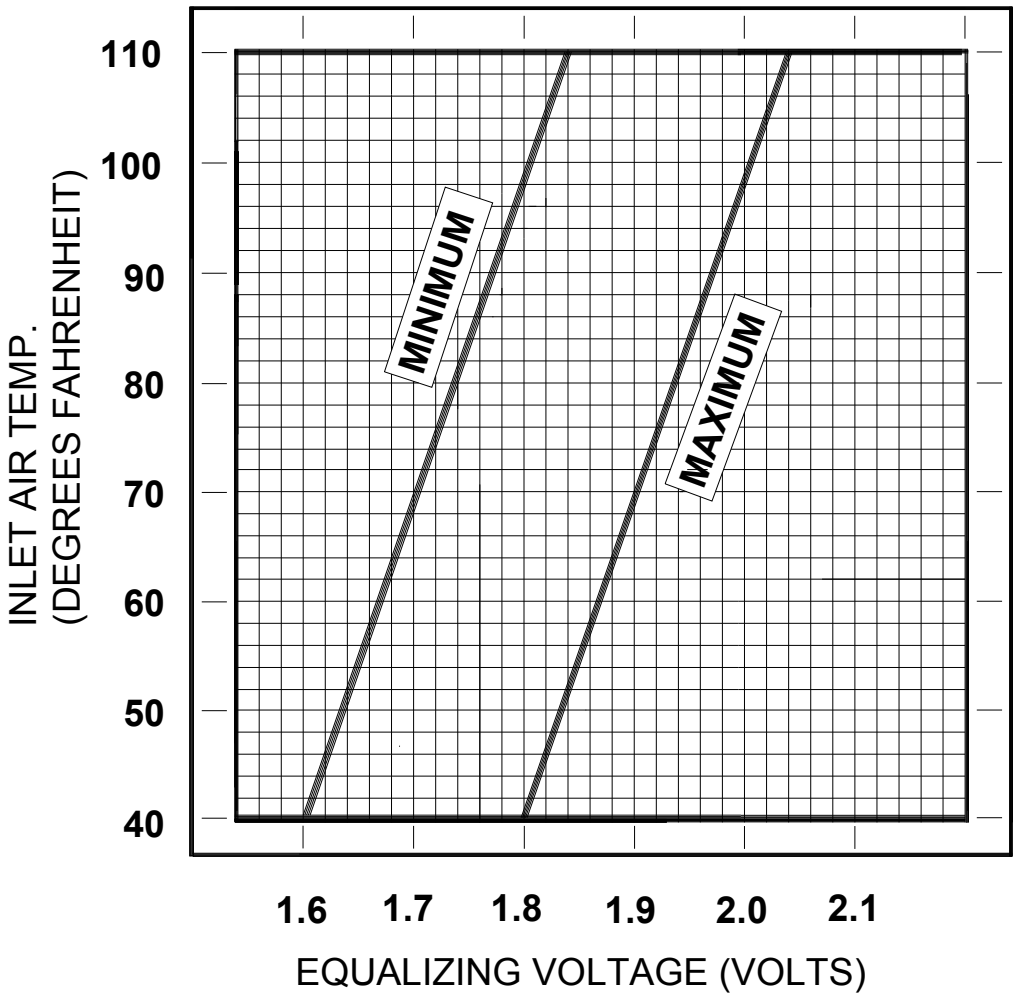

Figure 1007 - Equalizing Voltage Acceptance Limits
Models 23081-022, -022A, -023, -023A

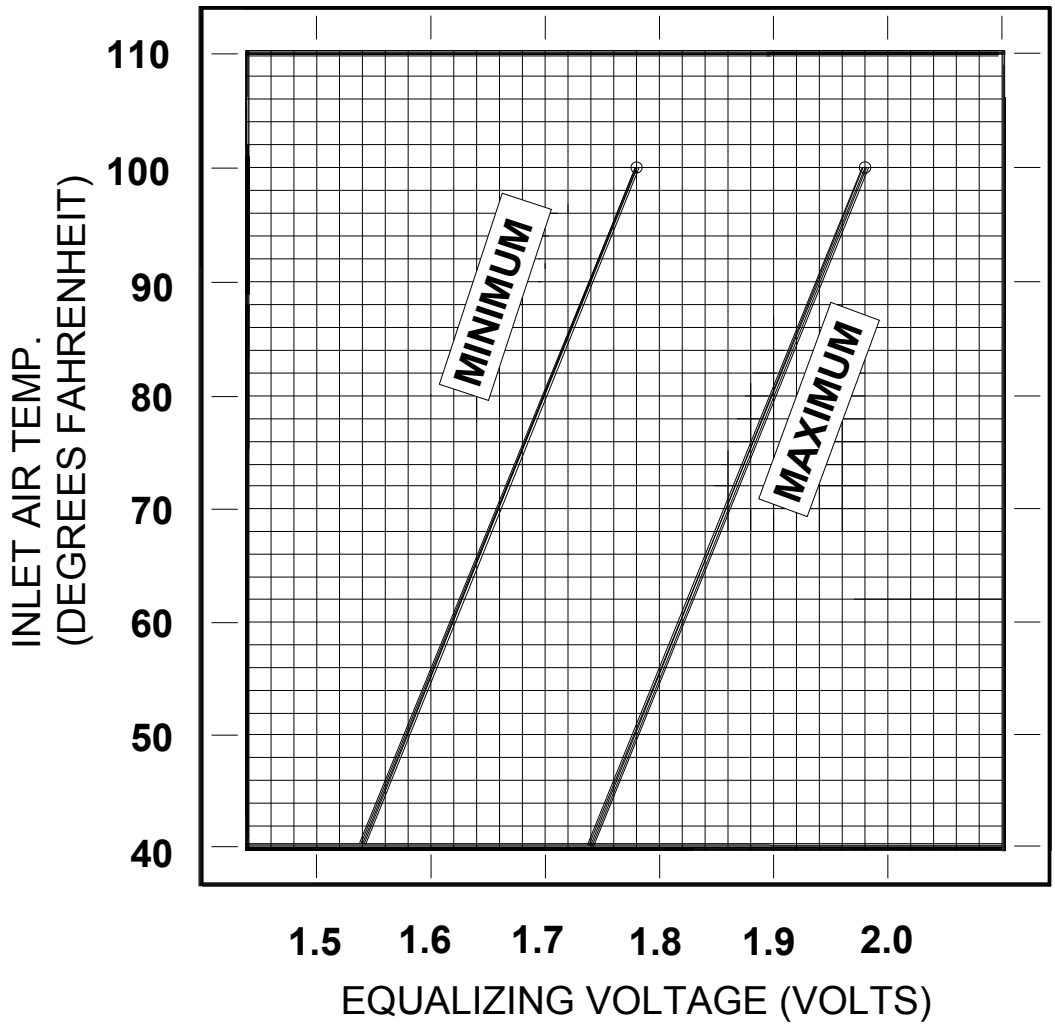

Figure 1008 - Equalizing Voltage Acceptance Limits
Models 23081-056, -059, -069, -070

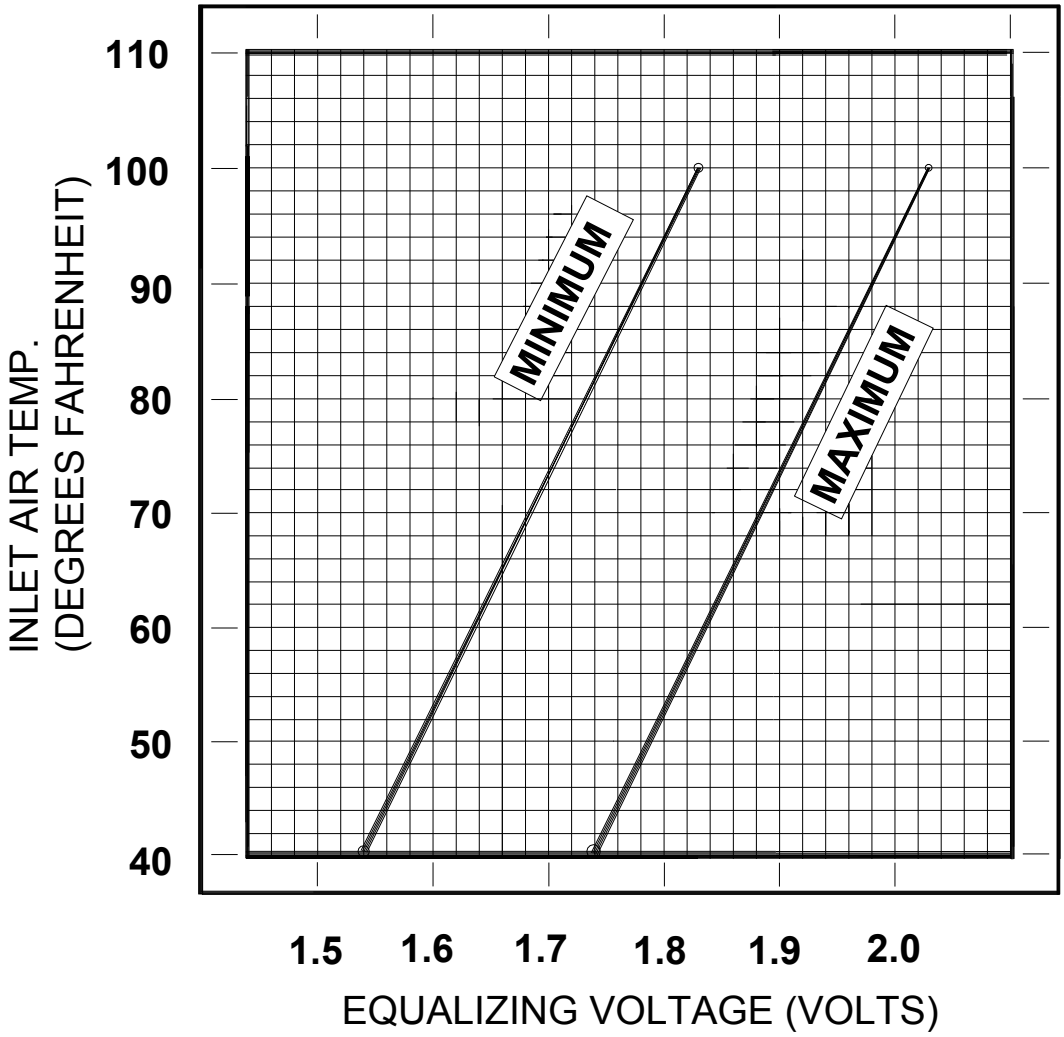

Figure 1009 - Equalizing Voltage Acceptance Limits
Model 23081-063

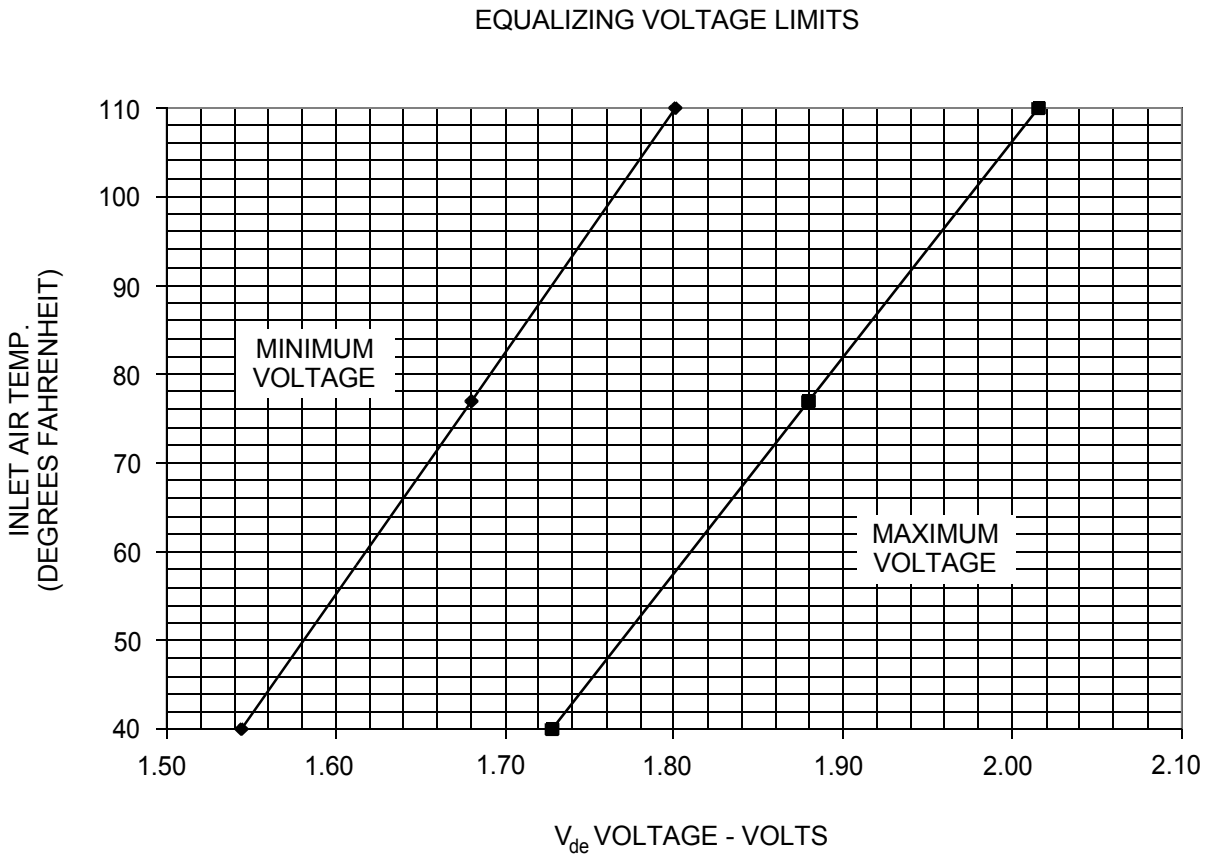

Figure 1010 - Equalizing Voltage Acceptance Limits Model 23081-078

C. Residual Voltage (For model 23081-078 only)

(1) Immediately after the minimum speed for regulation test, operate the generator as a generator at 8,100 rpm and no load with the field circuit open.

(2) Record the residual voltage (B+ to E-).

(3) Acceptance limit:

(a) The residual voltage must not be less than 0.5 V.

D. Overspeed Test

(1) With model hot as a result of the previous test, operate at 14,000 rpm, no load for five minutes.

(a) No indication of failure (throwing of varnish, solder, noise, vibration, loosening of parts).

E. Compounding
(For models 23081-007, -008, -011, -011-1, -012, -012-1, -024 only)

(1) Operate the model at 12,000 rpm, 30 V DC.

(2) Apply loads of 0, 50, 100, 150, and 200 A.

(3) Measure and Record field current at Terminal A (A_1).

(a) Field current must rise with increasing load.

F. Commutation Test

(1) Operate the model at 30 V DC (V_2) with the speed and the loads listed below:

(a) For models 23081-007, -008, -011, -011-1, -012, -012-1, -024:

1 12,000 rpm, 100 and 200 A (V_1/SH_1).

(b) For model 23081-078:

1 8,100 rpm, 200 A (V_1/SH_1), self cooled air with room ambient air-in.

2 12,634 rpm, 200 A (V_1/SH_1), self cooled air with room ambient air-in.

3 13,000 rpm, no load, self cooled air with room ambient air-in.

(c) For all other models:

1 12,000 rpm, 200 A (V_1/SH_1).

(2) Record the commutation.

(3) Visually examine the condition of commutation.

NOTE: The proper angle for viewing commutation is approximately 30 to 45 degrees from the brush box as shown in Figure 1011.

(4) Acceptance Limits:

(a) Acceptable (pin point) commutation must be interpreted to permit continuous sparking that extends 0.12 inch (3,0 mm) beyond the edge of the brush (210) and occasional (no more than 10 per minute) single sparks that extend up to 0.25 in. (6,4 mm) beyond the edge of the brush (210).

(b) Unacceptable commutation is considered to be continuous sparking or “arcing” that extends 0.25 in. (6,4 mm) beyond the edge of the brush (210).

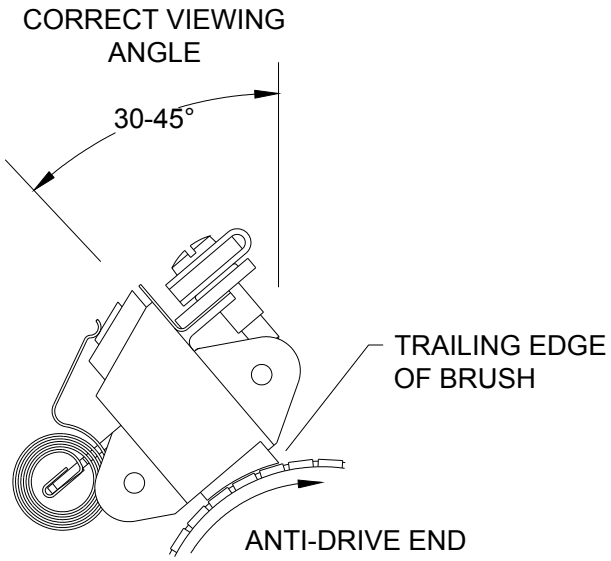

Figure 1011 - Commutation Viewing Angle

G. Speed Pickup Test (For models 23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)

(1) With the field switch open, adjust the model speed to 6,000 rpm.

(2) Connect a 20 kΩ ± 10% load across pins A and B of connector (360). See Figure 1012.

(3) Connect oscilloscope, set at 0.5 v/cm and 5 millisecond time sweep, across pins A and B of connector (360).

(4) With field switch (SW_3) open, adjust the model speed to 6,000 rpm.

(5) Adjust oscilloscope for display of 2 or 3 cycles.

(6) Measure and record peak-to-peak voltage of speed pickup output voltage.

(7) Observe speed pickup output voltage waveforms.

(8) Acceptance Limits:

(a) Peak-to-peak voltage: 2.5 V Min. to 4.5 V Max.

(b) Refer to Figure 1013 for acceptable voltage waveform.

NOTE: If unacceptable results are reached, adjust air gap of speed pickup for correct voltage reading and waveform.

(c) The frequency of the signal must be 4200 Hz at exactly 6,000 rpm.

NOTE: Reference GSIL 2008-01 to check if the correct spur gear was installed.

(9) Disconnect and remove load from pins A and B of connector (360).

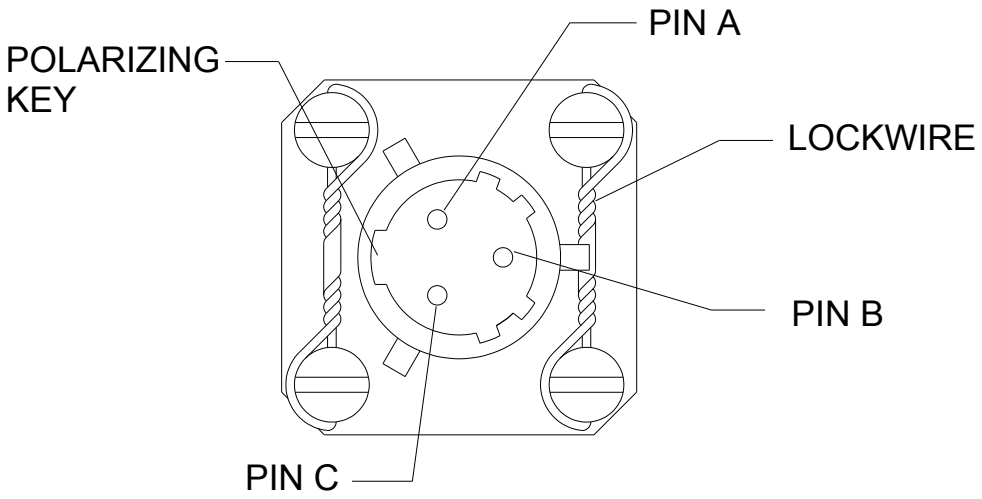

Figure 1012 - 3-Pin Connector Pin Locations

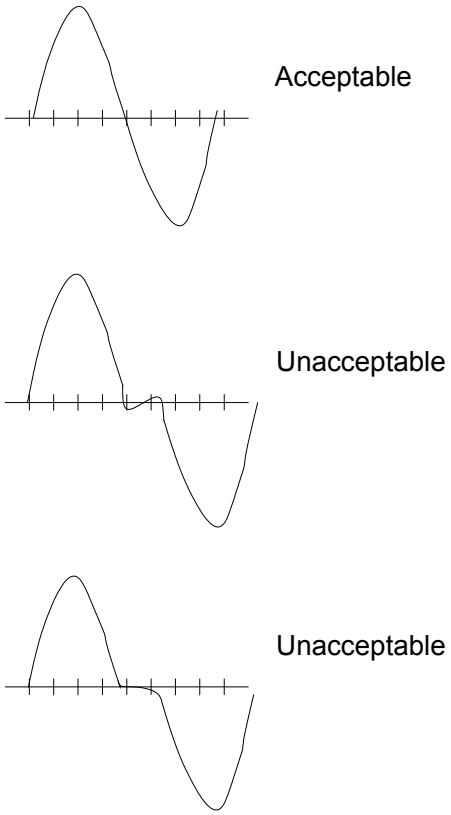

Figure 1013 - Voltage Wave Forms for Speed Pickup Test

H. Speed Pick-Up Dielectric Test
(For models 23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)

WARNING: **BEFORE YOU USE THE HIGH VOLTAGE TESTER, MAKE SURE THAT THE POWER SWITCH IS IN THE 'OFF' POSITION. MAKE SURE THAT NO PERSON TOUCHES THE EQUIPMENT OR THE PROBES. THIS WILL PREVENT DEATH OR INJURY FROM ELECTRIC SHOCK.**

CAUTION: DO NOT DO DIELECTRIC TESTING ON A MACHINE THAT HAS NOT BEEN FULLY CLEANED.

(1) Connect pins A and B of connector (360) together. See Figure 1012.

(2) Attach positive (red) lead of high pot tester to connected terminal leads.

(3) Attach negative (black) lead of high pot tester to an unfinished surface of the model frame.

CAUTION: INCREASE OR DECREASE THE TEST VOLTAGES SLOWLY (100 V PER SECOND, MAXIMUM) INCREASING OR DECREASING THE VOLTAGE TOO QUICKLY CAN CAUSE SERIOUS DAMAGE TO THE UNIT.

(4) Apply dielectric test voltage of 250 V RMS for one minute (commercial frequency) between combined connector pins and machine frame.

(5) Slowly decrease voltage to zero.

(6) Turn the power supply OFF.

(7) Disconnect the electrical test leads from the test unit.

(8) Acceptance Limits:

(a) Any arcing as evidenced by flashover (surface discharge), sparkover (air discharge), breakdown (puncture discharge) or leakage current more than 2 mA will be evidence of damp, dirty, weak or defective components.

I. DC Starter-Generator / DC Generator Dielectric Test

WARNING: **BEFORE YOU USE THE HIGH VOLTAGE TESTER, MAKE SURE THAT THE POWER SWITCH IS IN THE 'OFF' POSITION. MAKE SURE THAT NO PERSON TOUCHES THE EQUIPMENT OR THE PROBES. THIS WILL PREVENT DEATH OR INJURY FROM ELECTRIC SHOCK.**

CAUTION: DO NOT PERFORM DIELECTRIC TESTING DURING MAINTENANCE INSPECTION OR TROUBLESHOOTING OF THE UNIT AS IT MAY CAUSE CUMULATIVE DEGRADATION OF THE ELECTRICAL CIRCUIT INSULATION. THIS TEST IS RECOMMENDED ONLY FOR ACCEPTANCE TESTING OF AN OVERHAULED UNIT THAT HAS BEEN THOROUGHLY CLEANED.

(1) Disconnect the model from test circuit.

(2) Remove commutation viewing adapter.

(3) While machine is still hot as a result of testing, connect all stator terminal leads (A+, B+, D and E-), or (A+, B+, C+, D and E-) for C+ terminal models, of the terminal block together.

(4) Attach positive (red) lead of high pot tester to connected terminal leads.

(5) Attach negative (black) lead of high pot tester to an unfinished surface of the model frame.

WARNING: **FAILURE TO USE NECESSARY SAFETY PRECAUTIONS WHEN HANDLING HIGH VOLTAGE ELECTRICAL LEADS DURING HIGH POTENTIAL TESTING CAN CAUSE SERIOUS INJURY OR DEATH.**

CAUTION: INCREASE OR DECREASE THE TEST VOLTAGES SLOWLY (100 V PER SECOND, MAXIMUM). INCREASING OR DECREASING THE VOLTAGE TOO QUICKLY CAN CAUSE SERIOUS DAMAGE TO THE UNIT.

(6) Apply dielectric test voltage of 250 V AC RMS at commercial frequency for 50 or 60 Hz for one minute or 300 V AC RMS for one second (commercial frequency) between each circuit and between each circuit and machine frame.

(7) Slowly decrease voltage to zero.

(8) Turn the power supply OFF.

(9) Disconnect the electrical test leads from the test unit.

(10) Acceptance Limits:

(a) Any arcing as evidenced by flashover (surface discharge), sparkover (air discharge), breakdown (puncture discharge) or leakage current more than 5 mA will be evidence of damp, dirty, weak or defective components.

J. Locked Rotor Test (Shunt Start Models)
(For Models 23081-007, -008, -011, -011-1, -012, -012-1, -022, -022A, -023, -023A, -024, -056, -059, -069, -070)

CAUTION: THE MODEL 23081-078 DOES NOT REQUIRE STARTER TEST. DO NOT PERFORM LOCKED ROTOR TEST ON THE MODEL 23081-078, IT CAN CAUSE DAMAGE TO THE DRIVE SHAFT.

NOTE: This test is accomplished during acceptance testing. The model must have been overhauled and have an armature with a resurfaced commutator. Reference Standards Practice Document 1001.

(1) Rigidly mount the model to test stand by the mounting flange.

(2) Connect 0.0 Ω jumper between terminals A and B as shown in Figure 1014.

(3) With voltage output set to zero, turn power supply ON.

CAUTION: DO NOT ENERGIZE THE UNIT MORE THAN 4 SECONDS. TURN POWER OFF IMMEDIATELY IF POWER IS MORE THAN VOLTAGE AND AMPS OF ACCEPTANCE LIMITS.

(4) Increase voltage between terminals B and E (V_2) until output torque is 10.0 lb.ft. (13,6 Nm).

NOTE: If current or voltage exceeds acceptable limits before the required torque is measured, remove power. Rotate armature to a different orientation and repeat test.

(5) Measure and record line current (V_1/SH_1).

(6) Measure and record voltage between terminals B and E (V_2).

(7) Turn the power supply OFF.

(8) Acceptance Limits:

(a) B to E Voltage (V_2): 12.0 V DC Maximum.

(b) Line Current (V_1/SH_1): 400 A Maximum.

K. Locked Rotor Test (Series Start Models)
(For Models 23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073)

CAUTION: THE MODEL 23081-078 DOES NOT REQUIRE STARTER TEST. DO NOT PERFORM LOCKED ROTOR TEST ON THE MODEL 23081-078, IT CAN CAUSE DAMAGE TO THE DRIVE SHAFT.

NOTE: This test is accomplished during acceptance testing. The model must have been overhauled and have an armature with a resurfaced commutator. Reference Standards Practice Document 1001.

(1) Rigidly mount the model to test stand by the mounting flange.

(2) Open connection between terminals A and B. See Figure 1015.

(3) With voltage output set to zero, turn power supply ON.

CAUTION: DO NOT ENERGIZE THE UNIT MORE THAN 4 SECONDS. TURN POWER OFF IMMEDIATELY IF POWER IS MORE THAN VOLTAGE AND AMPS OF ACCEPTANCE LIMITS.

(4) With an open circuit between terminals A and B, increase voltage between terminals C and E (V_2) until output torque is 13.0 lb.ft. (17,6 Nm).

(5) Measure and record line current (V_1/SH_1).

(6) Measure and record voltage between terminals C and E (V_2).

NOTE: If current or voltage is more than acceptable limits before the required torque is measured, remove power. Rotate armature to a different orientation and repeat test.

(7) Turn the power supply OFF.

(8) Disconnect the electrical test leads and remove the starter-generator from the test stand.

(9) Acceptance Limits:

(a) C to E voltage is not to be more than 12 V DC.

(b) Line current (V_1/SH_1) is not to be more than 400 A.

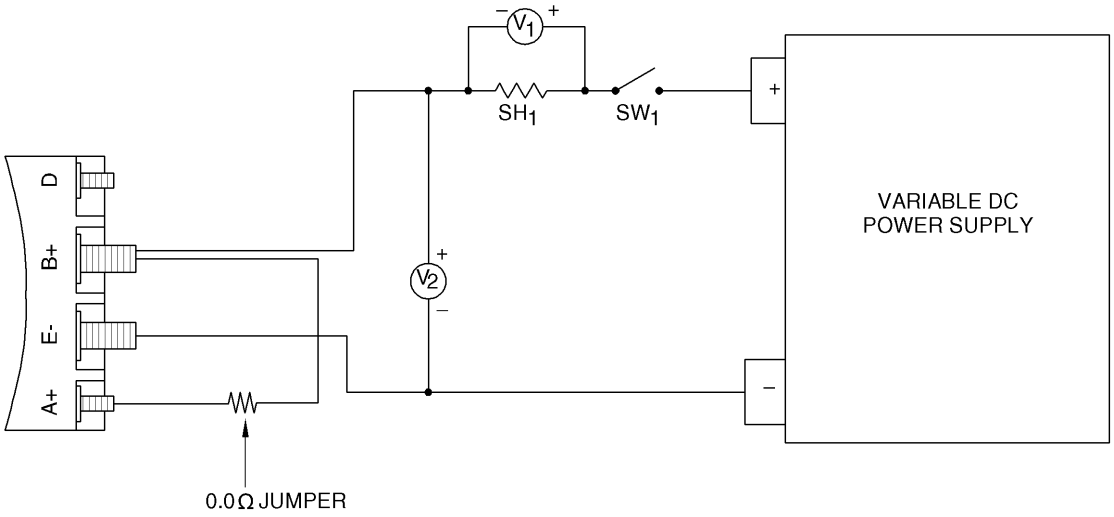

Figure 1014 - Shunt Start Locked Armature Test Connection Diagram
Models 23081-007, -008, -011, -011-1, -012, -012-1, -022, -022A, -023, -023A, -024, -056, -059, -069, -070

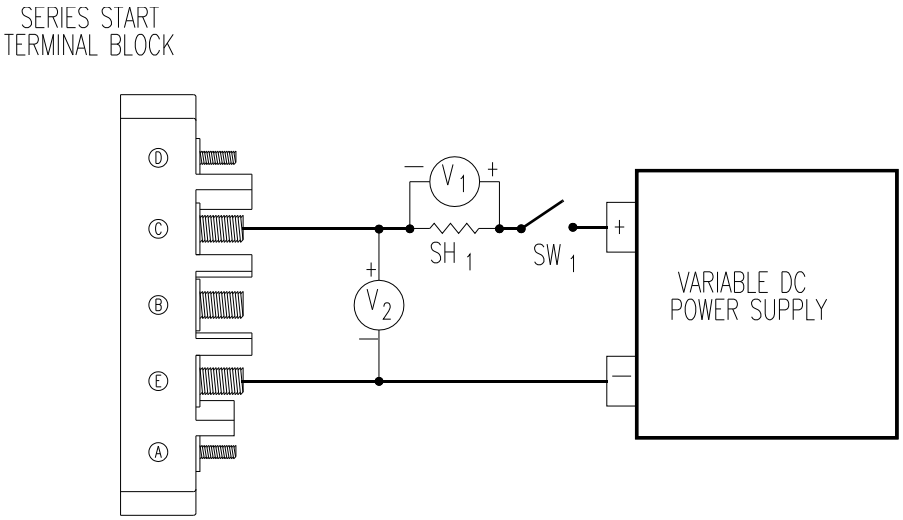

Figure 1015 - Series Start Locked Armature Test Connection Diagram
Models 23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073

L. Commutator Runout

CAUTION: DO NOT TOUCH THE POLISHED COMMUTATOR SURFACE WITH BARE HANDS. SKIN ACIDS AND OILS CAN CONTAMINATE CONDUCTING SURFACES, CAUSING CORROSION OR POOR ELECTRICAL CONTACT.

(1) Remove the commutation viewing adapter from the model.

(2) Put the model in a V-block or cradle support.

(3) Make sure there is sufficient access for the dial indicator to touch the commutator surface.

NOTE: You can get access to the commutator by removing one of the brushes from the complete brush holder or by finding an access area between the complete brush holders to do the measurement.

(4) Put the tip of the dial indicator on the brush wear path on the commutator surface.

NOTE: Make sure the dial indicator on the brush wear path to the commutator surface.

(5) Install a spline wrench on the drive shaft.

(6) Turn the drive shaft with constant force in the direction of rotation of the model.

(7) Measure bar-to-bar and total indicator reading (T.I.R.) run-out in the full circumference of the commutator.

(8) Acceptance Limits:

(a) Bar-to-Bar Runout: 0.0002 in. (0,005 mm) Max.

(b) Total Indicated Runout: 0.0008 in. (0,020 mm) Max.

8. Final Assembly After Acceptance Testing

After the model has successfully completed and passed acceptance testing, refer to the ASSEMBLY section for final assembly instructions.

9. Fault Isolation Table

The following tables list faults that can occur during acceptance testing, performance testing, or when the model is in service. For each fault, probable causes are listed along with related corrective actions. When a fault is detected, perform the corrective actions necessary to return the model to a serviceable condition. A complete acceptance test is required after corrective action is accomplished.

Fault	Probable Cause	Corrective Action
A. Maximum Speed for Regulation Test (For models 23081-007, -008, -011, -011-1, -012, -024 and -078 only)		
The field current limit is exceeded (A_1).	Too much load was applied during testing.	Check applied load at load bank. Apply correct load.
	Stator windings are shorted or grounded.	Clean stator and housing assembly, refer to procedure in CLEANING section.
		Dielectric test stator and housing assembly, refer to CHECK section.
		Replace stator and housing assembly if it fails the dielectric test.
	Armature is shorted or grounded.	Clean armature, refer to procedure in CLEANING section
		Dielectric test components of the armature, refer to the CHECK section.
		Replace armature if it fails the dielectric test.

Table 1004 - Fault Isolation Table

Fault	Probable Cause	Corrective Action
B. Continuous Operating Speed, Equalizing Voltage, and Minimum Speed Test		
High Equalizing Voltage (V_4).	Cooling air flow is low.	Check air flow path for obstructions. Clear all obstructions.
	Brushes are not properly seated.	Do brush run-in procedure. Refer to SPD 1006.
	Loose brush lead(s).	Inspect all brush leads for loose connections. If loose brush lead is found and no evidence of arcing is present, secure brush lead to complete brush holder. If loose brush is found and evidence of arcing is present, replace brush.
	Brush circuit(s) open.	Inspect all brush leads for an open circuit. If open circuit found, overhaul or repair the model as necessary.
	Armature is shorted or grounded.	Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, check armature for a short with a growler. Refer to the CHECK section. If armature fails growler check, replace armature.
	Stator and housing assembly is shorted or grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.
Field current (A_1) limit is exceeded.	Too much load applied during testing.	Check and adjust applied load at load bank, as necessary.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
Low external field resistance.	Cooling air flow is low.	Check air flow path for obstructions. Clear all obstructions.
	Brushes are not properly seated.	Do brush run-in procedure. Refer to SPD 1006.
	Brushes hung up in complete brush holder.	Inspect for proper positioning.
	Commutator surface incorrectly filmed or irregular.	Check armature. Refer to CHECK section. Repair commutator surface or replace armature. Refer to REPAIR section. Do brush run-in procedure. Refer to SPD 1006.
	Armature is shorted or grounded.	Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, check armature for a short with a growler. Refer to the CHECK section. If armature fails growler check, replace armature.
	Stator and housing assembly is shorted or grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
C. Residual Voltage Test (For model 23081-078)		
Residual voltage measurement is below minimum limit.	Insufficient magnetic properties in stator and housing assembly	Replace stator and housing assembly
	The magnetic fields can be out of alignment due to a fault or improper shutdown.	Operate as a generator under load on a drive stand to align the magnetic fields. Replace stator and housing assembly. Polarize the field IAW the Paragraph 15. of the REPAIR section.
D. Overspeed Test		
Noisy Operation.	Bearings are defective and/or installed incorrectly.	Replace bearings.
	Cooling fan blades rubbing or are out of balance.	Check fan blades and air inlet for damage. Replace cooling fan if damaged. Repair or replace air inlet if damaged. NOTE: There are no authorized repair procedures to balance cooling fans.
	Drive shaft spline is worn.	Disassemble drive shaft from the model. Inspect drive shaft IAW the CHECK section. Repair or replace drive shaft as necessary.
	Armature striking against the stator and housing assembly.	Disassemble the model. Check both parts for physical damage. Repair or replace damaged parts as necessary.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
DC Starter-Generator / DC Generator vibrates.	Bearings are defective and/or installed incorrectly.	Visually inspect bearings. Disassemble the model and replace bearings as necessary.
	Armature is out of balance.	Disassemble the model. Check armature balance. Refer to SPD 1001. Repair or replace armature as necessary in accordance with SPD 1001.
E. Compounding (For models 23081-007, -008, -011, -011-1, -012, -012-1 and 024 only)		
Shunt field current does not increase with load.	Stator compensating windings bad.	Disassemble the model. Replace stator and housing assembly.
F. Commutation Test		
Too much sparking with no load.	Brushes are not properly seated.	Do brush run-in procedure. Refer to SPD 1006.
	One or more complete brush holders are loose.	Check attaching hardware. If damage is found, REPAIR bearing and brush support assembly as necessary. Do dielectric test on bearing and brush support assembly according to procedure in CHECK section. Do brush run-in procedure. Refer to SPD 1006.
	Brush spring pressure below limit.	Check brush spring pressure. Refer to SPD 1006. REPLACE brush springs that do not meet limits in FITS AND CLEARANCES section.
	An armature winding is partially or completely open.	REPLACE armature.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
Too much sparking with no load. (Continued)	Commutator surface incorrectly filmed or irregular.	Check armature. Refer to CHECK section. REPAIR commutator surface or replace armature. Refer to REPAIR section. Do brush run-in procedure. Refer to SPD 1006.
	Stator and housing assembly is shorted or grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, REPLACE stator and housing assembly.
	Armature is out of balance.	Check armature balance. Refer to SPD 1001. REPAIR or REPLACE armature as necessary.
G. Speed Pickup Test (For models 23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)		
No output voltage.	Speed pickup leads are shorted to the model frame.	Check for continuity between the model frame and speed pickup leads. Replace speed pickup if continuity is found.
	Speed pickup coil or lead wires are open.	Check speed pickup for continuity between speed pickup leads. Replace speed pickup if continuity is not found.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
Output voltage not within limits.	Incorrect air gap between speed pickup and spur gear.	CAUTION: DO NOT ADJUST THE AIR GAP WHILE THE MODEL IS OPERATING. ADJUSTING THE AIR GAP DURING OPERATION CAN DAMAGE THE EQUIPMENT. Adjust air gap to be within following limits: 0.004 to 0.006 inch (0,102 to 0,152 mm).
	Low output.	Reduce air gap. See Caution.
	High output.	Increase air gap. See Caution.
Speed pickup waveform is incorrect.	Incorrect air gap between speed pickup and spur gear.	Adjust air gap to be within following limits: 0.004 to 0.006 inch (0,102 to 0,152 mm). See Caution.
	Speed pickup spur gear is damaged.	Replace speed pickup spur gear.
	Speed pickup is damaged.	Replace speed pickup.
H. Speed Pickup Dielectric Test (For models 23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)		
Speed pickup insulation breakdown.	Lead wires are grounded to stator and housing assembly or speed pickup has short to ground.	Check for continuity between the model frame and speed pickup leads. Replace speed pickup if continuity is found.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
I. DC Starter-Generator / DC Generator Dielectric Test		
DC Starter-Generator / DC Generator insulation breakdown.	Bearing and brush support assembly is grounded.	Disassemble the model. Clean bearing and brush support assembly. Refer to CLEANING section. Do dielectric test on bearing and brush support assembly according to procedure in CHECK section. If bearing and brush support assembly fails dielectric test, replace insulating sleeves and washers, according to the procedures in the disassembly and assembly section.
	Armature is grounded.	Disassemble the model. Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, check armature for a short with a growler. Refer to the CHECK section. If armature fails growler check, replace armature.
	Stator and housing assembly is grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
J. Locked Rotor Test (For all models except 23081-078)		
Low or no torque.	Stator and housing assembly is shorted or grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.
	Armature is shorted or grounded.	Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, check armature for a short with a growler. Refer to the CHECK section. If armature fails growler check, replace armature.
	Brushes incorrectly seated or installed.	Remove the brush cover. Using a wire hook tool, pull brush sets away from commutator surface. CHECK commutator surface for damage. REPAIR, if limits are not exceeded in FITS AND CLEARANCES section. Do brush run-in procedure. Refer to SPD 1006. Re-test the model.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
Low or no torque. (Continued)	Open brush circuit.	Remove the brush cover. Inspect all brush leads for an open circuit. If an open circuit is found, replace brush (new brush only). Do brush run-in procedure. Refer to SPD 1006. Re-test the model.
Calculated efficiency is below minimum limit.	Windings hot from testing.	Allow the windings to cool. Repeat test.
	Field current is low.	Check field circuit for high resistance.
	Brushes are incorrectly seated or installed.	Refer to SPD 1006 for brush installation, seating, and run-in procedures.
Time to reach specified rpm exceeds minimum limit.	Windings hot from testing.	Allow the windings to cool. Repeat test.
	Field current is low.	Check field circuit for high resistance.
	Brushes are incorrectly seated or installed.	Refer to SPD 1006 for brush installation, seating, and run-in procedures.

Table 1004 - Fault Isolation Table (Continued)

Fault	Probable Cause	Corrective Action
Line current (V_1/SH_1) or voltage between terminals B and E (V_2) exceeded.	Stator and housing assembly is shorted or grounded.	Disassemble the model. Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.
	Armature is shorted or grounded.	Disassemble the model. Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, check armature for a short with a growler. Refer to the CHECK section. If armature fails growler check, replace armature.
K. Commutator Runout Check		
Bar-to-bar runout or total indicated runout exceeded.	Shifted commutator bars.	REPAIR commutator surface. REPLACE armature if not repairable.

Table 1004 - Fault Isolation Table (Continued)

10. Component Testing Fault Isolation Table

Wherever possible in the component testing fault isolation procedures, repairs are made. When repair is not possible, replace components.

Fault	Probable Cause	Corrective Action
A. Stator and Housing Assembly Dielectric Test		
Insulation breakdown	Stator and housing assembly is shorted or grounded.	Clean stator and housing assembly. Refer to CLEANING section. Do dielectric test on stator and housing assembly according to procedure in CHECK section. If stator and housing assembly fails dielectric tests, replace stator and housing assembly.
B. Armature Dielectric Test		
Insulation breakdown	Armature is shorted or grounded.	Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, clean armature. Refer to CLEANING section. Repeat dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests after a second cleaning, repeat test between commutator bars and retaining bands.

Table 1005 - Component Testing Fault Isolation Table

Fault	Probable Cause	Corrective Action
C. Armature Dielectric Test, Between Commutator Bars and Retaining Bands		
Insulation breakdown	Grounded armature.	Clean armature. Refer to CLEANING section. Do dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests, clean armature. Refer to CLEANING section. Repeat dielectric test on armature according to procedure in CHECK section. If armature fails dielectric tests after a second cleaning, replace armature.
D. Bearing and Brush Support Assembly Dielectric Test		
Insulation breakdown	Grounded armature.	Clean bearing and brush support assembly. Refer to CLEANING section. NOTE: Leads for filter capacitor should be disconnected. Do dielectric test on bearing and brush support assembly according to procedure in CHECK section. If bearing and brush support assembly fails dielectric test, clean bearing and brush support assembly. Refer to CLEANING section. Replace insulating sleeves and washers. Repeat dielectric test on bearing and brush support assembly according to procedure in CHECK section. If bearing and brush support assembly fails dielectric tests after a second cleaning, replace bearing and brush support assembly.

Table 1005 - Component Testing Fault Isolation Table (Continued)

VERIFICATION / FINAL ACCEPTANCE DATA SHEET

Model Number: 23081- Inspected by: _____

Serial Number: _____ Date: _____

Inspection/Test	Requirements/Limits	Measurements	Accept	Reject
Visual inspection	Check for physical damage			
Maximum Speed for Regulation Test (23081-007, -008, -011, -011-1, -012, -012-1, -024 and -078)	Voltage between terminals B and A, (V_3)	V DC		
	Field current, (A_1) at terminal A (10 A max)	A		
	External field resistance must not be greater than 35 Ω	Ω		
Continuous Operating Speed, Equalizing Voltage and Minimum Speed Test	Measured equalizing voltage D and E (V_4)	V DC		
	Temperature	°F		
	Frame temperature	°F		
	Field current (A_1) (10 A max)	A		
	Voltage between terminals B and A (V_3)	V DC		
	Calculated external field circuit resistance (0.4 Ω min (For all models, except 23081-078)) (0.5 Ω min (For model 23081-078))	Ω		
	Calculated equalizing voltage (D-E)	V DC		
Residual Voltage (23081-078)	Voltage between terminals B and E (0.5 min)	V DC		
Overspeed Test	No sign of electrical or mechanical failure			
Compounding (23081-007, -008, -011, -011-1, -012, -012-1, -024)	Field current rises with increasing load.	A		
		A		
		A		
		A		

Inspection/Test	Requirements/Limits	Measurements	Accept	Reject
Commutation Test (12,000 rpm at 100 A) (23081-007, -008, -011, -011-1, -012, -012-1, -024)	Commutation must not exceed pinpoint sparking.			
Commutation Test (12,000 rpm at 200 A) (For all models except 23081-078)	Commutation must not exceed pinpoint sparking.			
Commutation Test (8,100 rpm at 200 A) (23081-078)	Commutation must not exceed pinpoint sparking.			
Commutation Test (12,634 rpm at 200 A) (23081-078)	Commutation must not exceed pinpoint sparking.			
Commutation Test (13,000 rpm at no load) (23081-078)	Commutation must not exceed pinpoint sparking.			
Speed Pickup Test (23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)	Peak-to-peak voltage (2.5 to 4.5 V DC)	V DC		
	Voltage waveform			
	Frequency at 6,000 RPM	Hz		
Speed Pickup Dielectric Test (23081-007, -008, 022, -022A, -023, -023A, -024, -056, -059, -069, -070)	No indication of insulation breakdown			
DC Starter-Generator / DC Generator Dielectric Test	No indication of insulation breakdown. (5 mA leakage max)	mA		

Inspection/Test	Requirements/Limits	Measurements	Accept	Reject
Locked Rotor Test (Shunt Start) (23081-007, -008, -011, -011-1, -012, -012-1, -022, -022A, -023, -023A, -024, -056, -059, -069, -070)	Output torque 10.0 lb.ft (13,6 Nm)	lb.ft (Nm)		
	Line current (V_1/SH_1) (400 A Max).	A		
	B to E voltage (V_2) (12 V DC max).	V DC		
Locked Rotor Test (Series Start) (23081-001, -002, -003, -004, -017, -018, -042, -043, -057, -063, -072, -073)	Output torque 13.0 lb.ft (17,6 Nm).	lb.ft (Nm)		
	Line current (V_1/SH_1) (400 A max).	A		
	C to E voltage (V_2) (12 V DC max).	V DC		
Commutator Runout	Bar-to-bar runout (0.0002 inch (0,005 mm) max)	in. mm		
	Total indicated runout (0.0008 inch (0,020 mm) max)	in. mm		

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SCHEMATICS AND WIRING DIAGRAMS

1. Introduction

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DISASSEMBLY

1. Introduction

This section provides disassembly procedures for the 23081 Series I models. Disassemble only to the extent required to replace defective parts, unless complete overhaul is required. Additional disassembly of major components is not necessary unless specifically instructed in the CHECK or TESTING AND FAULT ISOLATION sections. Before disassembly, wipe exterior surfaces with a clean cloth to remove dust, dirt, or other foreign materials.

Do not remove threaded inserts. Refer to CHECK section for details.

Do not disassemble riveted parts. Refer to REPAIR section to determine whether part(s) can be replaced.

Do not open or desolder permanent connections unless replacement of worn, damaged, or defective parts is necessary. Tag electrical wires before removal. All soldering and desoldering procedures must be done to ANSI/IPC J-STD-001.

During overhaul, replace bearings, brushes and O-rings. Parts that have been removed during disassembly, such as, insulating parts, retaining rings, screws, self-locking nuts and lock washers, must be discarded regardless of their condition. The screws that attach the brush leads to the brush holder do not need to be replaced unless damaged.

NOTE: When the model is removed for service, the QAD kit and terminal block cover usually stay on the aircraft.

2. Disassembly Tools

In addition to standard shop tools, those special tools, fixtures, and equipment listed in Table 3001 are required for disassembly.

WARNING: YOU MUST OBEY THE TOOL AND EQUIPMENT MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Tool Description	Source/Figure Reference
Adapter, Anti-drive End Armature Shaft	Figure 9001
Adapter, Drive End Armature Shaft	Figure 9002
Arbor Press	Commercially Available
Bearing Puller (Snap-On A78 or Equivalent)	Commercially Available
Driver, Dampener Hub	Figure 9006
Driver, Inner Race Bearing	Figure 9004

Table 3001 - Disassembly Tools

Tool Description	Source/Figure Reference
External Snap Ring Pliers	Commercially Available
Pin Insertion/Extraction Tool	Commercially Available
Plastic or Leather Mallet	Commercially Available
Spline Wrench	Figure 9015
Support, Anti-drive End Hub	Figure 9011
Support, Bearing and Brush Support Assembly	Figure 9009
Support, Drive End Outboard Hub	Figure 9012
Support, Horizontal Stator and Housing Assembly	Figure 9013
Tweezers	Commercially Available
Wire Hook Tool	Commercially Available

Table 3001 - Disassembly Tools (Continued)

3. Disassembly Materials

Materials necessary for the model disassembly are listed in Table 3002.

NOTE: Disassembly materials are not available from Safran Power. All items can be purchased commercially.

WARNING: YOU MUST OBEY THE MATERIAL MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Material	Description/Specification	Source (CAGE Code)
Foam Cushion	N/A	Commercially Available
Isopropyl Alcohol	TT-I-735, Grade A See **WARNING** before using this material. Flash Point: 53 °F (12 °C), FLAMMABLE Refer to the Material Safety Data (MSD) Sheet for the material for additional safety information	Commercially Available
Masking Tape	N/A	Commercially Available

Table 3002 - Disassembly Materials

4. Disassembly of the DC Starter-Generator / DC Generator

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers in Figure 10001 of ILLUSTRATED PARTS LIST.

A. Remove QAD Mounting Kit from DC Starter-Generator / DC Generator, if present

NOTE: The V-retainer coupling usually stays on the aircraft when the model is removed for service, check and inspection of the part is not required if not present.

NOTE: The mounting adapter coupling usually stays on the aircraft when the model is removed for service, check and inspection of the part is not required if not present.

(1) Loosen self-locking nut (30) and remove V-retainer coupling (20) from the starter-generator / generator.

(2) Remove QAD and mounting adapter (50) from starter-generator / generator.

B. Remove the Identification Plate (60), Information Plate (80), Caution Decal (100), FAA-PMA Label (-110) and Modification Label (-120) from Stator and Housing Assembly (550)

NOTE: Do not remove these items unless they are damaged or unreadable.

NOTE: Minor scratches and superficial damage that do not affect the legibility are not reason to replace the ID plate.

(1) Use a smooth, flat tool that will not scratch the stator housing to wedge under the edge of the identification plate or information plate and pry up on the corners of the plate near the drive screws that hold it in place to dislodge the plate from the housing.

NOTE: This will tear the corners of the light metal identification plate.

(2) Remove the remaining metal from under the head of each drive screw.

(3) Use a small pair of sidecutters with the flat face to the housing to wedge in under the head of each drive screw to hold the shank of the screw and turn out counterclockwise.

(4) Discard the four drive screws (70) from the identification plate, and discard the two drive screws (90) from the information plate (80) from the stator and housing assembly (550).

(5) Keep the identification plate for reference when transferring the information to a replacement identification plate (60).

WARNING: HANDLE THE TOOL CAREFULLY. WEAR EYE PROTECTION.

(6) Remove and discard the caution decal (100), FAA-PMA label (-110) and modification label (-120) from stator and housing assembly (550).

(a) Lift the corner of the caution decal, FAA-PMA label and modification label with a sharp tool.

(b) Peel off and discard the caution decal, FAA-PMA label and modification label from the model.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(c) Use isopropyl alcohol to remove adhesive residue.

(d) Wipe dry with a soft dry cloth.

C. Remove Terminal Block Cover (130) from DC Starter-Generator / DC Generator

NOTE: When the model is removed from service, the terminal block cover is usually kept with the aircraft.

(1) For models 23081-022, -022A, -023, -023A, -056, -059, -069 and -070:

(a) Pull cover off of terminal block. See Figure 3001.

(2) For models 23081-007, -008, -011, -011-1, -012, 012-1, -024:

(a) Remove and discard the two screws (140) that attach terminal block cover to terminal block.

(b) Remove terminal block cover by pulling it off the terminal block. See Figure 3001.

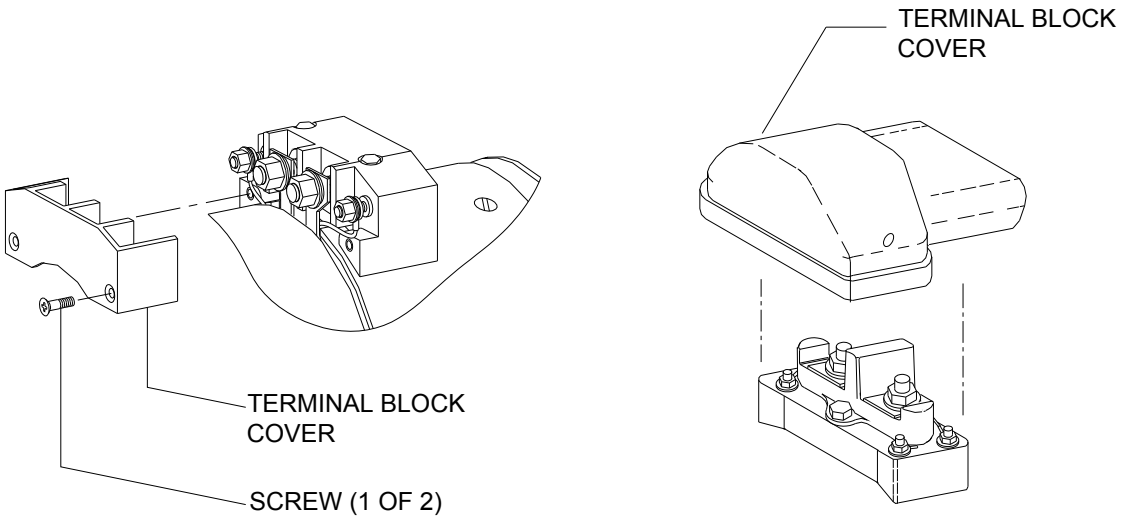

Figure 3001 - Removing Terminal Block Cover

D. Remove Air Inlet (150) from DC Starter-Generator / DC Generator

(1) Remove and discard the screws (200) that attach the air inlet to bearing and brush support assembly (320).

(2) Remove air inlet.

E. If necessary, Disassemble Air Inlet Assembly (150)

(1) Remove and discard the flat washers (-190) and rivets (-180) from air inlet subassembly (160) and screen (170).

(2) Remove the screen (170) from the inside of the air inlet.

F. Remove Brushes (210) from Bearing and Brush Support Assembly (320) (See Figure 3002)

NOTE: If brushes (210) are to be reused, identify the brushes (210) and complete brush holders (10002-30) with the numbers 1 through 4.

(1) Remove the screw (220) that attaches brush (210) shunt lead to complete brush holder (10002-30).

CAUTION: RAISE AND LOWER BRUSH SPRINGS SLOWLY. DO NOT LIFT BRUSH SPRINGS MORE THAN NEEDED TO REMOVE BRUSHES FROM EACH COMPLETE BRUSH HOLDER.

(2) Use a wire hook tool to lift two brush springs (10002-50) away from brush (210). Remove brush (210) from complete brush holder (10002-30).

(3) Slowly return brush springs (10002-50) to a resting position on complete brush holder (10002-30).

(4) Identify brush (210) with the number on complete brush holder (10002-30) from which it was removed.

(5) Repeat Paragraph 4.F.(1) thru Paragraph 4.F.(4) for each remaining brush (210).

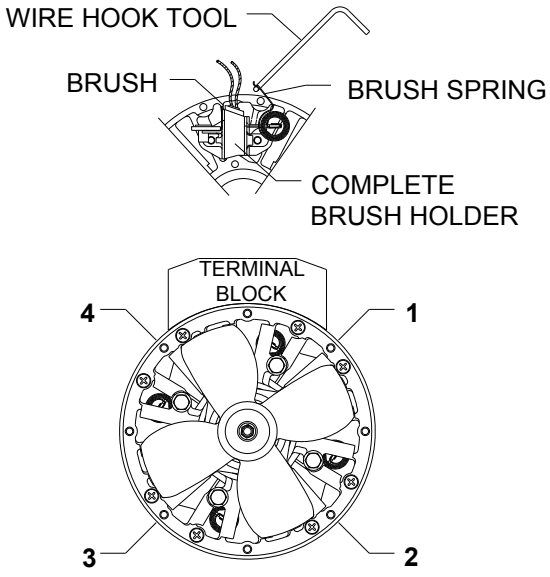

Figure 3002 - Brush Set Locations and Numbers

G. Remove Fan (230) from Drive Shaft (260) (See Figure 3003)

(1) Put a spline wrench on drive spline to prevent drive shaft from turning while removing self-locking nut.

(2) Remove and discard the self-locking nut (240) and flat washer (250) from drive shaft (260).

(3) Slide the fan (230) off of the drive shaft (260).

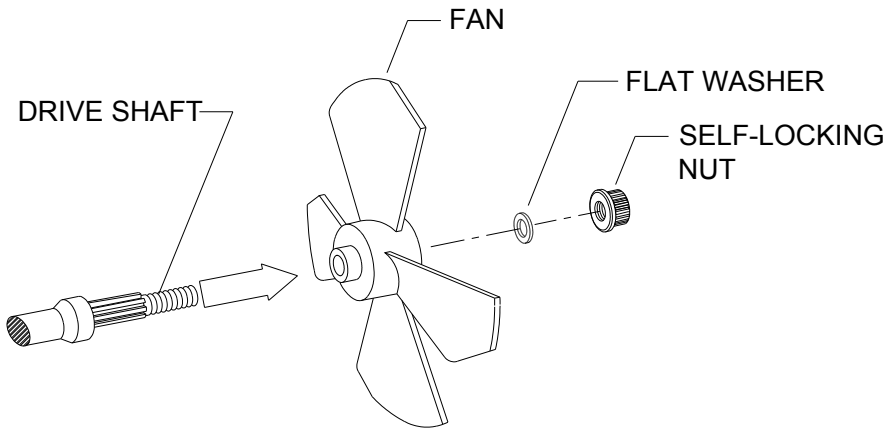

Figure 3003 - Removing Fan From Drive Shaft

H. Remove Drive Shaft (260) with Attached Dampener Hub (300), Dampener Plate (290), O-ring (270), and Friction Ring (280) from Armature (480) Shaft

CAUTION: DO NOT HIT WITH HIGH FORCE WHEN YOU TAP THE DRIVE SHAFT. THE HIGH FORCE CAN CAUSE DAMAGE TO THE DRIVE SHAFT THREAD.

(1) Lightly tap the anti-drive end of drive shaft (260) with a plastic or leather mallet to disengage it from armature (480) shaft.

(2) Pull drive shaft (260) out of the drive end of the model.

WARNING: DO NOT CUT, RIP, OR SAND ASBESTOS-CONTAINING MATERIALS. LEAVE UNDAMAGED MATERIALS ALONE AND, TO THE EXTENT POSSIBLE, PREVENT THEM FROM BEING DAMAGED, DISTURBED, OR TOUCHED. DISCARD MATERIAL BY FIRST CHECKING WITH LOCAL HEALTH, ENVIRONMENTAL, OR OTHER APPROPRIATE OFFICIALS TO FIND OUT ABOUT PROPER HANDLING AND DISPOSAL PROCEDURES.

(3) Remove friction ring (280) from drive shaft (260). If friction ring is Part No. 02-5600-05, it must be discarded because it contains asbestos.

(4) Remove dampener plate (290) from dampener hub (300) on drive shaft (260).

(5) If present, remove and discard O-ring (270) from drive shaft (260).

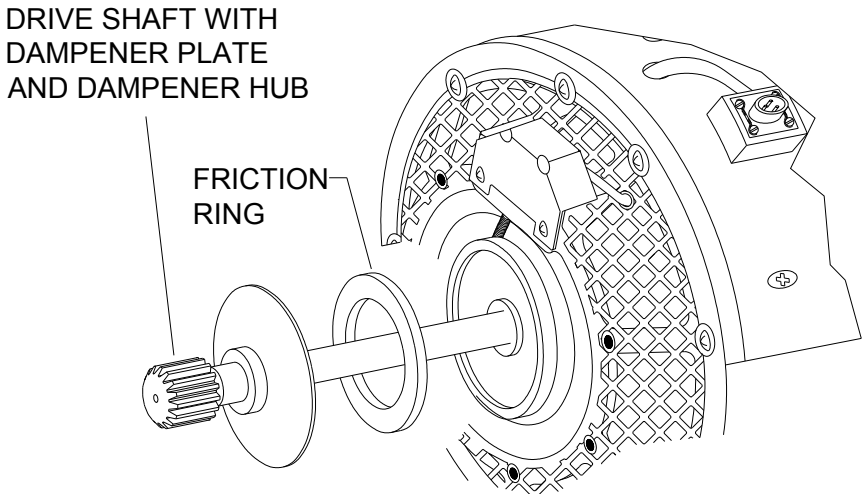

Figure 3004 - Drive Shaft with Dampener Plate and Dampener Hub

I. Remove Dampener Hub (300) from Drive Shaft (260) (See Figure 3005)

NOTE: Do not remove dampener hub from drive shaft unless hub or drive shaft are damaged.

CAUTION: PUT A FOAM CUSHION UNDER DRIVE SHAFT TO PREVENT IT FROM BEING DAMAGED.

(1) Set a foam cushion and a bearing hub support on an arbor press table.

(2) Set a dampener hub driver on the drive shaft (260) on the flat side of dampener hub (300).

(3) Insert drive shaft (260) through the center of the drive end hub support until dampener hub driver is seated on the drive shaft (260).

(4) Slowly press drive shaft (260) down into the drive end hub support until dampener hub (300) disengages from drive shaft (260).

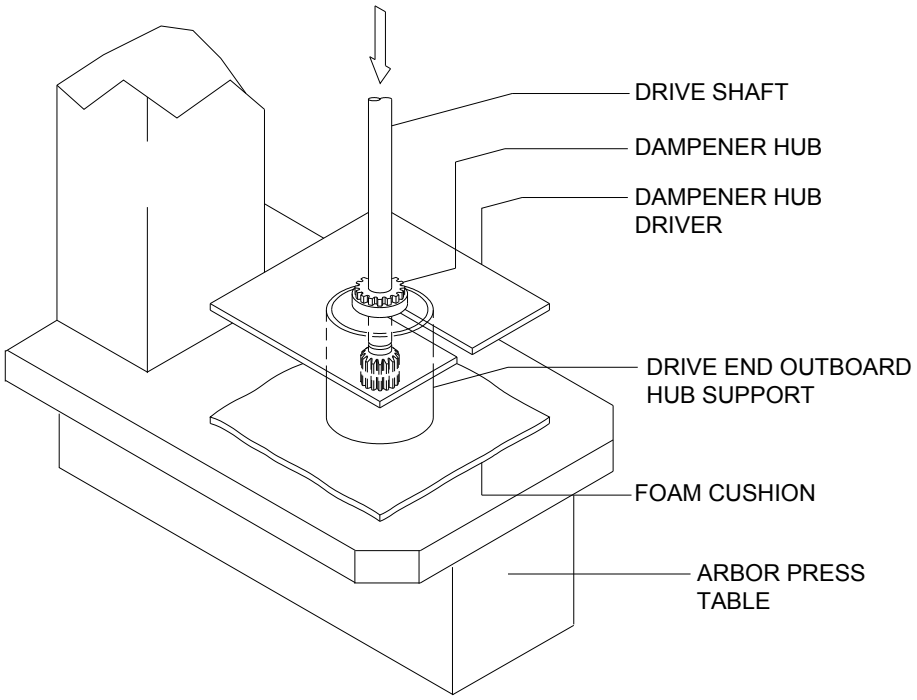

Figure 3005 - Remove the Dampener Hub from the Drive Shaft

J. Remove Dampener Backplate or Dampener Backplate and Gear (310), Retaining Ring (540) and Baffle Disc (outboard) (530) from Armature (480) Shaft (See Figure 3006)

CAUTION: FAILURE TO USE THE DRIVE END ARMATURE SHAFT ADAPTER WHEN REMOVING THE DAMPENER BACKPLATE AND SPUR GEAR CAN CAUSE PERMANENT DAMAGE TO THE ARMATURE SHAFT.

(1) Put drive end armature shaft adapter into the drive end of armature (480) shaft.

CAUTION: TAPE THE JAWS OF THE BEARING PULLER TO PREVENT DAMAGE TO THE DAMPENER BACKPLATE DURING REMOVAL.

(2) Remove dampener backplate (290) from armature (480) shaft with a suitable bearing puller.

(3) Use external snap ring pliers to remove and discard retaining ring (540).

(4) Remove and retain baffle disc (outboard) (530).

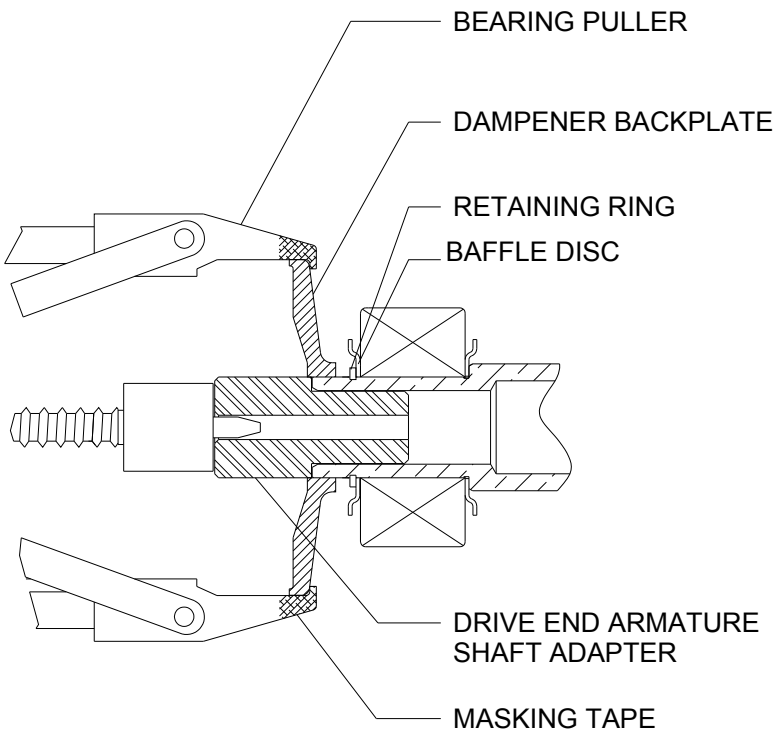

Figure 3006 - Removing Dampener Backplate

K. Remove Bearing and Brush Support Assembly (320) and Attached Armature (480) from Stator and Housing Assembly (550) (See Figure 3007)

(1) Put the model on a horizontal stator and housing assembly support.

CAUTION: MAKE SURE YOU USE THE DRIVE END ARMATURE SHAFT ADAPTER TO REMOVE THE BEARING AND BRUSH SUPPORT ASSEMBLY AND ATTACHED ARMATURE. THIS WILL PREVENT DAMAGE TO THE ARMATURE SHAFT.

(2) Remove and discard eight self-locking screws (330), eight lock washers (340, and eight flat washers (350) that attach the bearing and brush support assembly (320) to stator and housing assembly (550).

(3) Put the drive end armature shaft adapter into the armature (480) shaft.

(4) Tap on the drive end armature shaft adapter with a rubber or plastic mallet until the bearing and brush support assembly (320) disconnects from the stator and housing assembly (550).

(5) Carefully remove the bearing and brush support assembly (320), together with the armature (480), from the stator and housing assembly (550).

NOTE: The drive end ball bearing (520) and baffle disc (530) (inboard) will stay on the armature (480) shaft when removed from the stator and housing assembly (550).

(6) Carefully remove bearing and brush support assembly (with attached armature) from stator and housing assembly.

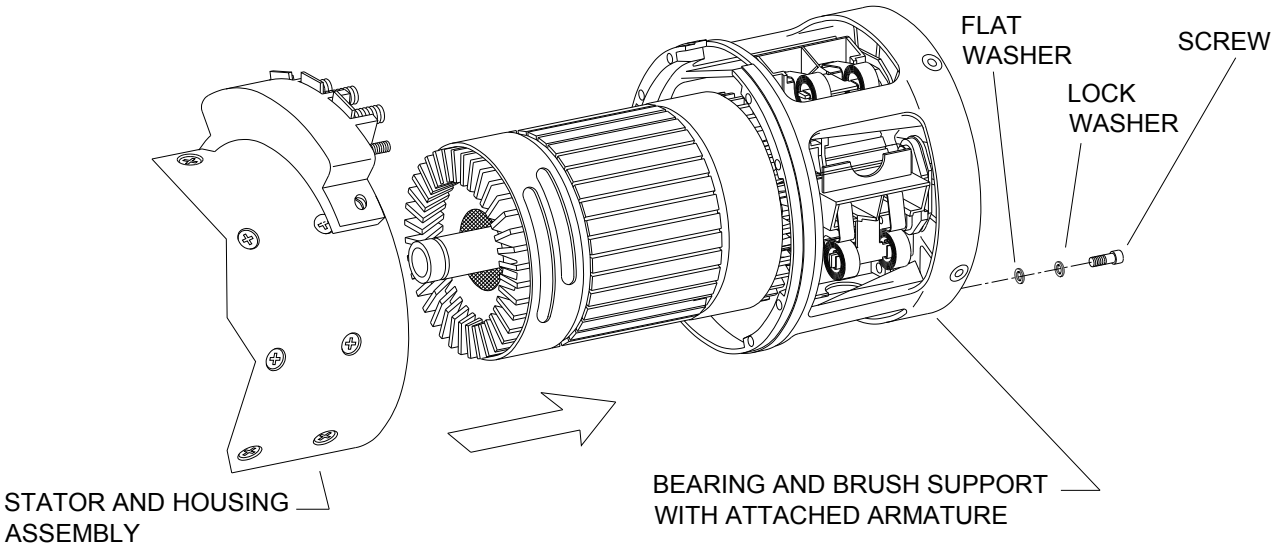

Figure 3007 - Removing Bearing and Brush Support Assembly

L. Remove 3-pin Connector (360) and if applicable Spacer (370), from Stator and Housing Assembly (550) (See Figure 3008)

NOTE: Only applicable to models: 23081-007, -008, -022, -022A, -023, -023A, 024, -056, -059, -069 and -070.

(1) Remove and discard the lockwire from four screws (380) that attach the 3-pin connector (360) and spacer (370) to stator and housing assembly (550).

(2) Remove four screws (380) and pull the connector (360) from stator and housing assembly (550) to length of electrical wire.

(3) Carefully desolder the leads from the pins.

NOTE: All desoldering procedures must be done to ANSI/IPC J-STD-001.

(4) Remove pins A, B and C from connector using pin insertion/extraction tool. Set 3-pin connector (360) and spacer (370, if applicable) aside.

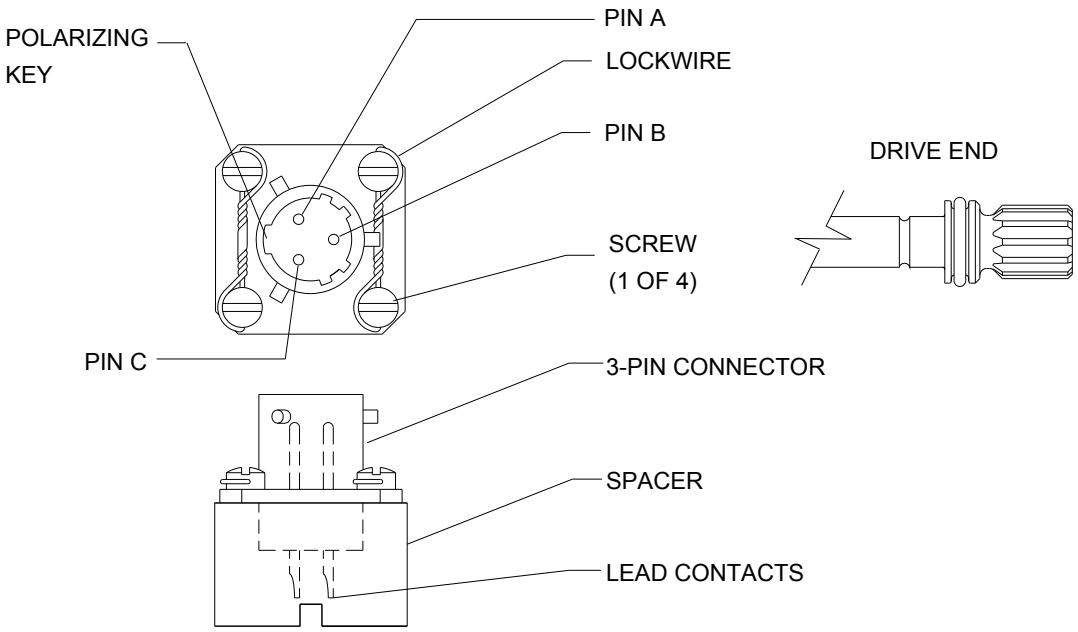

Figure 3008 - Removing 3-Pin Connector from Stator and Housing Assembly

M. Remove Drive End Bearing Support Assembly (390) from Stator and Housing Assembly (550) (See Figure 3009)

(1) Set stator and housing assembly on a horizontal stator and housing assembly support.

(2) Remove and discard screws (400), lock washers (410), flat washers (420), and tooth lock washers (430, if applicable) that attach drive end bearing support assembly to stator and housing assembly.

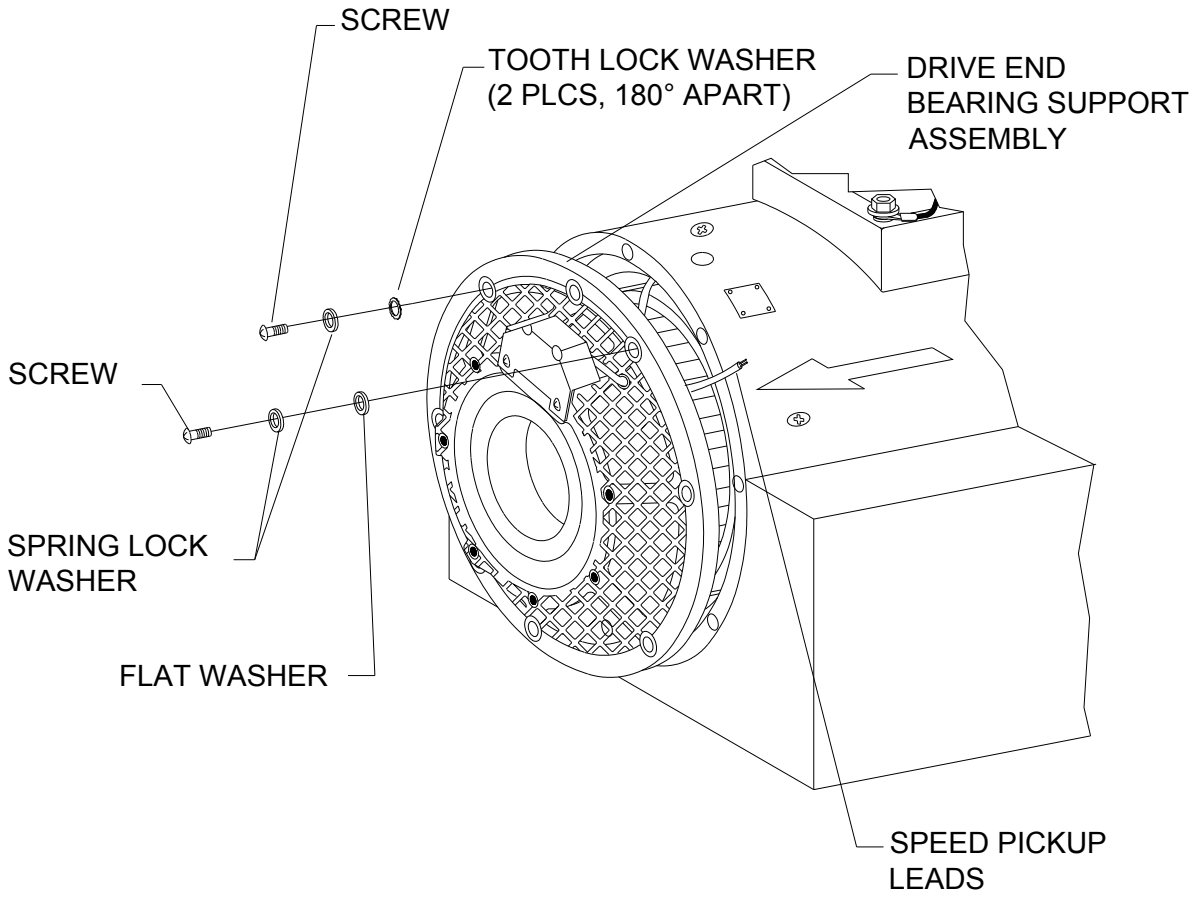

Figure 3009 - Removing Drive End Bearing Support Assembly from Stator and Housing Assembly

CAUTION: DO NOT USE HIGH FORCE WHEN TAPPING DRIVE END BEARING SUPPORT ASSEMBLY OR YOU CAN DAMAGE THE MATING FLANGE OF THE STATOR AND HOUSING ASSEMBLY.

(3) Lightly tap outer diameter of drive end bearing support assembly with a plastic or leather mallet to loosen it from stator and housing assembly.

(4) Remove drive end bearing support assembly from stator and housing assembly while carefully pulling speed pickup leads through stator windings (where applicable).

N. Remove Speed Pickup Guard (440), Speed Pickup (460), and Grommet (470) from Drive End Bearing Support Assembly (390) (See Figure 3010)

NOTE: The following applies to models 23081-007, -008, -022, -022A, -023, -023A, -024, -056, -059, -069 and -070 only.

(1) For models 23081-022, -022A, -023, -023A, -056, -059, -069 and -070:

(a) Remove and discard screws (450) that attach speed pickup guard (440) to drive end bearing support assembly.

(b) Remove speed pickup guard (440).

(2) Pull speed pickup leads through the grommet (470).

(3) Loosen speed pickup jam nut and back it away from drive end bearing support assembly (390).

(4) Remove speed pickup.

(5) Remove and discard grommet (470).

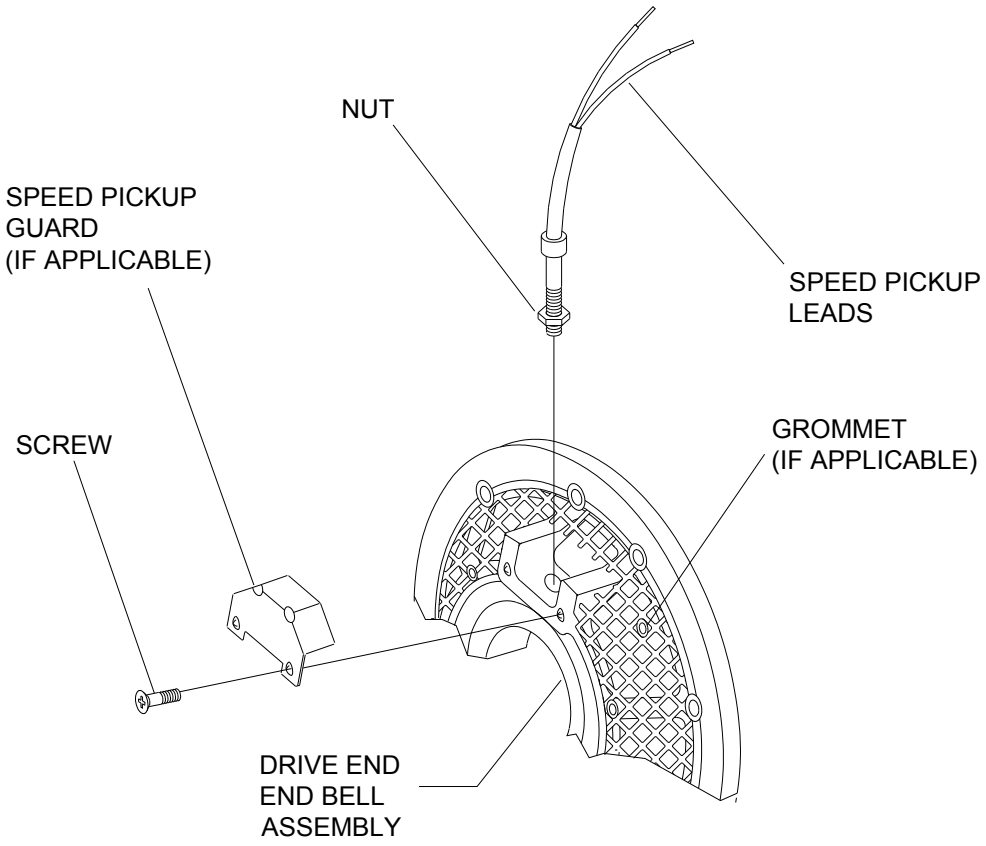

Figure 3010 - Removing Speed Pickup

O. Remove Armature (480) from Bearing and Brush Support Assembly (320) (See Figure 3011)

CAUTION: TO PREVENT DAMAGE TO THE ARMATURE SHAFT, PUT A FOAM CUSHION AT THE BASE OF THE ANTI-DRIVE END BELL ASSEMBLY SUPPORT.

(1) Put a foam cushion and bearing and brush support assembly support on an arbor press table.

(2) Put the bearing and brush support assembly (320), with the attached armature (480), onto the bearing and brush support assembly support.

CAUTION: FAILURE TO USE THE ANTI-DRIVE END ARMATURE SHAFT ADAPTER WHEN PRESSING THE ARMATURE FROM THE BEARING AND BRUSH SUPPORT ASSEMBLY CAN CAUSE PERMANENT DAMAGE TO THE ARMATURE SHAFT.

(3) Insert an anti-drive end armature shaft adapter into the end of the armature (480) shaft.

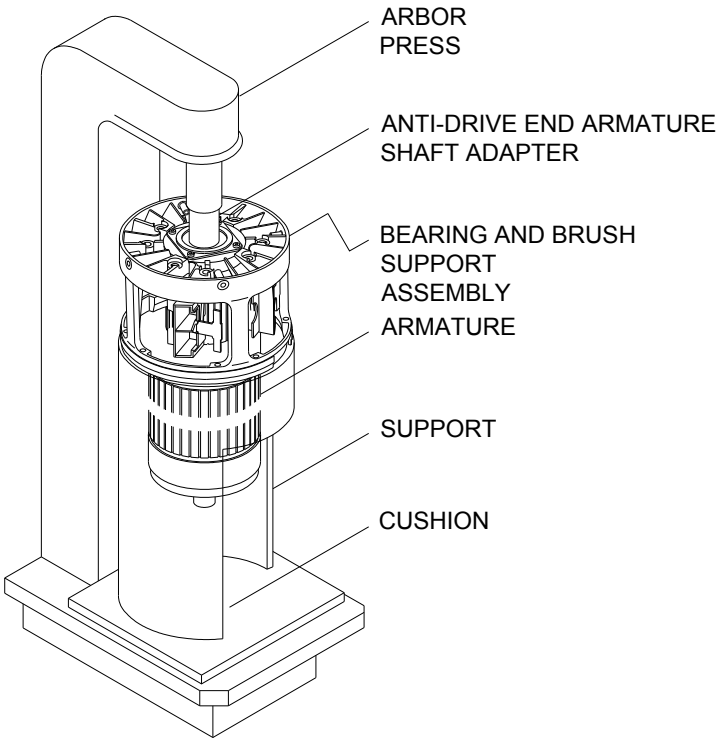

Figure 3011 - Remove the Armature from the Bearing and Brush Support Assembly

CAUTION: TO PREVENT DAMAGE TO THE ARMATURE SHAFT, HOLD IT SECURELY WHEN IT IS PRESSED OUT OF THE BEARING AND BRUSH SUPPORT ASSEMBLY.

(4) Carefully press the armature (480) shaft down and away from the bearing and brush support assembly (320).

(5) Carefully remove armature (480) from inside the bearing and brush support assembly support.

P. Remove Bearing Retainer (490) and Anti-Drive End Bearing (520) from Bearing and Brush Support Assembly (320) (See Figure 3012)

CAUTION: FAILURE TO USE AN ANTI-DRIVE END HUB SUPPORT WHEN BEARING IS PRESSED FROM THE ADE BEARING AND BRUSH SUPPORT ASSEMBLY CAN CAUSE PERMANENT DAMAGE TO THE BEARING AND BRUSH SUPPORT ASSEMBLY.

(1) Remove and discard screws (500) and lock washers (510) that attach bearing retainer to bearing and brush support assembly.

NOTE: The leads from the filter board assemblies on bearing and brush support assembly become disconnected when the screws that attach the bearing retainer are removed.

NOTE: Previous versions featured a grounding lead (10004-70) that was not built into the windings. Disconnect the lead from one of the negative brush holders.

(2) Move filter board leads away from bearing liner.

(3) Remove bearing retainer.

(4) Set an anti-drive end hub support on the table of an arbor press.

(5) Set the bearing and brush support assembly (320) on the anti-drive end hub support with the inboard side facing up.

(6) Set an inner race bearing driver on the inner race of anti-drive end bearing (520).

(7) Slowly press anti-drive end bearing (520) from bearing and brush support assembly (320) using an inner race bearing driver.

(8) Remove anti-drive end bearing (520) from inside the anti-drive end hub support. Discard anti-drive end bearing.

NOTE: Do not disassemble the bearing and brush support assembly (320) unless damage is found.

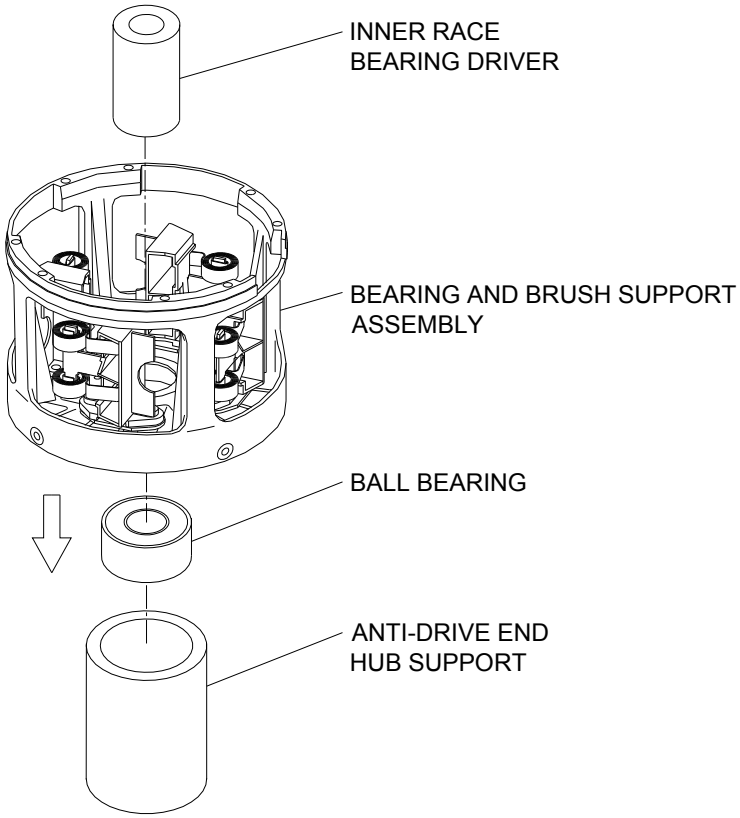

Figure 3012 - Removing the Anti-Drive End Ball Bearing

Q. Remove Drive-End Ball Bearing (520) and Baffle Disc (inboard) (530) from Armature (480) Shaft

CAUTION: FAILURE TO USE A DRIVE END ARMATURE SHAFT ADAPTER CAN CAUSE PERMANENT DAMAGE TO ASSEMBLY.

(1) Put a drive end armature shaft adapter into drive-end of armature shaft.

(2) Use a suitable bearing puller to remove drive-end ball bearing (520) from armature (480) shaft and discard the drive-end ball bearing (520).

(3) Remove and retain baffle disc (inboard) from the armature shaft.

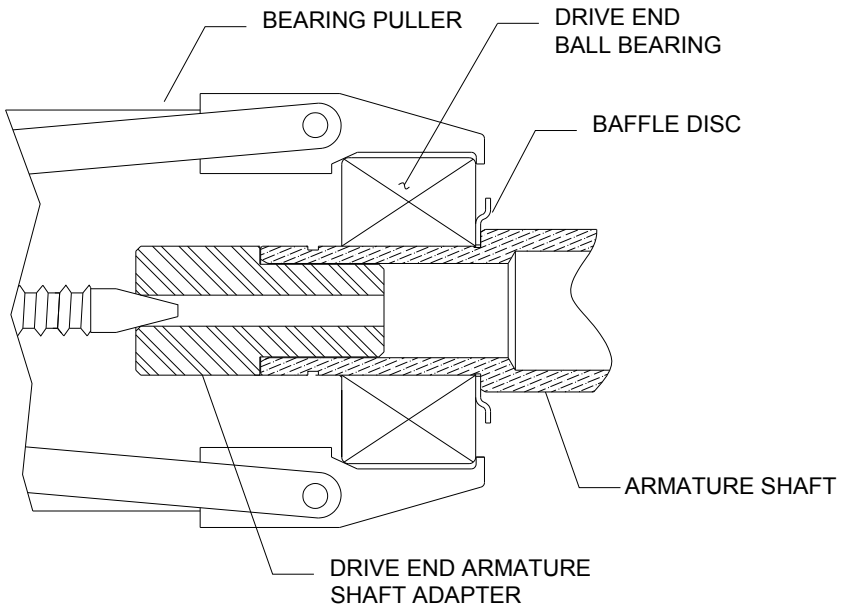

Figure 3013 - Removing Ball Bearing from Drive End Armature Shaft

5. Disassembly of Bearing and Brush Support Assembly

Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers in Figure 10002 of the ILLUSTRATED PARTS LIST. Do not disassemble further than necessary to examine, repair or replace parts.

A. Remove Complete Brush Holder (30) Assemblies (without Filter Boards) from Anti-Drive End End Bell (120) (See Figure 3014)

NOTE: Do not disassemble bearing and brush support assembly unless necessary.

(1) Remove and discard nuts (140), flat washers (90), and insulating washers (130) from bolts (100) or screws (100).

(2) Remove brush holder assemblies from bolts.

(3) Discard non-metallic washers (110 and 120) and insulation sleeves (80).

(4) Repeat Paragraph 5.A.(1) thru Paragraph 5.A.(3) as required for remaining complete brush holders (30).

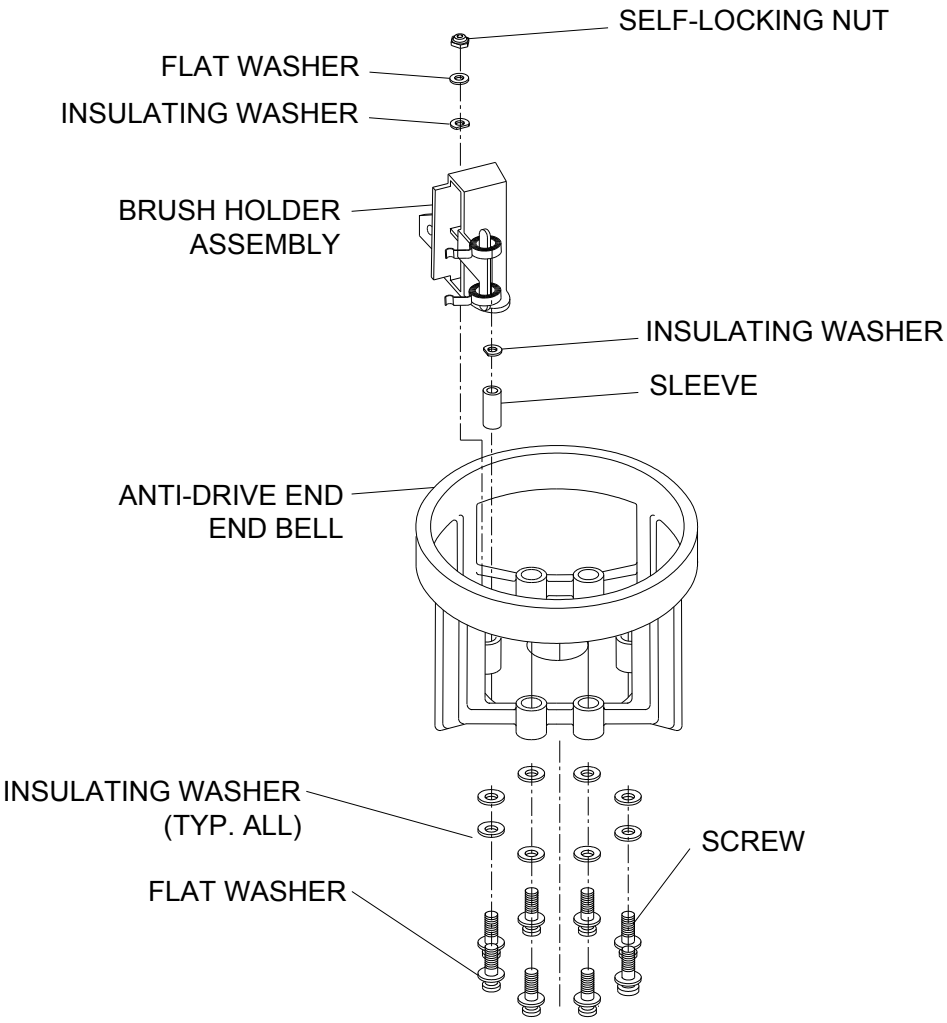

Figure 3014 - Removing Brush Holder Assemblies (Without Filter Board)

B. Remove Complete Brush Holder (30) Assemblies (with Filter Boards) from Anti-Drive End End Bell (120) (See Figure 3015)

NOTE: Do not disassemble bearing and brush support assembly unless necessary.

(1) Remove and discard nuts (140), flat washers (90), and insulating washers (130) from bolts (100) or screws (100).

(2) Remove filter board assemblies (60) and brush holder assemblies from the bolts.

(3) Remove brush holder assemblies from bolts.

(4) Discard non-metallic washers (110 and 120) and insulation sleeves (80).

(5) Repeat Paragraph 5.A.(1) thru Paragraph 5.A.(3) as required for remaining complete brush holders (30).

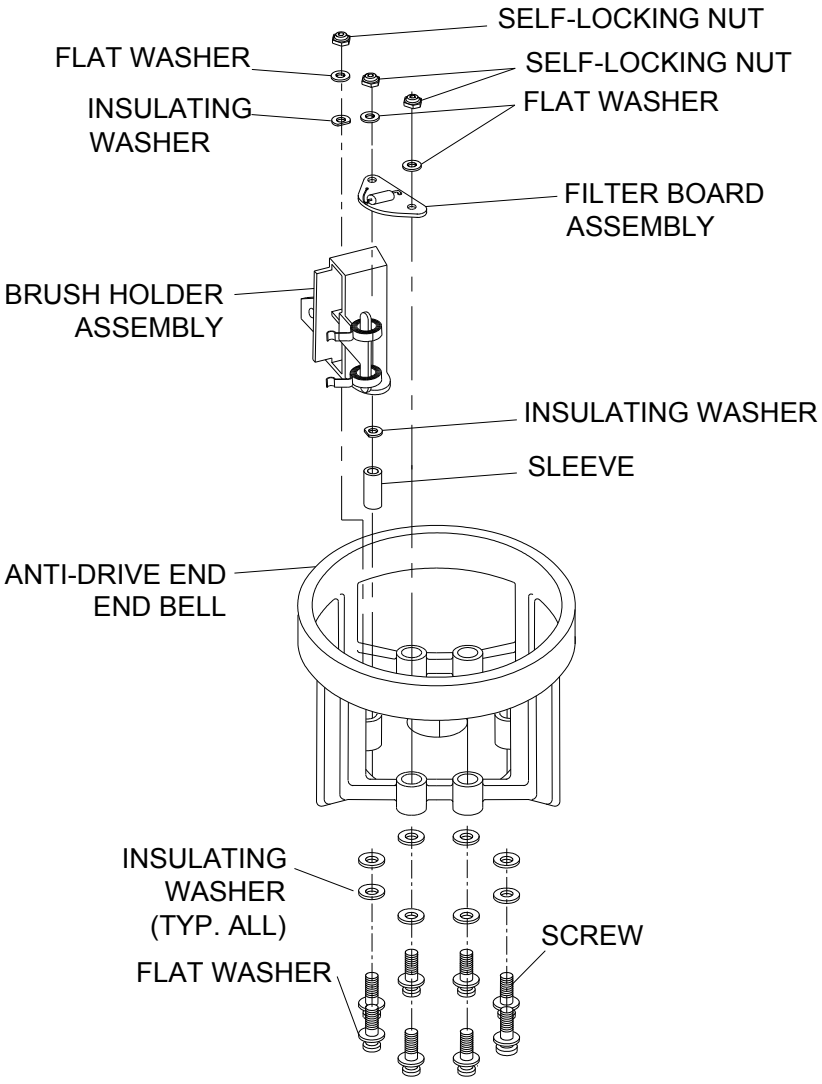

Figure 3015 - Removing Brush Holder Assemblies (With Filter Boards)

C. Remove Brush Springs (50) from Brush Holder (30)

(1) Remove any of the eight brush springs that need to be replaced from brush holder assemblies.

(2) Discard damaged brush springs.

6. Disassembly of Drive End Bearing Support Assembly

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10003.

NOTE: Do not disassemble drive end end bell further than required to examine, repair or replace parts determined to be unserviceable.

A. Remove Screen Guard (20) from Drive End End Bell (10)

(1) Remove and discard attaching drive screws (30) and flat washers (40).

(2) Remove and discard screen guard.

B. For Models 23081-007 and -008, Remove the Magnetic Pickup Bracket (50) from Drive End End Bell (10)

(1) Remove and discard attaching screws (60).

(2) Remove magnetic pickup bracket.

7. Disassembly of Stator and Housing Assembly

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10004.

NOTE: Use a socket wrench with a ground-down outer diameter that will not damage the terminal block while removing attaching hardware.

NOTE: Do not disassemble the stator and housing assembly further than the removal of the terminal block to examine, repair, or replace parts determined to be unserviceable.

A. Remove Attaching Hardware from the Terminal Block (60) (See Figure 3016)

(1) For stator and housing assembly effect codes A, B, F:

(a) Remove three nuts (30) and flat washers (40) from the three large terminal studs. Discard nuts (30).

(b) Remove two nuts (10) and flat washers (20) from terminal block (60) studs A and D. Discard nuts (10).

(c) Remove two terminal lugs (120) from terminal block (60) studs and let rest to length of electrical wire.

(2) For stator and housing assembly effect codes C, D and E:

(a) Remove two nuts (30) and flat washers (40) from two large terminal studs. Discard nuts (30).

(b) Remove two nuts (10) and flat washers (20) from terminal block (60) studs A and D. Discard nuts (10).

(c) Remove two terminal lugs (120) from terminal block (60) studs and let rest to length of electrical wire.

(3) For stator and housing assembly effect code C, remove grommet (110) from the stator and housing assembly.

NOTE: The grommet does not need disassembled unless damaged.

(a) Remove the grommet from the stator and housing assembly by prying up on the edge of the grommet with a flat head screw driver until enough of the grommet is exposed.

(b) Use needle nose pliers to remove the grommet from the stator and housing assembly.

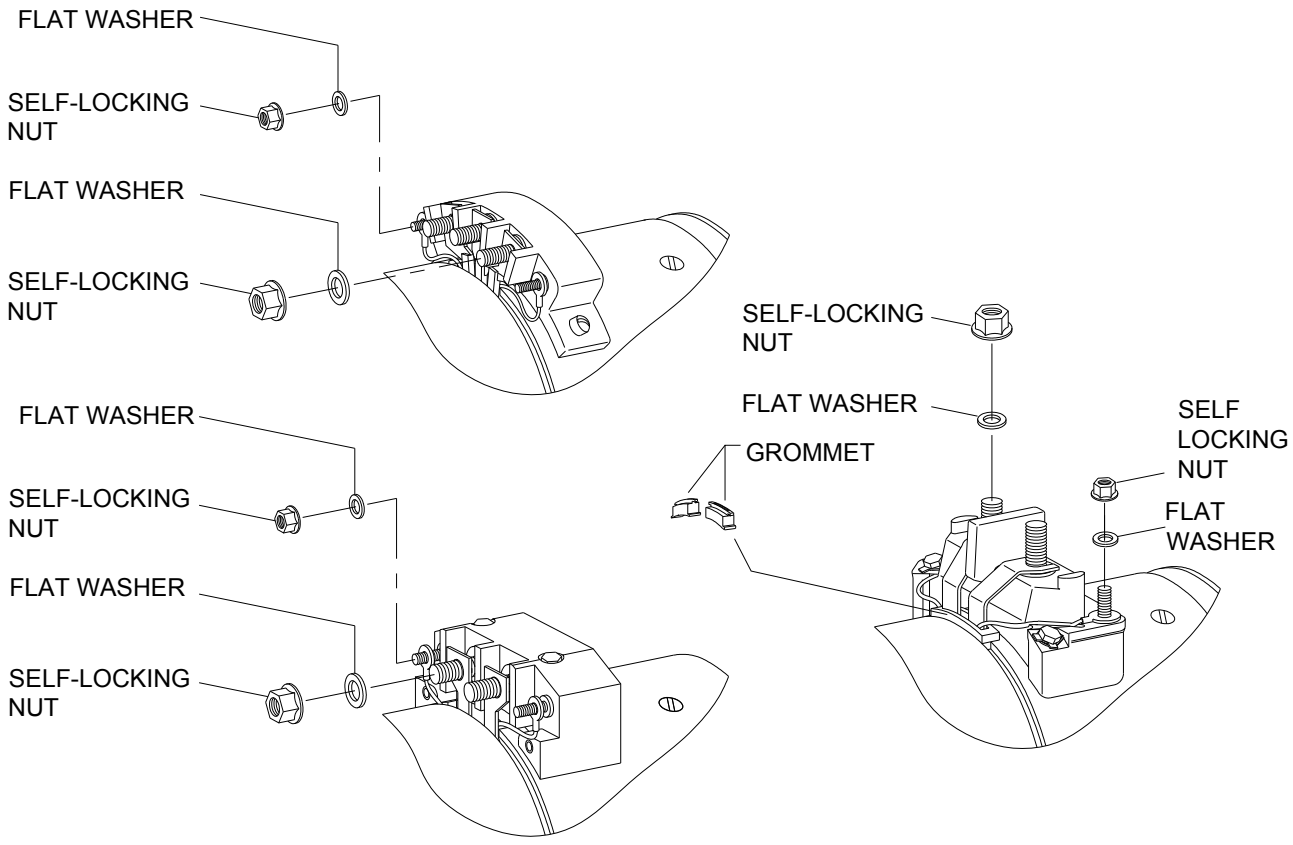

Figure 3016 - Remove Miscellaneous Hardware

B. Remove the Terminal Block (60) from the Stator and Housing Assembly (See Figure 3017)

(1) For stator and housing assembly effect codes A, B, D, E, F:

(a) Remove two screws (80), lock washers (90) and flat washers (100) from terminal block (60). Discard lock washers (90) and flat washers (100).

(2) For stator and housing assembly effect code C:

(a) Remove three screws (80), lock washers (90) and flat washers (100) from terminal block (60). Discard lock washers (90) and flat washers (100).

(3) Carefully remove the terminal block (60) from the stator and housing assembly by lifting slightly and rotating the terminal block (60) out from the stator and housing assembly.

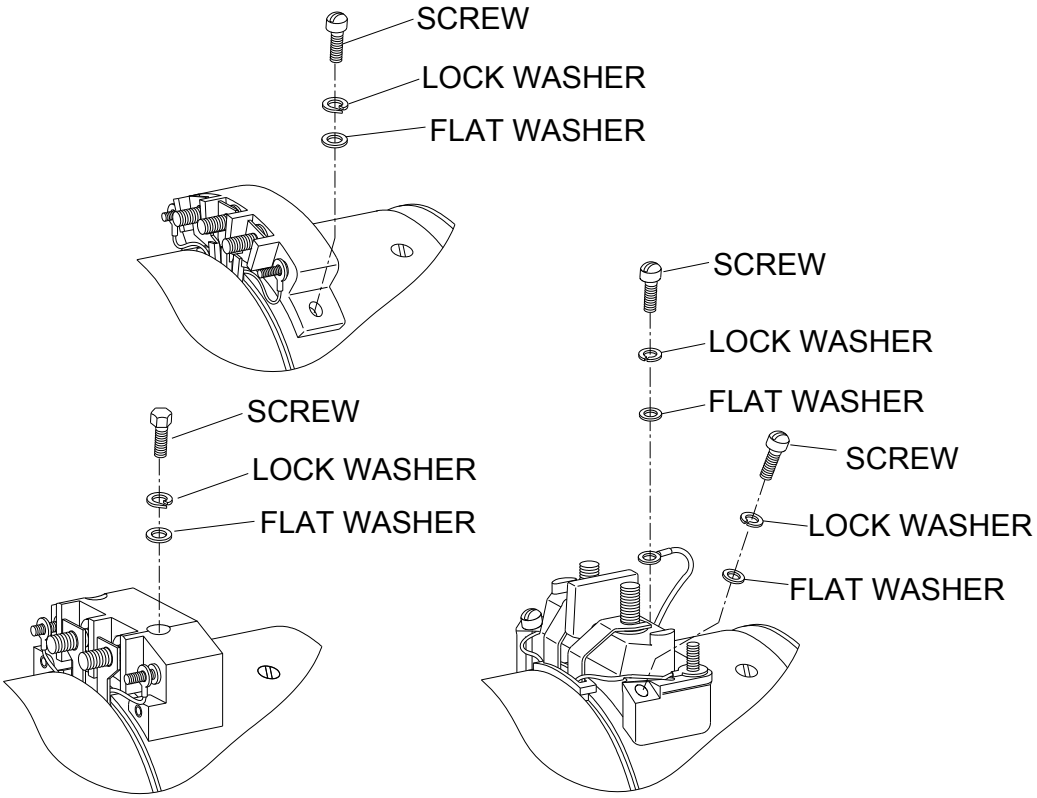

Figure 3017 - Terminal Block Removal

CLEANING

1. Introduction

This section contains the cleaning procedures for 23081 Series I models.

2. Cleaning Tools

In addition to standard shop tools, those special tools, fixtures, and equipment listed in Table 4001 are required for disassembly.

WARNING: YOU MUST OBEY THE TOOL AND EQUIPMENT MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Tools Description	Source/Figure Reference
Agitation Tank	Commercially Available
Compressed Air (The compressed air for cleaning must be free of oil and water)	Commercially Available
Oven (0 to 300°F (-18 to 149°C))	Commercially Available
Soak Tank	Commercially Available
Spray Booth	Commercially Available
Ultrasonic Cleaning Tank	Commercially Available
Black Light (The light is used to examine surfaces	Commercially Available

Table 4001 - Cleaning Tools

3. Cleaning Materials

Table 4002 lists equipment and materials required to perform the cleaning of assemblies, sub-assemblies and components.

NOTE: Reference GSIL 2006-01 for the use of Brulin 815GD-NF.

WARNING: YOU MUST OBEY THE MATERIAL MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

Material	Description/Specification	Source/CAGE Code
Bag, Polyethylene	Size that will easily enclose parts being washed.	Commercially Available
Brush	Nonmetallic, soft bristle	Commercially Available
Cleaning Pads/Wiping Cloths	Lint-free, soft fabric	Commercially Available
Corrosion Preventive	Cold application, water displacing soft film MIL-C-16173, Grade 3.	Commercially Available
De-ionized Water	For fresh water, Ion Exchange process to a resistivity not less than 750 kΩ/cm @ 77° F (25° C) min., when measured in accordance with ASTM D1125-95, Method A. For rinse water that is to be reused, check that the resistivity does not fall below 500 kΩ/cm @ 77° F (25° C) min., measured in accordance with ASTM D1125-95, Method A.	Commercially Available
Desiccant	MIL-D-3464E Type II, Kraft bag, 4 unit bag size Englehard Corporation Desiccate 25 or equivalent	Commercially Available

Table 4002 - Cleaning Materials

Material	Description/Specification	Source/CAGE Code
Detergent Refer to material technical data sheet for recommended dilution of water and detergent, and solution temperature.	Formula 815 GD or 815 GD-NF Applications: Hot tanks - aluminum safe Steam Cleaning Pressure Sprayers Ultrasonic Cleaning	Brulin and Company, Inc. 2920 Dr. Andrew J Brown Ave. Indianapolis, Indiana 46205-4066 USA Phone:(1) 317/923-3211 FAX: (1) 317/925-4596 www.bhcinc.com (V94058)
	Formula 1990 GD Application: Spray Wash Cleaning	
Isopropyl Alcohol	TT-I-735, Grade A See **WARNING** before using this material. Flash Point: 53 °F (12 °C), FLAMMABLE Refer to the Material Safety Data (MSD) Sheet for the material for additional safety information	Commercially Available

Table 4002 - Cleaning Materials (Continued)

4. Cleaning Procedures

Before you do procedures given in CHECK, REPAIR, ASSEMBLY, TESTING AND FAULT ISOLATION, and final inspection, the components must be cleaned, rinsed, and dried. All signs of moisture, oil, and other contamination must be removed from the internal structure of the generator to make sure all parts and circuits function correctly. Clean the models as follows:

A. Blow Out Dirt Particles

(1) Put the parts into a ventilated air spray booth.

WARNING: **WHEN YOU USE COMPRESSED AIR, ADJUST THE PRESSURE TO 29 PSI (200 KPA) MAXIMUM. PUT ON EYE PROTECTION TO PREVENT INJURY. FOLLOW NECESSARY PRECAUTIONS TO PREVENT INJURY TO OTHER PERSONNEL IN AREA.**

CAUTION: MAKE SURE THAT COMPRESSED AIR IS FREE FROM OIL AND WATER WHEN YOU CLEAN OR DRY COMPONENTS. THIS PRECAUTION PREVENTS CONTAMINATION OF THE COMPONENTS.

(2) Blow away all loose dirt with clean, dry, compressed air.

B. Clean the Parts

WARNING: **DETERGENT CAN BE DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.**

Wash the parts with one or more of the approved cleaning procedures given in Table 4003.

Procedure	Instructions
Spray	Put the parts into a high pressure spray wash booth using detergent Brulin 1990 GD.
	CAUTION: LIMIT THE PRESSURE TO CLEAN PARTS. HIGH PRESSURE CAN REMOVE OR DAMAGE SURFACE COATINGS, CONNECTIONS AND INSULATION.
	Spray the parts with a solution of detergent and de-ionized water. Refer to the manufacturers specification for the recommended dilution of water and detergent and solution temperature.
Ultrasonic	**CAUTION:** ULTRASONIC CLEANING CAN DAMAGE PLATING, BLACK OXIDE COATINGS, AND, IN ALUMINUM PARTS, DIMENSIONAL TOLERANCES.
	Put the parts into the ultrasonic cleaning tank using detergent Formula 815 GD or 815 GD-NF and de-ionized water. Refer to the manufacturers specification for the recommended dilution of water and detergent and solution temperature.
	Let the parts to soak for 15 to 20 minutes maximum.
	Remove all evidence of dirt with a soft bristle brush or cleaning rag.
Agitation	Put all parts into an agitation tank and clean using detergent Brulin 1990 GD and de-ionized water. Refer to the manufacturers specification for the recommended dilution of water and detergent and solution temperature.
	Agitate the parts until all evidence of dirt can be removed with a soft bristle brush or cleaning rag.
Soak	Put all parts into a soaking tank and clean using detergent Formula 815 GD or Brulin 1990 GD and de-ionized water. Refer to the manufacturers specification for the recommended dilution of water and detergent and solution temperature.
	Soak the parts until all evidence of dirt can be removed with a soft bristle brush or cleaning rag.

Table 4003 - Cleaning Procedures

C. Rinse the Parts

(1) Rinse the part(s) with de-ionized water.

D. Do the applicable cleaning procedure again until the parts are clean and free of dirt and carbon residue.

E. Dry the Parts

(1) Remove any moisture that remains on the parts with a dry lint-free cloth.

WARNING: WEAR INSULATED GLOVES AND OBSERVE ALL SAFETY PRECAUTIONS WHEN HANDLING HEATED PARTS TO AVOID PERSONAL INJURY.

(2) Put the cleaned parts in an oven at a temperature of 200 to 250 °F (93,3 to 121 °C) for 2 to 3 hours.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(3) Examine each part for carbon particles by wiping with isopropyl alcohol on a clean lint-free cloth.

5. Corrosion Preventive

NOTE: If the drive shaft is not expected to be re-installed into the model immediately after cleaning, apply a corrosion preventive compound to its black oxide coating (identified by a very dark finish).

WARNING: THE CORROSION PREVENTIVE COMPOUND IS FLAMMABLE AND TOXIC. EXTENDED EXPOSURE CAN CAUSE SKIN IRRITATION, DIZZINESS, AND HEADACHE. WHEN EXTENDED EXPOSURE IS NECESSARY, USE RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING.

(1) Apply a layer of MIL-C-16173, grade 3, corrosion preventive compound to the drive shaft.

NOTE: The drive shaft must be completely dry before you apply the corrosion preventive compound.

(2) Let the coating air dry for four hours. The coating will remain soft after drying.

6. Cleaning After Liquid Penetrant Inspection

A. Description

This specifies the procedure for cleaning part(s) after liquid penetrant inspection. Cleaning is necessary to remove residual penetrant or developer that could cause interference in processing or service requirements. Rinse parts fully with water and fully dry to make sure there is no interference in processing or service requirements.

B. Procedure

(1) Rinse the part(s) immediately after liquid penetrant inspection:

(a) The parts must be fully rinsed using water by manual or automated spray to remove the liquid penetrant.

1 Fully rinse the part(s) and aggressively agitate the part while it is immersed.

2 Pour the rinse water out from the part(s). Hold the part(s) vertical, open end down, for approximately one minute to drain.

(b) The part(s) surfaces must be visually examined under a black light after rinsing to make sure all the liquid penetrant has been removed.

1 Part(s) which show remaining liquid penetrant after rinsing must be fully cleaned and examined again.

(2) Drying of part(s) after rinsing:

CAUTION: REMAINING WATER USED FROM THE RINSING PROCEDURE MUST BE REMOVED. FAILURE TO OBEY DRYING INSTRUCTIONS CAN RESULT IN CORROSION OF THE MATERIAL.

(a) Remove the rinse water from the part(s) with a dry lint-free cloth.

WARNING: **WHEN YOU USE COMPRESSED AIR, ADJUST THE PRESSURE TO 29 PSI (200 KPA) MAXIMUM. PUT ON EYE PROTECTION TO PREVENT INJURY. FOLLOW NECESSARY PRECAUTIONS TO PREVENT INJURY TO OTHER PERSONNEL IN AREA.**

CAUTION: MAKE SURE THAT COMPRESSED AIR IS FREE FROM OIL AND WATER WHEN YOU CLEAN OR DRY COMPONENTS. THIS PRECAUTION PREVENTS CONTAMINATION OF THE COMPONENTS.

(b) Use compressed air to remove rinse water.

WARNING: FAILURE TO USE NECESSARY SAFETY PRECAUTIONS WHEN HANDLING HOT MATERIALS CAN CAUSE SEVERE BURNS TO SKIN. WEAR THERMAL PROTECTIVE CLOTHING WHEN HANDLING HEATED PARTS.

(c) Immediately put the washed and rinsed part(s) in a vented 250° ± 10° F (121,1° ± 5,6° C) oven for a minimum of 2 hours.

1 The part(s) is to be positioned horizontally on a rack or on a block that will hold it in position.

(d) After the part(s) is fully dried and has cooled.

1 Check for indications of possible corrosion caused by the liquid penetrant.

a Reject the part(s) if corrosion is found.

2 If no corrosion is found, put the part(s) in a polyethylene bag with a bag of desiccant and seal it with tape, twist tie or rubber band.

3 The part(s) must be kept in a bag with desiccant until just before assembled on the model.

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CHECK

1. Introduction

This section provides initial and detailed component inspection procedures for the models returning from service for scheduled and unscheduled maintenance. Complete an initial inspection of the model before beginning testing or disassembly. The results of this inspection will determine if the model is in satisfactory condition for a verification test or if it will need further disassembly, inspection, and/or replacement of parts.

This section provides the information that is needed to do a satisfactory inspection of the model components. During an overhaul of the model, all primary components must be examined to determine if they are serviceable.

Reject a part if wear or damage is outside the acceptance limits or is not serviceable.

2. Inspection Tools

WARNING: YOU MUST OBEY THE TOOL AND EQUIPMENT MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

In addition to normal shop tools, specific tools and materials for inspection of the model are listed in Table 5001.

Tool Description	Source/Figure Reference
Dial Indicator	Commercially Available
Dynamic Balancer	Safran Power Standard Practice Document (SPD) 1001
Growler	Commercially Available
High Potential (Dielectric) Tester	Commercially Available
Magnifier, 7X to 10X	Commercially Available
Ohmmeter	Commercially Available
LCR meter (Inductance, capacitance and resistance)	Commercially Available
Pull Scale	Commercially Available
Surface Plate	Commercially Available
V-blocks	Commercially Available

Table 5001 - Inspection Tools

3. Inspection Materials

Materials necessary for the model inspection are listed in Table 5002.

WARNING: YOU MUST OBEY THE MATERIAL MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Item	Description/Specification	Source (CAGE Code)
Brush, non-metallic, soft bristle	Brush, non-metallic, soft bristle	Commercially Available
Cleaning pads/wiping cloths, lint-free, soft fabric	Cleaning pads/wiping cloths, lint-free, soft fabric	Commercially Available
Isopropyl Alcohol See **WARNING** before using this material.	TT-I-735, Grade A Flash Point: 53 °F (12 °C), FLAMMABLE. Refer to the Material Safety Data (MSD) Sheet for the material for additional safety information.	Commercially Available

Table 5002 - Inspection Materials

A. Use of Growler

A growler is required to check for shorted armature windings. When an alternating current is passed through a growler, the current sets up a magnetic flux in the windings of the armature. As the flux passes through the windings, a potential is induced causing current to flow if the winding is short-circuited. The current flow is then detected by an iron feeler, such as a hacksaw blade.

The most common way of using a growler is the ‘feeler method’ in which the growler spans a slot containing a winding. The feeler of iron is held about 0.25 inch (6,4 mm) above the slot containing the other side of the same winding. If the winding is shorted, the feeler will be pulled down to the slot and will stick and vibrate. The feeler can also be used on the same side of the winding that is spanned by the growler.

4. General Information

Check Acceptance Limit Measurements for individual components are found in the FITS AND CLEARANCES section of this CMM. If part does not meet acceptance limits, discard. Use the following procedures for all inspections.

A. Examine the DC Starter-Generator / DC Generator and its Components visually for:

- signs of corrosion
- chipped-off enamel
- nicks, cracks, dents, scratches
- gouging, scoring or glazing mating surfaces
- fretting corrosion on mating surfaces
- loose or defective attaching parts
- distortion
- discoloration
- crossed or stripped threads
- condensation at drain holes
- torn or cracked seals
- galling or glazing of friction lining residue
- bent or distorted springs
- rounding, stripping or uneven wear on gear teeth

B. Examine Electrical Components visually for:

- loose or defective attaching parts
- damage caused by too much heat
- electrical arcing paths
- corroded contacts or terminals
- loose or defective electrical connector, contacts or terminals
- corroded electrical pins or connector
- bent connector pins
- loose, broken or shorted terminations

5. Initial Inspection

NOTE: If damage is found during inspection, stop the inspection immediately and begin further disassembly of the model using the instructions in the DISASSEMBLY section.

A. Visually Examine the DC Starter-Generator / DC Generator in a brightly lit work area in accordance with (IAW) Paragraph 4.A.

(1) If shipping or handling damage exists, stop the inspection and notify your supervisor.

(2) If operational damage exists, write down the components that need to be replaced or repaired and continue the inspection.

B. Clean the Exterior of the DC Starter-Generator / DC Generator

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(1) Clean the surface of the model using a lint-free cleaning cloth moistened with isopropyl alcohol.

(2) If needed, loosen dust particles or grease with a soft bristle brush.

C. Examine the DC Starter-Generator / DC Generator in a brightly lit work area IAW Paragraph 4.B.

D. Examine the installation between the housing and both end bells. Make sure that all attaching hardware is in place.

6. Non-Destructive Test (NDT) Inspections

A. Magnetic Particle:

Unless otherwise specified, do magnetic particle inspections IAW ASTM-E1444. Unless otherwise specified, acceptance criteria must be IAW MIL-STD-1907 Table 1, Grade A.

B. Liquid Penetrant:

Unless otherwise specified, do liquid penetrant inspections IAW ASTM-E1417 type 1 Method A or B, sensitivity 2 or higher. Unless otherwise specified, acceptance criteria must be IAW MIL-STD-1907 Table II, Grade C.

7. Replace Service Parts and Common Hardware

A. Overhaul

During overhaul, replace bearings, brushes and O-rings. Parts that have been removed during disassembly, such as, insulating parts, retaining rings, screws, self-locking nuts and lock washers, must be discarded regardless of their condition. The screws that attach the brush leads to the brush holder do not need to be replaced unless damaged.

B. Service Repair

During repair, inspection or servicing, replace all exposed hardware and flat washers that are damaged, deformed, corroded, or have other apparent defects. Always replace bearings, retaining rings, lock washers, and self-locking nuts regardless of their condition if removed during disassembly.

8. Inspection Guidelines

A. Repair or Service Inspection

Examine only those components that have been disassembled for repair or service. Do not disassemble any component for inspections unless given instructions to do so in this section or in the TESTING AND FAULT ISOLATION section.

B. The following terms are referenced in this section:

- DISCARD -

  If damage to the part is found or the part is outside of the acceptance limits in the FITS AND CLEARANCES section, remove the part and replace it.

- REPAIR -

  If damage to the part is found or the part is outside of the acceptance limits in the FITS AND CLEARANCES section, the part can be repaired by a procedure found in the REPAIR section.

- DISASSEMBLE -

  If damage to the part is found to a part in an assembly, or part of the assembly is outside of the acceptance limits in the FITS AND CLEARANCES section, you can disassemble the part from the assembly and repair or replace the damaged part(s).

- REPLACE -

  If damage occurs that causes a part to be outside of the acceptance limits in the FITS AND CLEARANCES section or there is no repair procedure for that part, replace the part. Retain the following parts to submit for remanufacture: armature and stator and housing assembly.

C. Dimensions and Points

Letters (i.e., A, B, C, D, etc.) used in an illustration in this section indicate dimensions or points.

D. Surfaces

Numbers (i.e., 1, 2, 3, 4, etc.) used in an illustration indicate surfaces.

9. Inspection of Parts and Assemblies

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

NOTE: In cases where a repair is authorized but the repair does not work, discard and replace the item in question regardless of whether or not it is so spelled out in this manual.

A. V-Retainer Coupling (20) and T-bolt (40)

(1) Examine V-retainer coupling (20) IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if damage exists.

(2) Examine the T-bolt (40) IAW the procedures found in Paragraph 4.A.

(a) REPAIR the part if two or less threads are damaged.

(b) DISCARD the part if more than two threads are damaged.

B. Mounting Adapter (50) (See Figure 5001)

(1) Examine mounting adapter (50) IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks or major damage exists.

(b) REPAIR the part if minor surface damage exists.

(2) If the visual inspection finds indications which can be cracks, continue the inspection under 10X magnification.

(a) If visual indications of cracks or other structural defects are observed under 10X magnification, DISCARD the part.

(3) If the visual inspection under 10X magnification finds indications which can be cracks do a liquid penetrant inspection IAW Paragraph 6.B.

NOTE: After liquid penetrant inspection, the part(s) must have the liquid penetrant removed. Refer to the CLEANING section.

(a) REPLACE if damage is found.

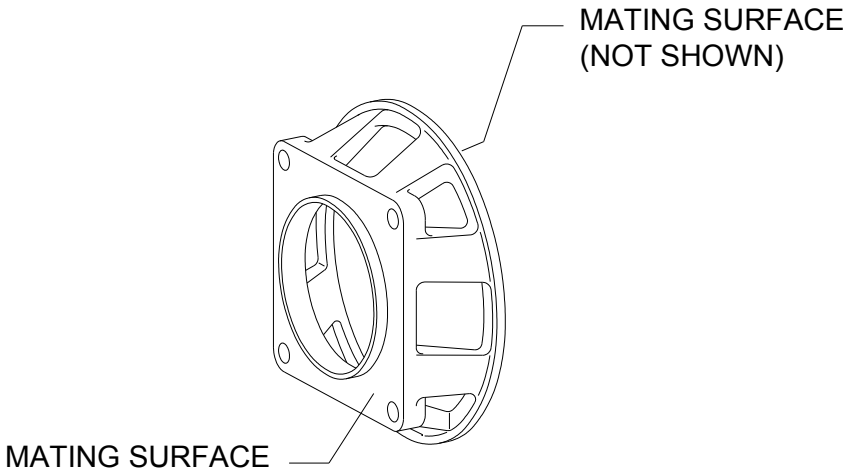


Figure 5001 - Inspecting Mounting Adapter

C. Identification Plate (60) (See Figure 5002)

NOTE: ID plates with superficial nicks, dents and scratches, that do not interfere with the legibility of the identification nameplate, can be reused providing they are sealed with acrylic coating.

(1) Examine the part IAW the procedures found in Paragraph 4.A.

If damage exists or the information is faded or unreadable:

(a) Retain the original identification plate.

(b) Transfer the information from the original identification plate to a replacement identification plate (60).

(c) DISCARD the original identification plate.

(2) Make sure that the drive screws (70) are tight and in place.

(a) DISCARD loose drive screws (70).

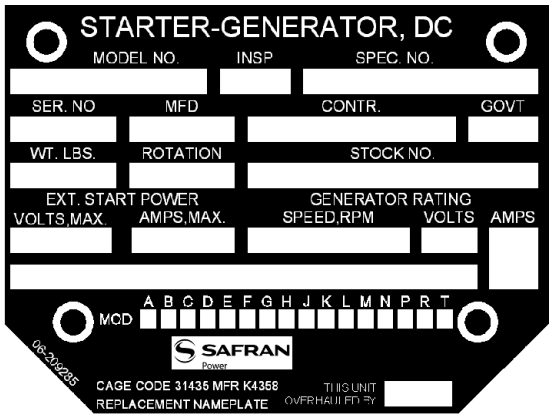


Figure 5002 - Replacement Identification Plate

D. Terminal Block Cover (130)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(2) DISCARD the part if damage exists.

E. Air Inlet/Air Inlet Assembly (150) (See Figure 5003)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks, major damage or fretting corrosion on either the inlet or mounting flange exists.

(b) REPAIR the part if minor surface damage exists.

(c) REPAIR the rivet (-180) if loose, missing or damaged.

(2) Examine the insulating tape for tears or loose edges.

(a) REPAIR the insulating tape if it is loose or torn.

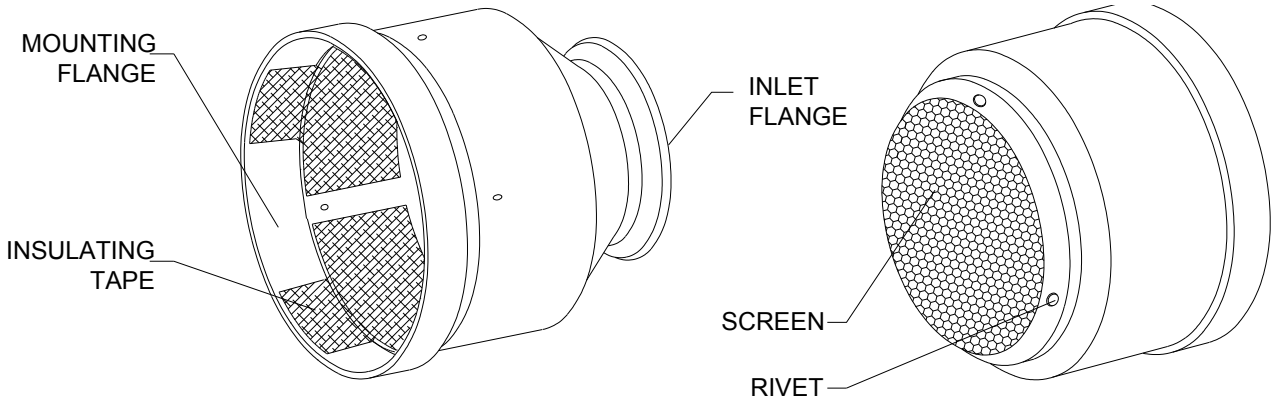


Figure 5003 - Inspecting Air Inlet

F. Brushes (210) (See Figure 5004)

NOTE: For repair only. Brushes must be replaced at each overhaul.

(1) Visually examine brushes for cracks, chips, frayed leads, and loose rivets or loose connections.

(a) DISCARD brushes if damaged.

(2) Visually examine wear indicator for remaining allowable wear.

(a) REPLACE brushes if remaining allowable wear will be exceeded before the next overhaul.

(b) Seat new brushes in accordance with instructions in SPD 1006.

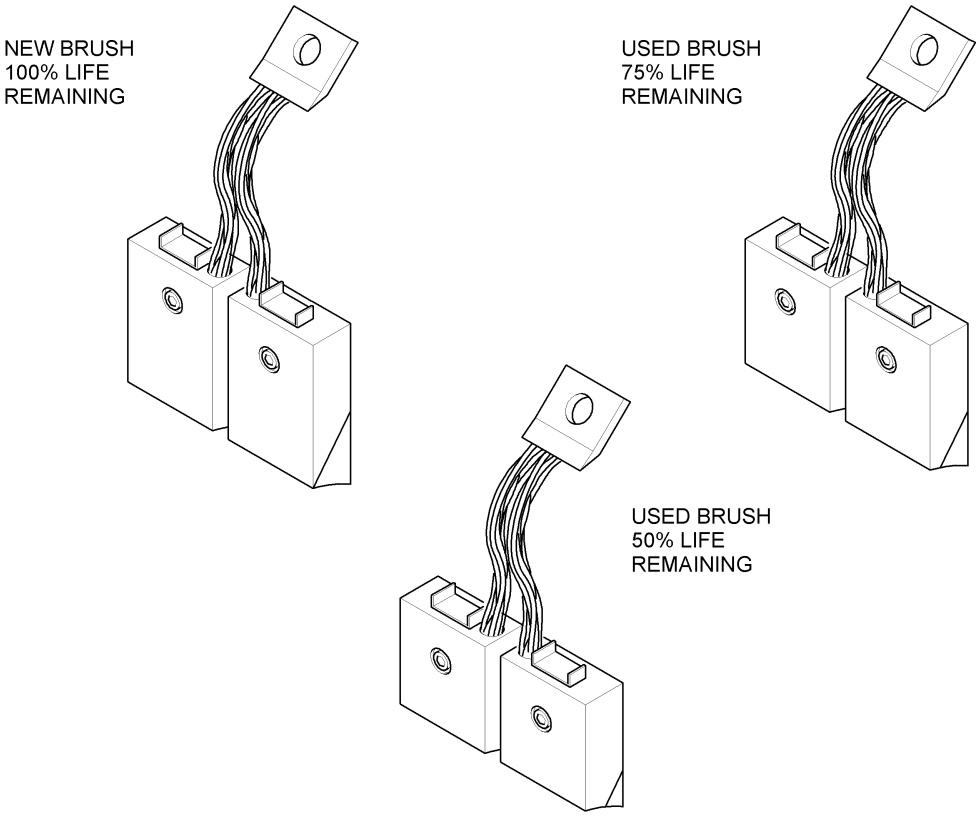


Figure 5004 - Brush Wear (Typical)

G. Fan (230) (See Figure 5005)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

NOTE: Pay particular attention to the blade edges and surfaces and shaft mating surface.

(a) DISCARD the part if cracks, scoring-gouging-glazing on mating surfaces, or major damage exists.

(b) REPAIR the fan if minor surface damage is found.

(2) If the visual inspection finds indications which can be cracks, continue the inspection under 10X magnification.

(a) If visual indications of cracks or other structural defects are observed under 10X magnification, DISCARD the part.

(3) If the visual inspection under 10X magnification finds indications which can be cracks do a liquid penetrant inspection IAW section Paragraph 6.B.

NOTE: After liquid penetrant inspection, the part(s) must have the liquid penetrant removed. Refer to the CLEANING section.

(a) REPLACE if damage is found.

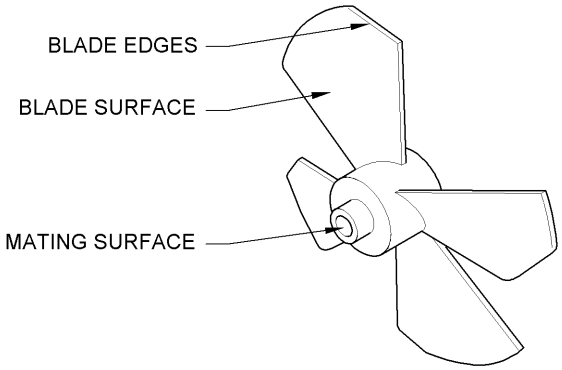


Figure 5005 - Fan

H. Drive Shaft (260) and Dampener Hub (300) (See Figure 5006)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISASSEMBLE the drive shaft (260) and dampener hub (300) if cracks or thread damage beyond two threads exist.

(b) REPAIR the drive shaft (260) and dampener hub (300) if dents, nicks, and scratches exist.

(2) Examine armature mating spline, drive spline, and dampener hub spline for rounding stripping, or uneven wear.

(a) DISASSEMBLE drive shaft (260) and dampener hub (300) if damaged.

(b) DISCARD the damaged part.

(3) Measure the drive end and anti-drive end drive spline diameters over two gage pins.

(a) DISASSEMBLE the drive shaft (260) and dampener hub (300) if the diameter is not within the limits in the FITS AND CLEARANCES section.

(b) DISCARD the out of specification part.

(4) Do the magnetic particle inspection IAW procedures found in Paragraph 6.A.

(a) DISCARD the drive shaft (260) and dampener hub (300) if damage is found.

NOTE: Examine drive shaft (260) and dampener hub (300) mating surfaces only if dampener hub (300) was removed from drive shaft (260).

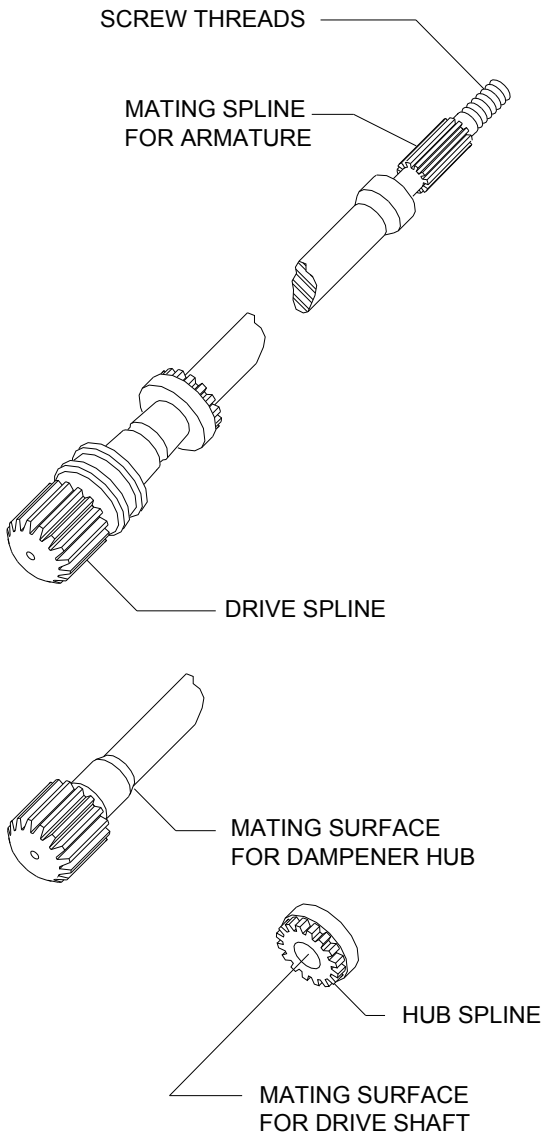


Figure 5006 - Inspecting Drive Shaft and Dampener Hub

I. Friction Ring (280) (See Figure 5007)

WARNING: DO NOT CUT, RIP, OR SAND ASBESTOS-CONTAINING MATERIALS. LEAVE UNDAMAGED MATERIALS ALONE AND, TO THE EXTENT POSSIBLE, PREVENT THEM FROM BEING DAMAGED, DISTURBED, OR TOUCHED. DISCARD MATERIAL BY FIRST CHECKING WITH LOCAL HEALTH, ENVIRONMENTAL, OR OTHER APPROPRIATE OFFICIALS TO FIND OUT ABOUT PROPER HANDLING AND DISPOSAL PROCEDURES.

(1) If friction ring is Part No. 02-5600-05, it must be discarded because it contains asbestos.

(2) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if damage is found.

(3) Measure the friction ring (280) thickness.

(a) DISCARD the part if thickness is not within limits in the FITS AND CLEARANCES section.

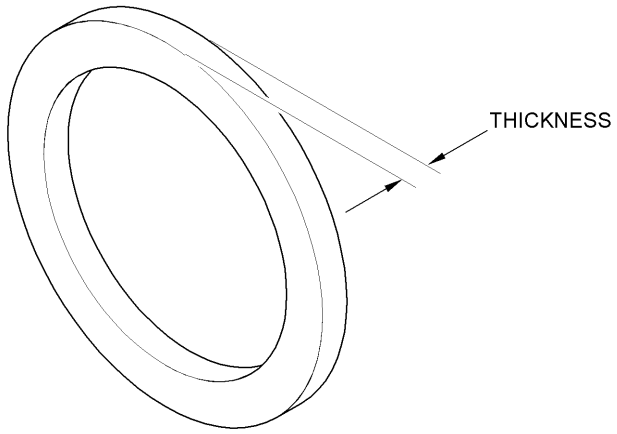


Figure 5007 - Friction Ring

J. Dampener Plate (290) (See Figure 5008)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks exist.

(b) REPAIR if minor nicks, scratches, gouging, scoring, or glazing is found.

(2) Examine the spline teeth for rounding, stripping, or uneven wear.

(a) DISCARD the part if damaged.

(3) Measure the dampener plate (290) thickness.

(a) DISCARD if thickness is below the acceptance limit in the FITS AND CLEARANCES section.

(4) Measure the distance between pins of the spline teeth.

(a) DISCARD if distance is above the acceptance limit in the FITS AND CLEARANCES section.

(5) Do the magnetic particle inspection IAW procedures found in Paragraph 6.A.

(a) DISCARD the dampener plate (290) if damage is found.

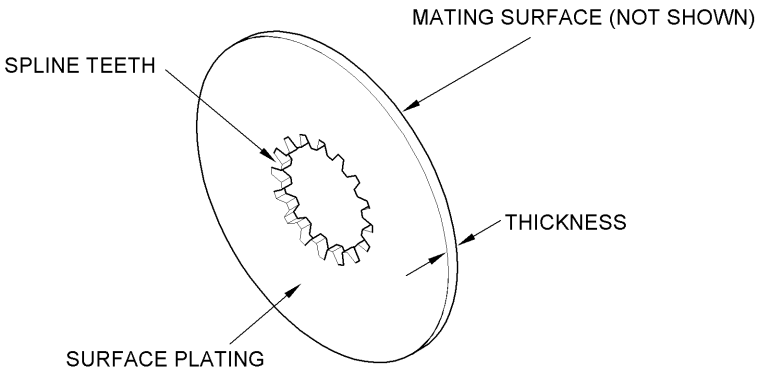


Figure 5008 - Dampener Plate

K. Dampener Backplate or Dampener Backplate and Gear (310) (See Figure 5009)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks exist.

(b) REPAIR if minor nicks or scratches exist.

(c) DISCARD if gouging, scoring, or glazing exists on mating surfaces.

(2) Do the magnetic particle inspection IAW procedures found in Paragraph 6.A.

(a) DISCARD dampener backplate (310) if damage is found.

(3) For effect codes E, F, Q, R, S, T, U, X, Z, CA, DA:

(4) The frequency of the signal must be 4200 Hz at exactly 6,000 rpm.

NOTE: Reference GSIL 2008-01 to check if the correct spur gear was installed.

(a) DISCARD the part if the gear teeth on the dampener backplate and gear (310) have rounding, stripping, or uneven wear.

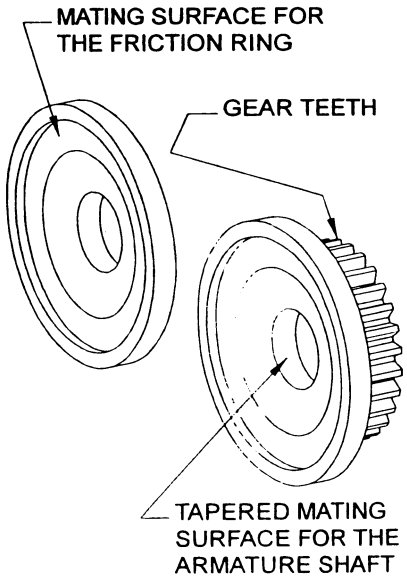


Figure 5009 - Inspecting Dampener Backplate

L. Bearing and Brush Support Assembly (320) (See Figure 5010 thru Figure 5011)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks or fretting and/or corrosion on the mating surface are found.

(b) REPAIR if minor dents, scratches and nicks or gouging scoring or glazing on the mating surfaces (marked 1, 2, 3, and 6 on Figure 5010) are found.

(2) If the visual inspection finds indications which can be cracks, continue the inspection under 10X magnification.

(a) If visual indications of cracks or other structural defects are observed under 10X magnification, DISCARD the part.

(3) If the visual inspection under 10X magnification finds indications which can be cracks do a liquid penetrant inspection IAW section Paragraph 6.B.

NOTE: After liquid penetrant inspection, the part(s) must have the liquid penetrant removed. Refer to the CLEANING section.

(a) REPLACE if damage is found.

(4) Measure the bearing liner diameter “A.” See Figure 5010.

(a) DISASSEMBLE the bearing and brush support assembly (320) if damage is found.

(b) REPAIR if the bearing liner diameter is out of the limits given in the FITS AND CLEARANCES section.

(5) Examine the helicoil inserts (10002-20, -45) at location 4 and 5 (See Figure 5010) for damage.

(a) REPAIR helicoil if damage is found.

(b) REPAIR any damaged parts.

(6) Examine the brush holders (10002-30), the brush spring supports and the center supports for cracks, warping, and discoloration caused by electrical arcing.

(a) DISCARD the complete brush holder (10002-30) if damage is found.

(7) If applicable, measure the capacitor capacitance value on each filter assembly (10002-60) at a frequency of 900 to 1100 Hz, 77° F (25° C) ± 10%.

(a) DISCARD the filter assembly (10002-60) if capacitance values fall outside the required limits in the FITS AND CLEARANCES section.

(8) Measure brush spring (10002-50) pressure using a pull scale with harness. See Figure 5011.

NOTE: When measuring brush spring pressure, readings can vary widely depending on where measuring device touches spring. Measurements must be taken from curved tip of spring at point where spring touches brush.

(a) Take six measurements.

(b) Calculate an average from the measurements.

(c) DISCARD any spring not within limits of FITS AND CLEARANCES section.

(9) Do a dielectric test as follows:

NOTE: The bearing and brush support assembly must be clean before you do the dielectric check.

WARNING: BEFORE YOU USE THE HIGH VOLTAGE ELECTRICAL EQUIPMENT, MAKE SURE THAT THE POWER SWITCH IS IN THE 'OFF' POSITION. MAKE SURE THAT NO PERSON TOUCHES THE EQUIPMENT OR THE PROBES. THIS WILL PREVENT DEATH OR INJURY FROM ELECTRIC SHOCK.

CAUTION: BEFORE YOU CONNECT OR DISCONNECT THE ELECTRICAL LEADS, TURN OFF THE POWER TO THE HIGH POTENTIAL TESTER. DAMAGE TO THE BEARING AND BRUSH SUPPORT ASSEMBLY CAN OCCUR.

(a) With the power OFF, connect the positive test lead of the high potential tester to the metal surface of the brush holder.

(b) Connect the negative test lead to an uncoated surface of the bearing and brush support.

(c) With the high potential tester output voltage at 0, set the power ON.

(d) Slowly adjust the output voltage (at a rate not more than 100 V/sec.) to 250 V RMS, commercial frequency. Decrease the voltage to zero.

(e) Set the high potential tester power OFF.

(f) Disconnect test leads from bearing and brush support assembly.

(g) Acceptance Limits:

1 Arcing, as seen by flashover (surface discharge), spark over (air discharge), breakdown (puncture discharge), or leakage current more than 2 mA will be caused by damp, dirty, weak or defective components.

If bearing and brush support assembly is unsatisfactory during the dielectric test, clean bearing and brush support assembly, and do the test again.

2 If bearing and brush support assembly is still unsatisfactory after cleaning; disassemble the bearing and brush support assembly, replace all insulating materials (i.e., washers, sleeves, insulators), and do the test again.

If bearing and brush support assembly is still unsatisfactory, replace it.

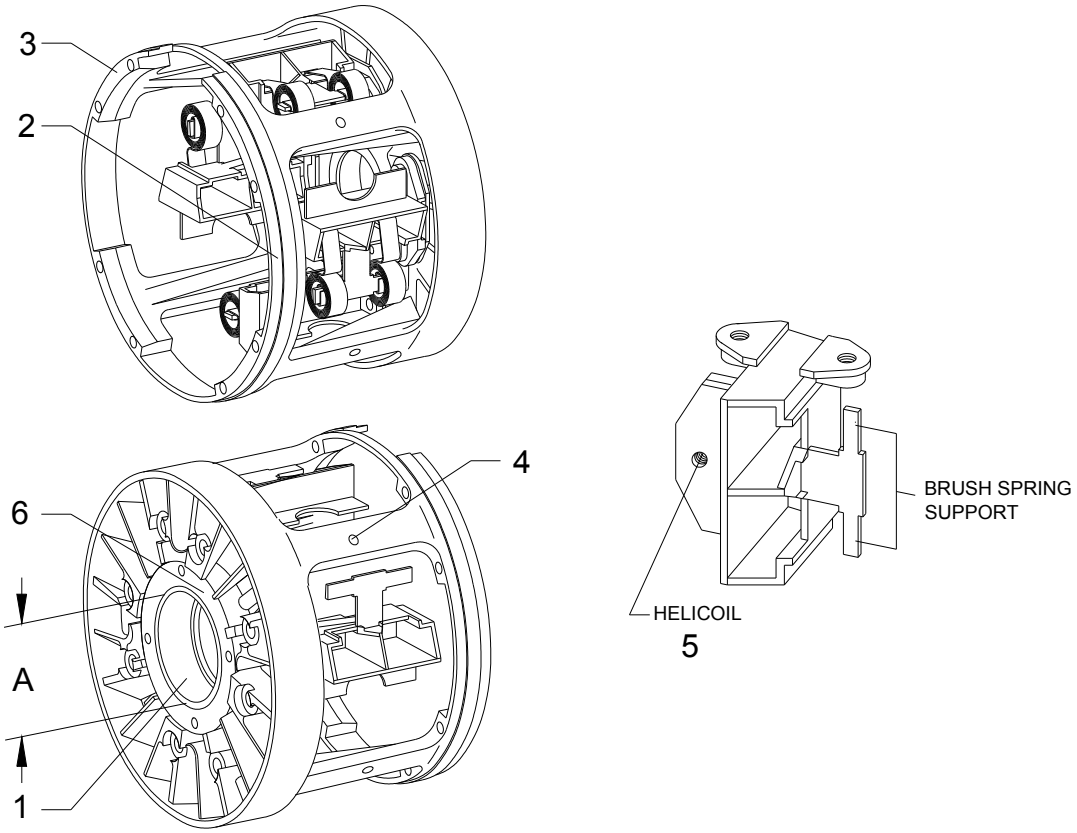


Figure 5010 - Inspecting Bearing and Brush Support Assembly

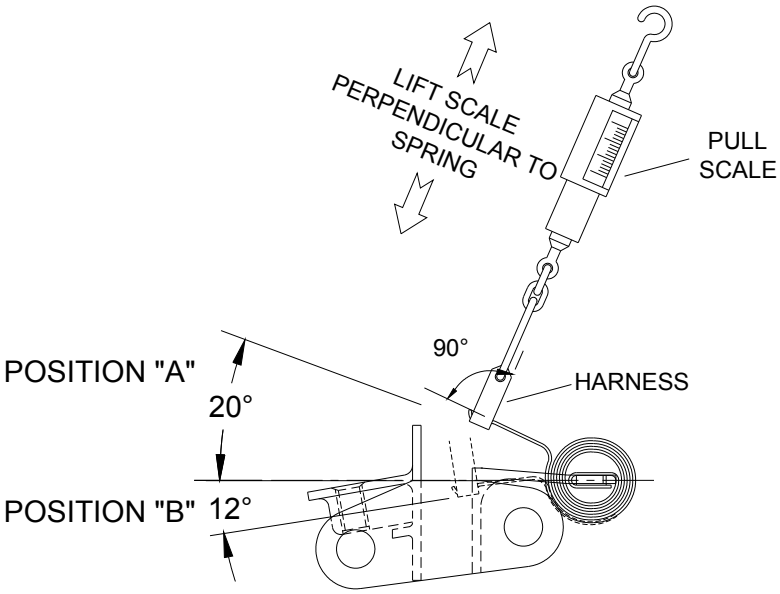


Figure 5011 - Determine Spring Force

M. 3-Pin Connector (360) and Spacer (370)

(1) Examine the part IAW the procedures found in Paragraph 4.A. and Paragraph 4.B.

(a) DISCARD the connector (360) and/or spacer (370) if damage exists.

(2) Make sure that connector (360) pins are not bent or missing.

N. Drive End Bearing Support Assembly (390)

(1) Examine part, refer to procedures found in Paragraph 4.A. See Figure 5012.

(a) DISCARD the part if cracks or fretting and/or corrosion on the mating surface are found.

(b) REPAIR if minor dents, scratches and nicks or gouging, scoring or glazing on the mating surfaces are found.

(2) If the visual inspection finds indications which can be cracks, continue the inspection under 10X magnification.

(a) If visual indications of cracks or other structural defects are observed under 10X magnification, DISCARD the part.

(3) If the visual inspection under 10X magnification finds indications which can be cracks, do a liquid penetrant inspection IAW Paragraph 6.B.

NOTE: After liquid penetrant inspection, the part(s) must have the liquid penetrant removed. Refer to the CLEANING section.

(a) REPLACE if damage is found.

(4) Measure bearing liner diameter “A”. See Figure 5012.

(a) REPAIR the bearing liner if the measurements are not within the limits of the FITS AND CLEARANCES section.

(5) Examine the threaded holes for crossed or stripped threads.

(a) DISCARD drive end bearing support assembly (390) if threaded hole damaged.

(6) Examine screen (10003-20) for tears.

(a) DISASSEMBLE drive end bearing support assembly (390) if damage is found.

(b) DISCARD drive screws (10003-30) and damaged screen (10003-20).

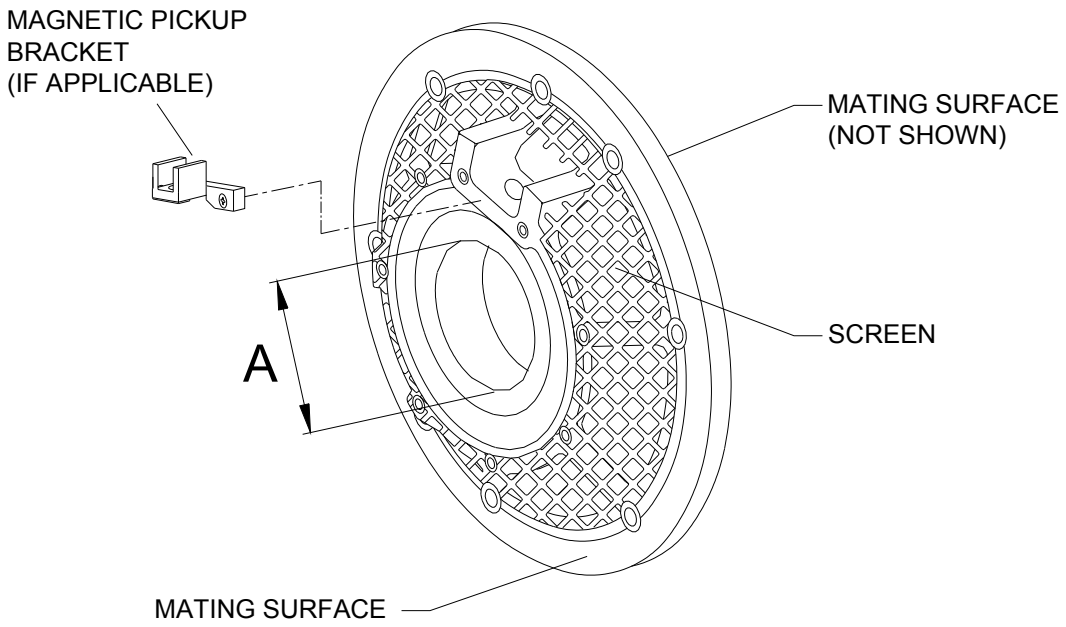


Figure 5012 - Inspecting Drive End Bearing Support Assembly

O. Speed Pickup (460) (See Figure 5013)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) REPAIR the part if two or less threads are damaged.

(b) DISCARD the part if more than two threads are damaged or other damage exists.

(2) Examine the insulation sleeving for damage.

(a) DISCARD the part if damage exists.

(3) Measure resistance between each speed pickup lead and ground.

(a) REPLACE the speed pickup if it does not meet the limit in FITS AND CLEARANCES section.

(4) Measure resistance between the two speed pickup leads.

(a) REPLACE the speed pickup if the resistance is not within the limits in FITS AND CLEARANCES section.

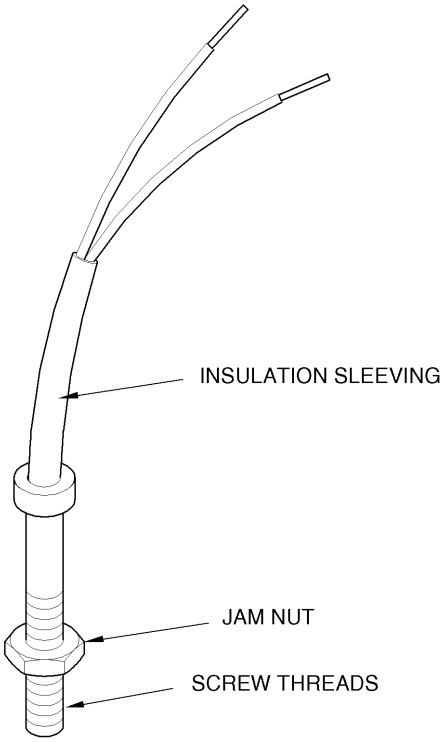


Figure 5013 - Inspecting Speed Pickup Screw and Leads

P. Armature (480) (See Figure 5014)

CAUTION: INSULATING ENAMEL (GLYPTAL OR EQUIVALENT) IS NOT APPROVED ON THE ARMATURE WINDINGS. THE ARMATURE MUST BE REPLACED IF YOU FIND INSULATING ENAMEL (GLYPTAL OR EQUIVALENT) ON THE ARMATURE WINDINGS.

(1) Before the commutator is refinished, measure commutator bar-to-bar run-out in a full circumference outside the brush paths (area where the brushes do not touch).

(a) REPLACE armature (480) if bar-to-bar run-out is more than the limits of the FITS AND CLEARANCES section before refinishing the armature. NO REPAIR IS PERMITTED.

(2) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if cracks or fretting and/or corrosion on the mating surface are found.

(b) REPAIR if minor dents, scratches and nicks or gouging scoring or glazing on the mating surfaces are found.

(3) Examine the armature for insulating enamel (Glyptal or equivalent).

(a) REPLACE the armature if insulating enamel (Glyptal or equivalent) is found on the armature windings.

(4) Examine bearing journals for gouging, scoring, or glazing.

(a) REPAIR bearing journals if damaged.

(b) REPLACE armature if damage is not repairable.

(5) Measure bearing journal diameters, A and C, as shown in Figure 5014.

(a) REPAIR bearing journals if they do not meet limits in FITS AND CLEARANCES section. Refer to SPD 1000.

(b) REPLACE armature if damage is not repairable.

(6) Measure commutator diameter B, as shown in Figure 5014.

(a) REPLACE armature if minimum commutator diameter “B” is below limit in FITS AND CLEARANCES section.

(7) Examine internal spline for rounding, stripping, or uneven wear.

(a) Check the drive spline for too much wear by engaging a new drive shaft into the armature internal drive spline. Reject the armature shaft if too much play is found when engaging the drive shaft.

NOTE: An armature spline with too much wear will not engage tightly with a new drive shaft.

(b) REPLACE armature if damaged.

(8) Examine commutator undercut for broken, damaged or missing mica.

(a) REPLACE armature if damaged.

(9) Examine commutator bars for burning and discoloration.

(a) REPAIR commutator if damaged.

(b) REPLACE armature if damage is not repairable.

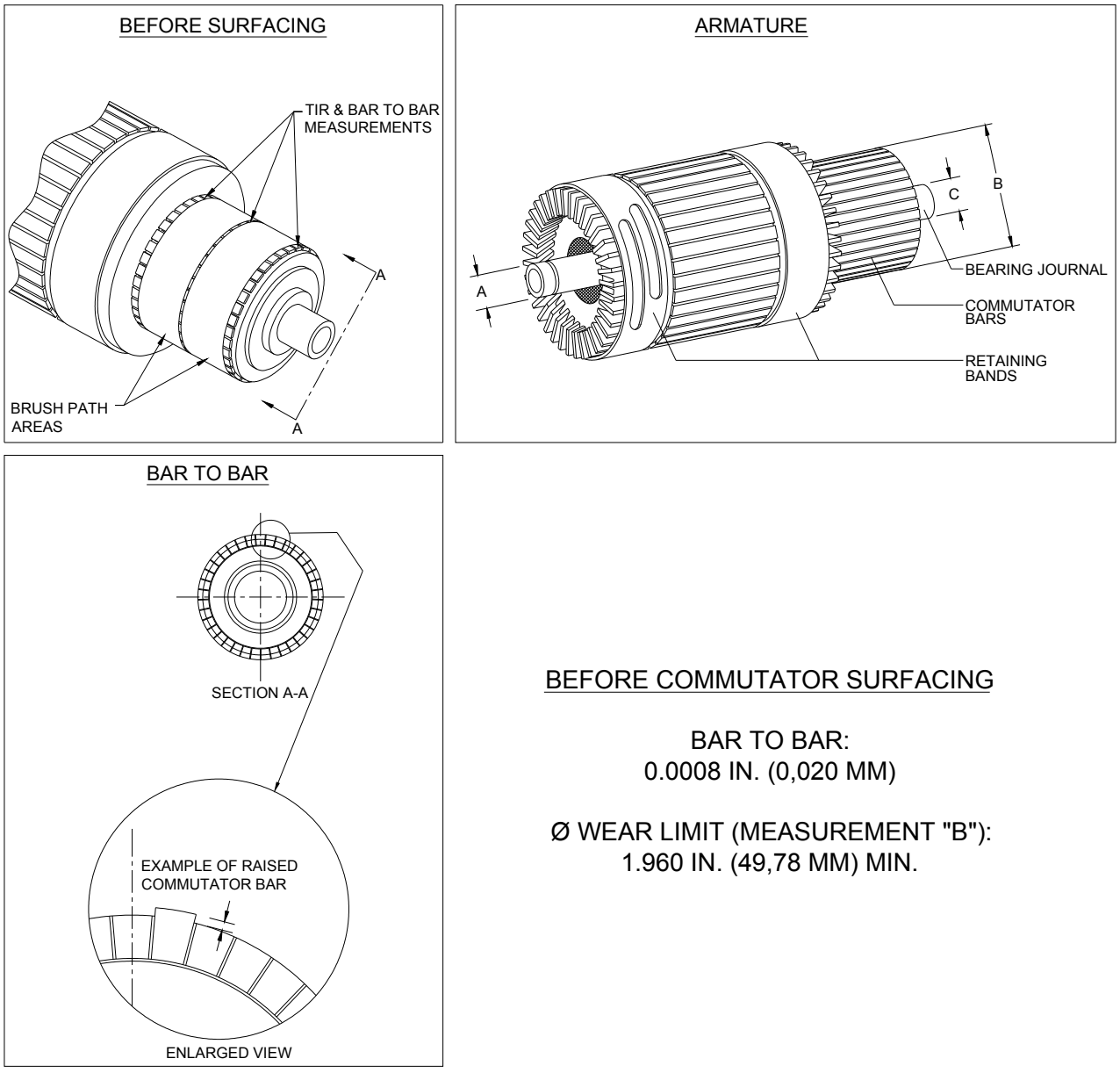
(10) Measure commutator undercut.

(a) REPAIR commutator if mica undercut depth (before recut) is below limits in FITS AND CLEARANCES section.

(b) REPLACE armature if damage is not repairable.

(11) Test armature windings for shorts using a growler and iron feeler. Refer to Paragraph 3.A. of this section for additional information about use of growler during inspection.

(a) REPLACE the armature (480) if a short exists.



BEFORE COMMUTATOR SURFACING

BAR TO BAR:
0.0008 IN. (0,020 MM)

Ø WEAR LIMIT (MEASUREMENT "B"):
1.960 IN. (49,78 MM) MIN.

Figure 5014 - Armature Check

(12) Do dielectric test.

WARNING: **BEFORE YOU OPERATE THE HIGH-VOLTAGE TESTER, MAKE SURE THAT THE POWER SWITCH IS IN THE 'OFF' POSITION. MAKE SURE THAT NO PERSON TOUCHES THE EQUIPMENT OR THE PROBES. THESE PRECAUTIONS PREVENT POSSIBLE DEATH OR INJURY FROM ELECTRIC SHOCK.**

CAUTION: YOU CAN CAUSE SERIOUS DAMAGE TO THE ARMATURE IF YOU DO NOT TURN OFF THE HIGH POTENTIAL TESTER BEFORE YOU CONNECT THE HIGH VOLTAGE ELECTRICAL LEADS.

CAUTION: THE ARMATURE MUST BE FULLY CLEANED BEFORE YOU DO A DIELECTRIC TEST.

(a) Set the power to the OFF position. Connect the positive test lead of the high potential tester to a commutator riser.

(b) Set the power to the OFF position. Put the negative test lead on the armature shaft.

(c) Set the high potential tester output voltage to 0. Turn the power to the ON position.

CAUTION: INCREASE AND DECREASE TEST VOLTAGES SLOWLY (100 VOLTS PER SECOND, MAXIMUM). IF THE VOLTAGE IS INCREASED AND/OR DECREASED TOO QUICKLY IT CAN CAUSE DAMAGE TO THE ARMATURE.

(d) At a rate that is not more than 100 V/sec., slowly adjust the output voltage to 250 V RMS, commercial frequency for 1 minute. Slowly decrease the voltage back to 0.

(e) Turn high potential tester power to the OFF position.

(f) Remove negative test lead.

(g) Keep the positive test lead connected to the commutator.

(h) Connect the negative lead to the drive end retaining band.

(i) Do the dielectric test again between the retaining band and commutator riser.

(j) Turn high potential tester power to the OFF position.

(k) Remove negative test lead.

(l) Keep the positive test lead connected to the commutator.

(m) Connect the negative lead to the anti-drive end retaining band.

(n) Do the dielectric test again between retaining band and commutator riser.

(o) Turn high potential tester power to the OFF position.

(p) Disconnect all test leads.

(q) Acceptance limits:

1 There must not be indication of moist, dirty, weak or defective components. An indication is flash-over (surface discharge), spark-over (air discharge) or breakdown (puncture discharge). The leakage current must not be more than 2 mA.

2 If the armature does not pass the acceptance limits, clean the armature and do the test again.

3 If the armature does not pass the acceptance limits of the dielectric test after cleaning, replace the armature.

Q. Bearing Retainer (490) (See Figure 5015)

(1) Examine the part IAW the procedures found in Paragraph 4.A.

(a) DISCARD the part if damaged.

(2) Carefully examine mating surfaces 1 and 2 for gouging, scoring, or glazing.

(a) DISCARD the part if damaged.

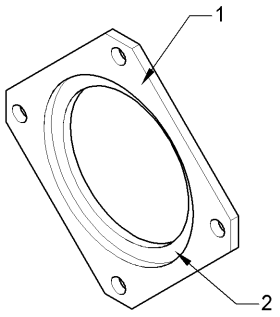


Figure 5015 - Bearing Retainer

R. Baffle Disc (530) (See Figure 5016)

(1) Examine part, refer to procedures found in Paragraph 4.A.

(a) Discard part if damaged.

(2) Carefully examine mating surfaces 1 and 2 for gouging, scoring, or glazing.

(a) DISCARD the part if damaged.

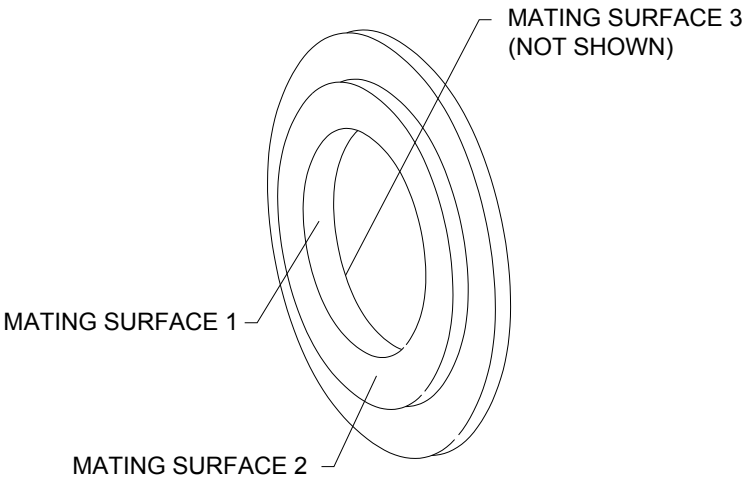


Figure 5016 - Inspecting Baffle Disc

S. Stator and Housing Assembly (550) (See Figure 5017)

CAUTION: INSULATING ENAMEL (GLYPTAL OR EQUIVALENT) IS NOT APPROVED ON THE STATOR WINDINGS. THE STATOR MUST BE REPLACED IF YOU FIND INSULATING ENAMEL (GLYPTAL OR EQUIVALENT) ON THE STATOR WINDINGS.

(1) Examine the part IAW the procedures found in Paragraph 4.A. and Paragraph 4.B.

(a) DISCARD the part if cracks or other major damage exists.

(b) REPAIR thread damage of two turns or less.

(c) DISCARD the part if thread damage is more than two turns.

(d) REPAIR the part if other damage exists.

(2) Examine the stator for insulating enamel (Glyptal or equivalent).

(a) REPLACE the stator if insulating enamel (Glyptal or equivalent) is found on the stator windings.

(3) Examine the brush leads and stator leads for damage.

(a) If brush lead damage is more than 5 percent of the brush lead, REPLACE the stator and housing assembly (550).

(b) If stator lead damage is found, REPLACE the stator and housing assembly (550).

(4) Do a dielectric test.

WARNING: **BEFORE YOU USE THE HIGH VOLTAGE ELECTRICAL EQUIPMENT, MAKE SURE THAT THE POWER SWITCH IS IN THE 'OFF' POSITION. MAKE SURE THAT NO PERSON TOUCHES THE EQUIPMENT OR THE PROBES. THIS WILL PREVENT DEATH OR INJURY FROM ELECTRIC SHOCK.**

CAUTION: FAILURE TO TURN OFF THE HIGH POTENTIAL TESTER POWER BEFORE CONNECTING OR DISCONNECTING HIGH VOLTAGE ELECTRICAL LEADS CAN CAUSE SERIOUS DAMAGE TO THE STATOR AND HOUSING ASSEMBLY.

CAUTION: STATOR AND HOUSING ASSEMBLY MUST BE THOROUGHLY CLEAN BEFORE PERFORMING A DIELECTRIC CHECK.

(a) Jumper all stator leads together.

(b) With power OFF, connect positive test lead of high potential tester to jumpered stator leads.

(c) With power OFF, connect negative test lead to uncoated surface of housing.

(d) With high potential tester output voltage at 0, turn power ON.

(e) At a rate not to be more than 100 V/sec., slowly adjust output voltage to 250 V RMS, commercial frequency for one minute. Slowly decrease voltage back to 0.

(f) Turn high potential tester power OFF.

(g) Disconnect test leads.

(h) Disconnect jumper from stator leads.

(i) Acceptance Limits:

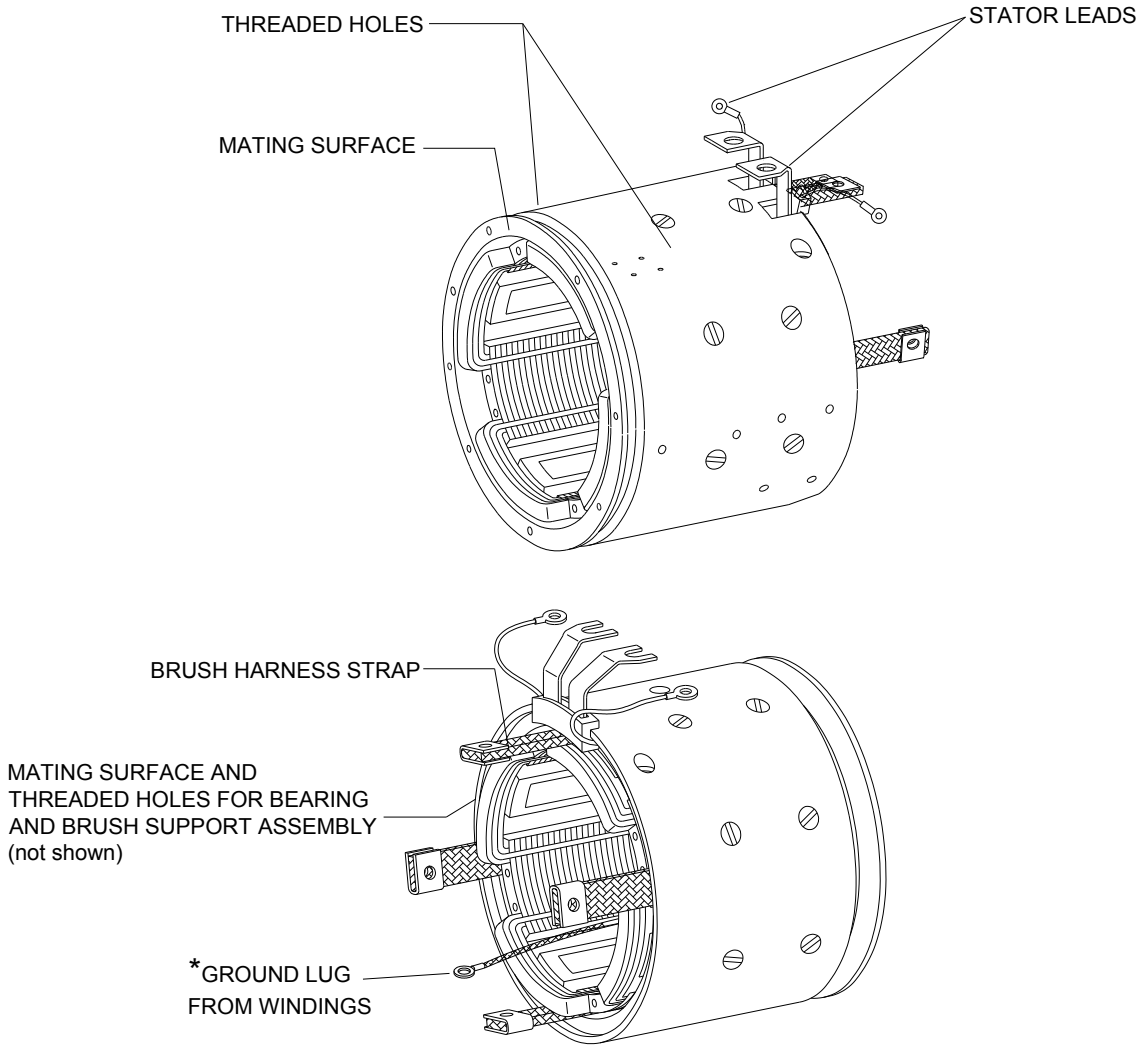
1 Arcing as evidenced by flashover (surface discharge), spark over (air discharge), breakdown (puncture discharge), or leakage current that is more than 2 mA is evidence of damp, dirty, weak or defective components and constitutes a failure.

If stator and housing assembly fails dielectric test, clean stator and housing assembly and repeat dielectric test.

2 If stator and housing assembly fails dielectric test after cleaning, replace stator and housing assembly.

(5) Use an ohmmeter to check for continuity between terminals A and E.

(a) REPLACE the stator and housing assembly (550) if an open circuit exists.



*PREVIOUS VERSIONS FEATURED A GROUNDING LEAD THAT WAS NOT BUILT INTO THE WINDINGS

Figure 5017 - Stator and Housing Assembly

T. Terminal Block (10004-60)

CAUTION: THE USE OF RE-MANUFACTURED TERMINAL BLOCKS IS NOT AUTHORIZED BY SAFRAN POWER. DAMAGED TERMINAL BLOCKS (OTHER THAN THOSE WITH REPAIRABLE THREAD DAMAGE) MUST BE DISCARDED.

(1) Examine part, refer to procedures found in Paragraph 4.A.

(a) DISCARD the part if damage, other than thread damage, exists.

(2) Examine terminal studs for crossed or stripped threads. See Figure 5018.

(a) REPAIR if damage is two or less thread turns.

(b) If damage is more than two turns:

1 DISCARD terminal block if P/N 23032-1518 or P/N 23069-1236 are on the terminal block.

2 If the model has terminal block P/N 23081-1310, see REPAIR section for the proper way to replace a damaged terminal stud.

(3) Measure the capacitance values between Terminals B and E and between B and the ground lead with a LCR meter.

(a) Measure the capacitance values between terminals B and E at the frequency as shown in the FITS AND CLEARANCES section.

1 DISCARD the part if the capacitance values are not in the limits as shown in the FITS AND CLEARANCES section.

(b) Measure the capacitance values between terminal B and the ground (and terminal C to ground for applicable models) lead at the frequency as shown in the FITS AND CLEARANCES section.

1 DISCARD the part if the capacitance values are not in the limits as shown in the FITS AND CLEARANCES section.

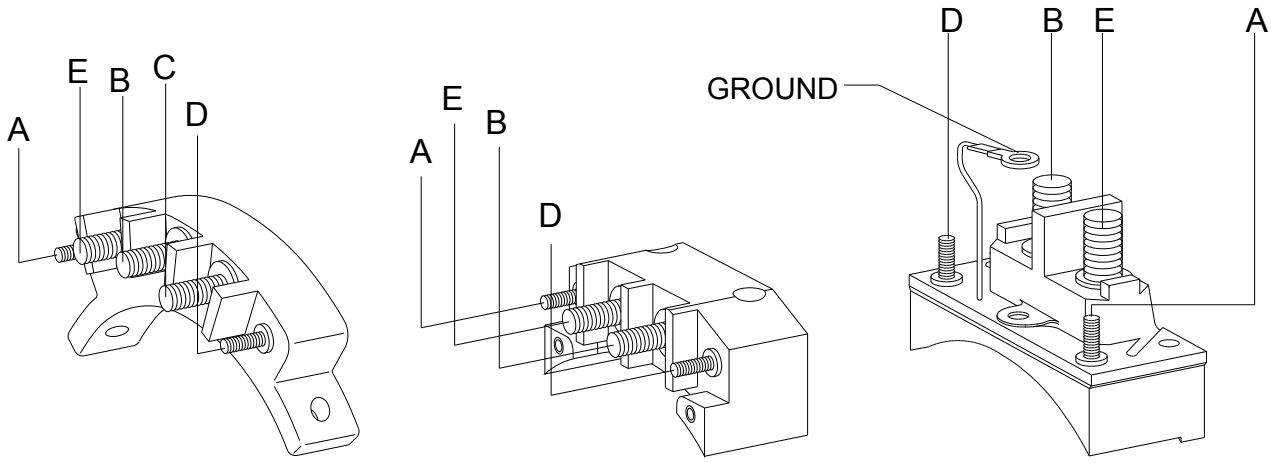


Figure 5018 - Terminal Block Inspection

10. Terminology

Table 5003 lists the definitions of terms used to describe damage conditions.

Term	Definition	Probable cause
Corrosion	The chemical or electrochemical reaction between a material, usually a metal, and its environment that produces a deterioration of the material and its properties	Environmental condition that causes deterioration.
Crack	A break in material.	Severe stress from overload or shock; possible extension of a scratch
Dent	A small, smoothly-rounded depression.	A sharp blow or excessive pressure
Fretting	Wear that occurs between tight-fitting surfaces subjected to cyclical relative motion of extremely small amplitude. Usually, fretting is accompanied by corrosion, especially of the very fine wear debris.	Vibration between mating surfaces.
Fretting corrosion	Accelerated deterioration at the interface between contacting surfaces as the result of corrosion and slight oscillatory movement between the two surfaces.	Vibration between mating surfaces.
Galling	Transfer of metal from one surface to another.	Result of localized lubrication break-down between sliding surfaces.
Glazing	Smoothing and creep of a surface.	Result of localized lubrication break-down between sliding surfaces.
Gouging	Removal of surface material, typified by rough and deep depressions.	Protruding objects, incorrectly aligned.
Nick	A sharp-bottomed depression that can have rough outer edges.	Dropping, banging.
Rounding	Removal of surface metal at corners or dulling of edges.	Result of abrasion, vibration, or poor mating surfaces.
Scoring	A deep scratch following a path of part travel.	Result of localized lubrication break-down between sliding surfaces.

Table 5003 - Terminology

Term	Definition	Probable cause
Scratch	A very shallow furrow or irregularity, usually longer than wide.	Movement of a sharp object across the surface.
Short	Evidenced by sparking, arcing, or high current. Electrical condition where two conductors are connected by a path of very low resistance.	The result when two carrying conductors are connected by a path of negligible resistance.
Stripped Thread	Thread of a nut, stud, bolt, or screw damaged by tearing away parts of the thread.	Incorrect installation of threaded mating parts.
Tear	Parting of material.	Excessive tension, caused by external force.
Wear	Slow removal of material. Wear may not be visible to the naked eye.	Result of abrasive substances contacting rolling surfaces and acting as a lapping compound.

Table 5003 - Terminology (Continued)

REPAIR

1. Introduction

CAUTION: ANY USE OF PARTS, MATERIALS, OR PROCESSES NOT AUTHORIZED BY SAFRAN POWER FOR MAINTENANCE OR OVERHAUL OF THE UNIT CAN AFFECT CONTINUED FLIGHT WORTHINESS OR INVALIDATE CERTIFICATION.

Repairs are limited to:

- repairing damaged surfaces: Paragraph 4.
- restoring surface coatings of parts and assemblies: Paragraph 5.
- repairing damaged threads: Paragraph 6.
- replacing helicoil inserts: Paragraph 7.
- replacing terminal lugs: Paragraph 8.
- replacing air inlet insulating tape: Paragraph 9.
- replacing air inlet assembly screen: Paragraph 10.
- bearing liner and journal restoration: Paragraph 11.
- commutator refinishing: Paragraph 12.
- armature balancing: Paragraph 13.
- repair of bearing and brush support assembly: Paragraph 14.
- correcting output voltage polarity: Paragraph 15.
- replacing removable terminal block studs: Paragraph 16.

Repair operations not outlined or referenced in this manual are not authorized by Safran Power.

In addition to specific repairs authorized by Safran Power in this manual, standard repair procedures for the models are described in the following Safran Power Standard Practice Documents (SPD).

- Selective (Brush Plating), Electrodeposition - Refer to SPD 1000.
- Armature Balancing for DC Starter-Generators / DC Generators - Refer to SPD 1001.
- Surface Repair and Coating - Refer to SPD 1002.
- Plastic Media Blasting - Refer to SPD 1003.
- Brush Holder Alignment Fixtures - Refer to SPD 1004.

- Brush Installation, Seating, and Run-In - Refer to SPD 1006.

2. Repair Tools

In addition to normal shop tools, specific tools for repair of the models are listed in Table 6001.

NOTE: Equivalent substitutes can be used for the tools listed in Table 6001.

WARNING: YOU MUST OBEY THE TOOL AND EQUIPMENT MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Tool Description	Source/Figure Reference
Bump Switch	Rating: 30 V DC, 10 A
Commutator Turning Fixture	Figure 9016
Crimp Tool	Commercially Available
Drive End Outboard Hub Support	Figure 9012
Helicoil Insert Removal and Installation Tool	Commercially Available
6 V Battery or Equivalent DC Power Source	Commercially Available
Stud installer, Mustang No. 1	Titan Tool Company, inc. 7410 West Ridge road Fairview, PA 16415 Ph: (814) 474-1583 Fax: (814) 474-5337 www.titantoolco.com
Terminal Stud Remover P/N: E23824-SQ5 Extracto© Stud Remover 3/8 inch-24 Equipped with 1/2 inch drive	
Terminal Stud Driver P/N: M1-AQ5-08 Mustang© Stud Driver 3/8 inch-24 Equipped with 1/2 inch drive	
Thread Chasers	Commercially Available
Peen Tool - used to roll rivet head	Commercially Available

Table 6001 - Repair Tools

3. Repair Materials

Materials necessary for the model repair are listed in Table 6002.

NOTE: Repair materials are not available from Safran Power. All items can be purchased commercially.

WARNING: YOU MUST OBEY THE MATERIAL MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Material	Description/Material Specification	Source
Chemical Film Solution Alodine 1200 or Pen, Touch-N-Prep	Chemical Film Solution MIL-DTL-5541, Type 1, Class 3 or Alodine® 1132 Touch-N-Prep Pen IAW MIL-DTL-81706B	Henkel Surface Technologies 32100 Stephenson Hwy. Madison Heights, MI 48071 Ph: (248) 583-9300 FAX: (248) 583-2976 (V1N6B3)
Isopropyl Alcohol	TT-I-735, Grade A See **WARNING** before using this material. Flash Point: 53 °F (12 °C), FLAMMABLE Refer to the Material Safety Data (MSD) Sheet for the material for additional safety information	Commercially Available
Lubricating Oil	N/A	Commercially Available
Cleaning Pads/Wiping Cloths	Lint-free, soft fabric	Commercially Available
Primer, Zinc Chromate	TT-P-1757 Composition G, Color Yellow.	Commercially Available
Abrasive paper	400/600 grit (non-aluminum oxide only)	Commercially Available

Table 6002 - Repair Materials

Material	Description/Material Specification	Source
Thread Locking Primer	Primer, Loctite Grade 7649	Loctite Corporation Aurora, IL Ph: (860) 571-5100 www.loctite.com (V7V827)
Thread Locking Adhesive	Loctite Grade 243	
Tape, Insulating	P/N SG13-06R 8 mil PTFE coated, fiberglass, acrylic adhesive	Philpott Brunswick, OH www.philpottrubber.com (V1T7E9)
India Stone	N/A	Commercially Available

Table 6002 - Repair Materials (Continued)

4. Surface Repair

Repair corroded or damaged surfaces of parts that have qualified for repair according to the CHECK section inspection guidelines.

A. Repair Procedure

(1) Remove corrosion, sharp edges, burrs, nicks, or scratches from cast surfaces, machined mating surfaces, and sealing surfaces with india stone or abrasive paper. Remove only sharp edges or burrs that are above surface of part.

(2) Remove minor raised edges, burrs, nicks, or scratches on polished or load-bearing surface. Remove only material that extends above polished surface. Make sure that dimensional tolerances are within limits

5. Restoring the Surface Coatings of Parts and Assemblies

A. Removal of Surface Coatings

Remove the surface coatings of parts and assemblies that have been damaged using plastic media blasting equipment and procedures in accordance with (IAW) SPD 1003.

NOTE: Follow the quality assurance guidelines listed in SPD 1003 for the use of plastic media blasting equipment.

B. Restoration of Surface Coatings

Repair the surface coatings of parts and assemblies that have been damaged or removed as given in the procedures in Safran Power SPD 1002.

Clean all parts per CLEANING section of this CMM.

WARNING: **CHEMICAL CONVERSION MATERIALS ARE POISONOUS AND CAN CAUSE EXPLOSIONS WHEN MIXED WITH ACIDS, REDUCING AGENTS COMBUSTIBLE AND OXIDIZING MATERIALS. ISOLATED STORAGE OF THESE MATERIALS IS MANDATORY.**

WARNING: **BEFORE YOU USE CHEMICAL CONVERSION MATERIALS, PUT ON A RESPIRATOR, RUBBER APRON, RUBBER GLOVES AND EYE PROTECTION. THIS WILL PREVENT INJURY FROM SPILLS AND FROM THE FUMES.**

WARNING: **KEEP CHEMICAL CONVERSION MATERIALS AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. CHEMICAL CONVERSION MATERIALS ARE FLAMMABLE.**

Item Number	Nomenclature	Process	Coating Repair
10001-50	Mounting Adapter	Refinish/Paint	Chemical Film touch-up or Wash Primer and paint
10001-150	Air Inlet P/Ns: 23081-1090, -1091, -1092, -1430, -1570, -1571, -1575, -1576, -1670	Refinish/Paint	Primer and paint
	Air Inlet P/Ns: 23081-1470, -1400	Refinish/Paint	Chemical Film touch-up or Wash Primer and paint
10001-310	Dampener Back Plate or Dampener Back Plate and Gear	Refinish phosphate	Re-phosphate IAW TT-C-490 or Phosphate touch-up
10001-550	Stator and Housing Assembly. Housing can be refinished.	Refinish/Paint	Chemical Film touch-up or Wash Primer and paint
10002-10	Anti-drive end end bell P/Ns: 23032-2165 (black), 23032-3665 (white), 23081-1050 (black)	Refinish/Paint	Primer and paint
	Anti-drive end end bell P/Ns: 23081-3320, -3322 -3365	Refinish/Paint	Chemical Film touch-up IAW MIL-DTL-5541, Class 3

Table 6003 - Surface Coating References

Item Number	Nomenclature	Process	Coating Repair
10003-10	Drive end bearing support P/Ns: 23081-1130, -1131, 1490	Refinish/Paint	Chemical Film touch-up IAW MIL-DTL-5541, Class 3
	Drive end bearing support P/Ns: 23032-3652 (white), 23081-1230 (white)	Refinish/Paint	Primer and paint
NOTE: Use this table with Safran Power SPD 1002 to determine the proper surface coating repair procedures. NOTE: Before adding primer/paint to any surface of any part, first record any part numbers or Safran Power CAGE codes to where primer/paint is applied. These will be reapplied after primer/painting is completed.			

Table 6003 - Surface Coating References

6. Thread Repair

A. Repair Damaged Threads as follows:

CAUTION: DO NOT USE A THREAD-CUTTING DIE. UNREPAIRABLE DAMAGE CAN RESULT FROM USING A THREAD-CUTTING DIE.

(1) Repair damaged threads with a thread-chaser.

(2) Remove any remaining sharp edges or burrs with an india stone.

WARNING: KEEP LUBRICATING OIL AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. THE OIL IS FLAMMABLE.

WARNING: DO NOT GET LUBRICATING OIL ON YOUR SKIN OR IN YOUR EYES AND DO NOT BREATHE THE FUMES. LUBRICATING OIL IS A POISONOUS MATERIAL.

(3) Apply a light coating of lubricating oil to repaired threads to prevent corrosion.

7. Helical Coil Insert Replacement

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10002.

A. Remove and Replace Damaged Helical Coil Inserts (20) as needed

(1) Remove damaged helical coil insert with helical coil insertion/removal tool.

(2) Clean hole for helical coil insert. Refer to the CLEANING section.

WARNING: **ZINC CHROMATE PRIMERS ARE POISONOUS AND CAN CAUSE EXPLOSIONS WHEN MIXED WITH ACIDS, REDUCING AGENTS, COMBUSTIBLE AND OXIDIZING MATERIALS. ISOLATED STORAGE OF THESE MATERIALS IS MANDATORY.**

WARNING: **BEFORE YOU USE ZINC CHROMATE PRIMER, PUT ON A RESPIRATOR, RUBBER APRON, RUBBER GLOVES AND EYE PROTECTION. THIS WILL PREVENT INJURY FROM SPILLS AND FROM THE FUMES.**

WARNING: **KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.**

(3) Apply a small quantity of zinc chromate primer to the outer surface of the replacement helicoil insert.

(4) Install helicoil coil insert to the depth shown in Figure 6001 below part surface while primer is still wet.

(5) Break off helicoil coil insert installation tang.

WARNING: **CHEMICAL CONVERSION MATERIALS ARE POISONOUS AND CAN CAUSE EXPLOSIONS WHEN MIXED WITH ACIDS, REDUCING AGENTS, COMBUSTIBLE AND OXIDIZING MATERIALS. ISOLATED STORAGE OF THESE MATERIALS IS MANDATORY.**

WARNING: **BEFORE YOU USE CHEMICAL CONVERSION MATERIALS, PUT ON A RESPIRATOR, RUBBER APRON, RUBBER GLOVES AND EYE PROTECTION. THIS WILL PREVENT INJURY FROM SPILLS AND FROM THE FUMES.**

WARNING: **KEEP CHEMICAL CONVERSION MATERIALS AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. CHEMICAL CONVERSION MATERIALS ARE FLAMMABLE.**

(6) Apply chemical film solution MIL-DTL-5541, Type 1, Class 3 to bare metal.

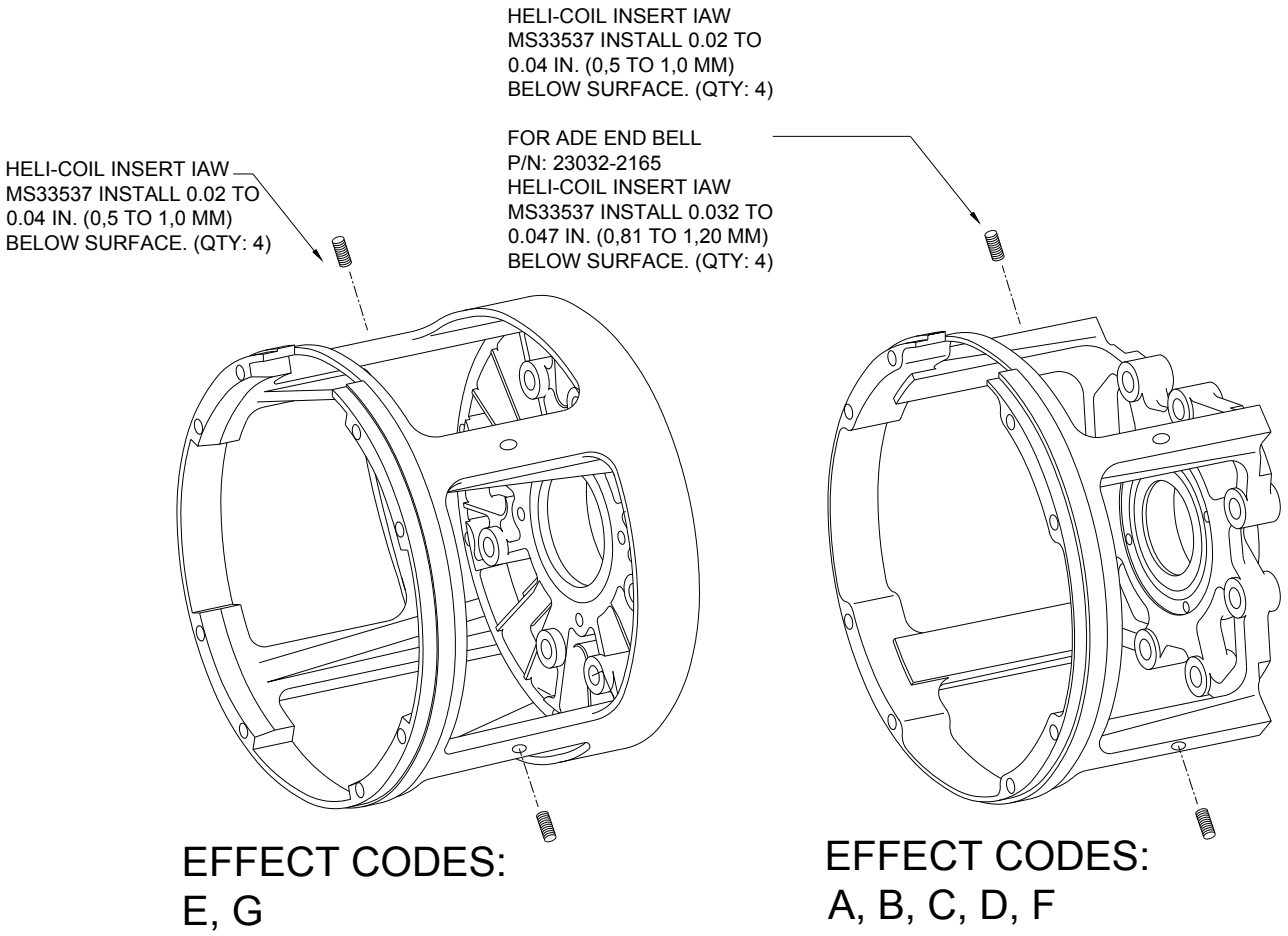


Figure 6001 - Helicoil Insert Replacement

8. Terminal Lug Replacement

A. Remove and Replace Damaged Terminal Lugs as follows:

(1) Cut the wire at the base of the terminal(s). Discard the terminal(s).

(2) Remove 0.25 inch (6.4 mm) of insulation sleeving from the end of the electrical wire(s).

(3) Use a crimping tool to install the new terminal(s).

9. Air Inlet Insulating Tape Repair (Air Inlet models 23081-1092, -1400, -1571 and -1576 only)

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

A. Replace the Insulating Tape

(1) Remove all signs of the insulating tape and clean the inside surface of the brush access cover (150). Refer to the CLEANING section.

(2) If the plating on the inner surface of the brush access cover (150) is damaged, repair the surface.

(3) For air inlet 23081-1092 and -1400:

(a) Install 4 pieces of insulating tape, 1.50 ± 0.06 in. square (38,1 ± 1,5 mm sq.), equally spaced. See Figure 6002.

(b) Install 1 piece of insulating tape, 1.50 ± 0.06 in. (38,1 ± 1,5 mm) with a length of 15.75 in. (400 mm). See Figure 6003.

(4) For air inlet 23081-1571 and -1576:

(a) Install 4 pieces of insulating tape, 1.56 ± 0.06 in. square (39,6 ± 1,5 mm sq.), equally spaced. See Figure 6004.

(b) Install 1 piece of insulating tape, 1.56 ± 0.06 in. (39,6 ± 1,5 mm) with a length of 15.75 in. (400 mm). See Figure 6005.

(5) Beginning at one of the four screw holes, attach strip of insulating tape inside the air inlet.

NOTE: A gap centered on one of the four screw holes, no more than 0.25 in. (6,4 mm) between the beginning and end of the insulating tape strip is permitted.

(6) Remove insulating tape from screw holes.

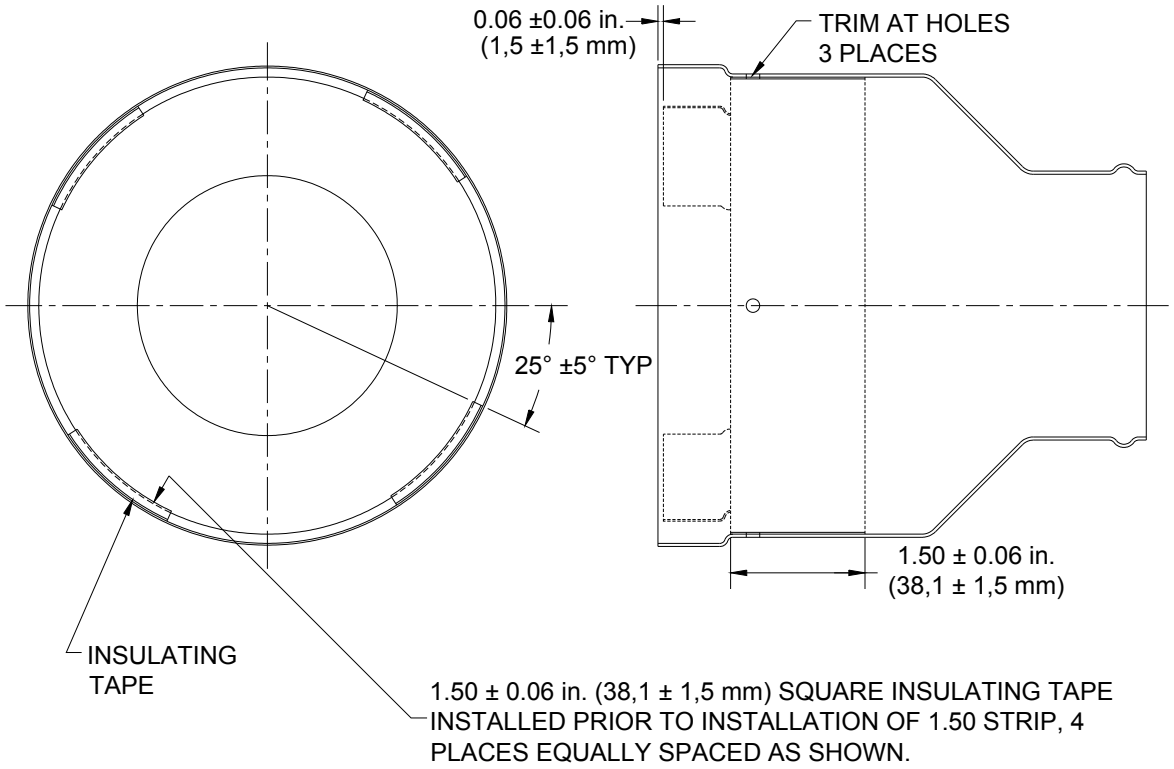


Figure 6002 - Install Air Inlet Insulating Tape (P/N: 23081-1092 and -1400)

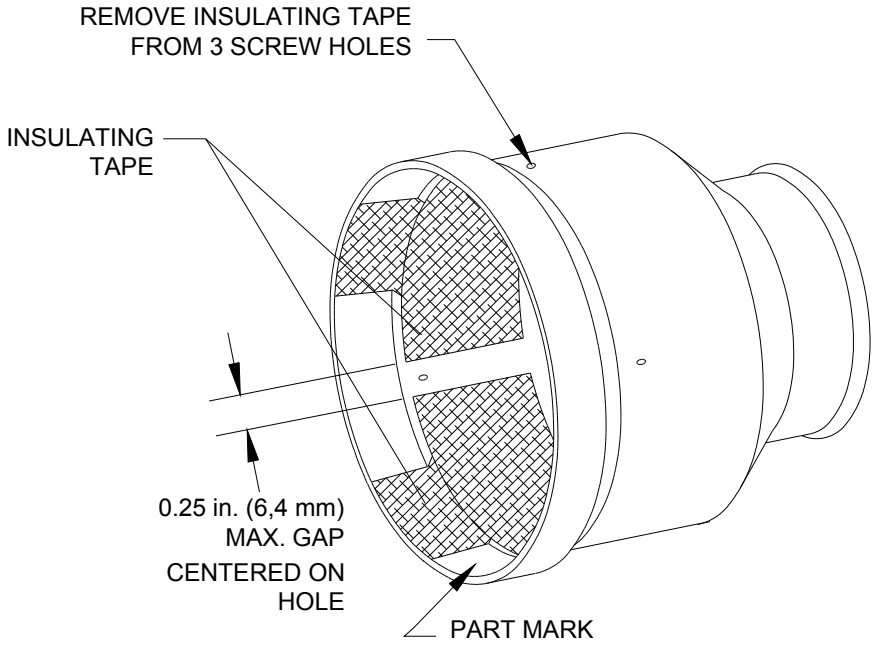


Figure 6003 - Inspection of Air Inlet Insulating Tape (P/N: 23081-1092 and -1400)

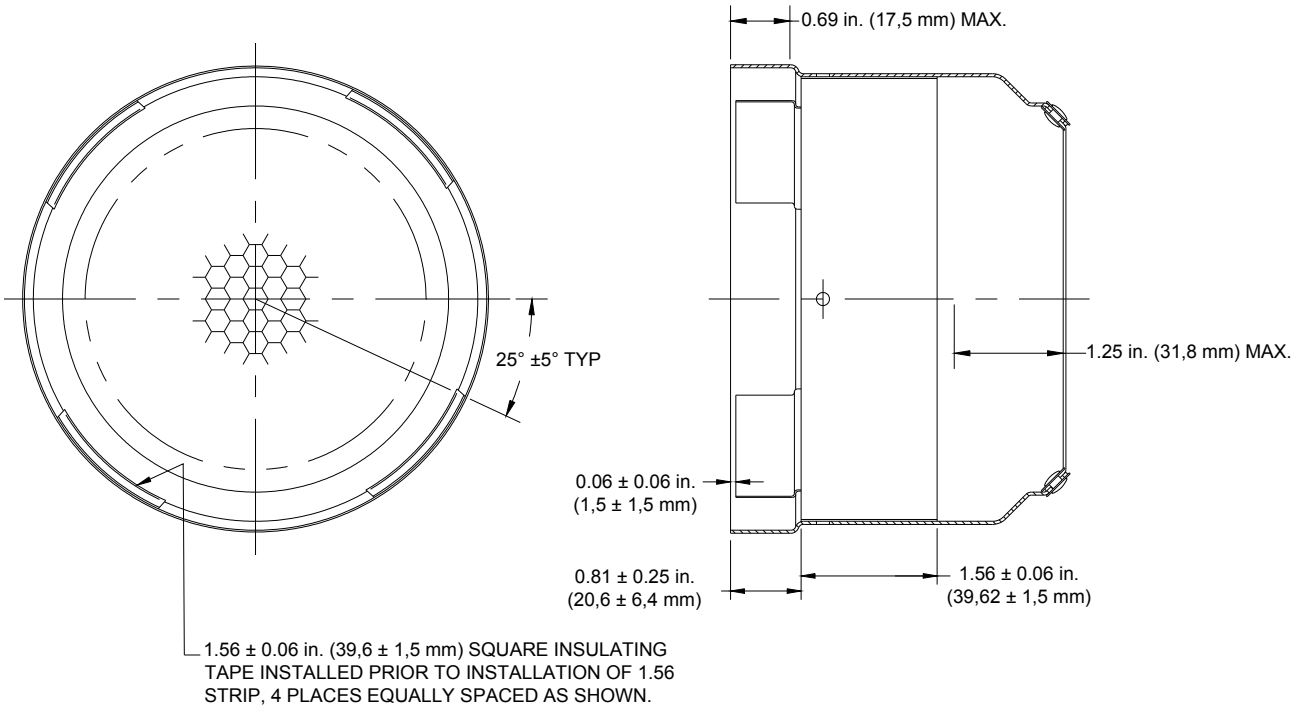


Figure 6004 - Install Air Inlet Insulating Tape (P/N 23081-1571 and -1576)

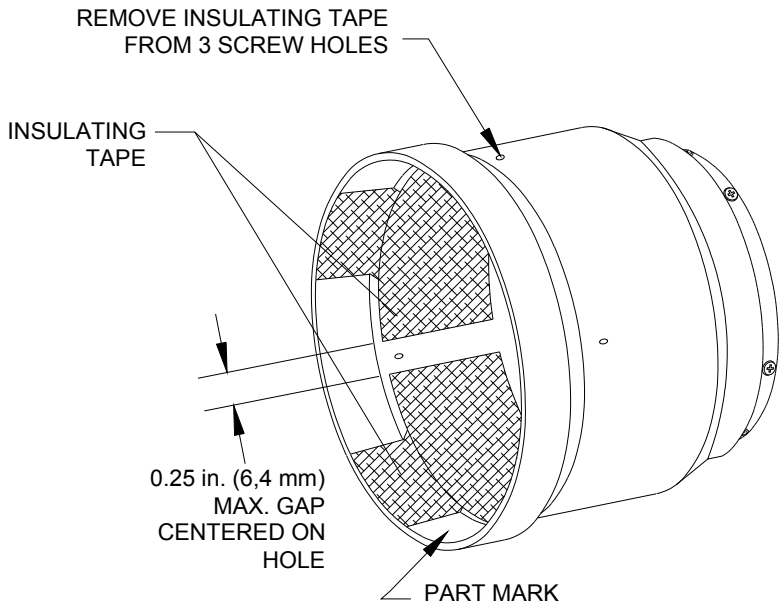


Figure 6005 - Inspection of Air Inlet Insulating Tape (P/N 23081-1571 and -1576)

10. Replacing Air Inlet Screen for Air Inlet & Screen Assembly (10001-150)

Part Number	Description	Quantity
10001-170	Screen, Air Inlet	1
10001-180	Rivet, Aluminum Alloy	6
10001-190	Washer, Flat	12

Table 6004 - Parts Required for Air Inlet Screen Replacement

A. Repair Procedure (See Figure 6006)

(1) Drill out six rivets (10001-180).

NOTE: Do not deform rivet mounting hole.

(2) Discard damaged screen (10001-170).

(3) Install screen inboard of inlet.

(4) Put one washer (10001-190) on each rivet.

(5) Install rivet with washer through inlet and screen.

NOTE: The rivet can be installed with formed head facing inboard or outboard.

(6) Put one washer on installed rivet.

CAUTION: A SPLIT IN THE ROLLED OVER SURFACE OF RIVET MUST NOT EXTEND INTO THE RIVET BODY. NO MORE THAN (2) SPLITS WILL BE ALLOWED IN A 90-DEGREE AREA. A TOTAL OF NO MORE THAN 3 SPLITS WILL BE ALLOWED. VISUALLY INSPECT THE ASSEMBLY PER THE INSTRUCTIONS IN THE CHECK SECTION.

(7) Use a peen tool to roll over drilled end of rivet.

(8) Repeat Paragraph 10.A.(4) thru Paragraph 10.A.(7) for remaining five rivet locations.

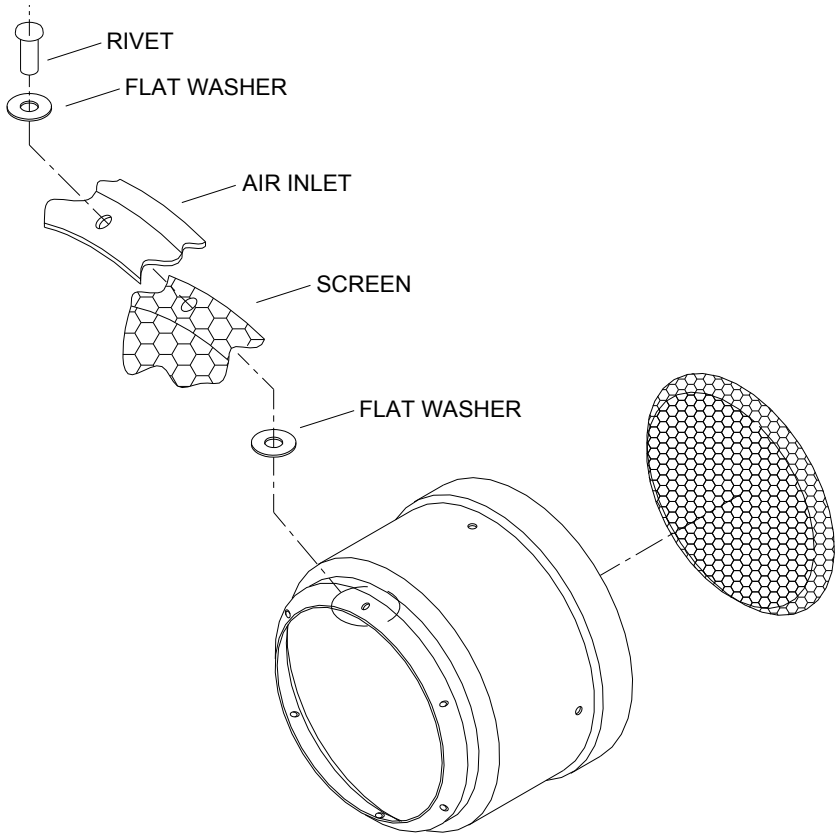


Figure 6006 - Air Inlet Assembly Screen Replacement

11. Bearing Journal and Liner Restoration

A. Bearing Journals

(1) If the armature shaft bearing journals are worn beyond limits in the FITS AND CLEARANCES section, restoration may be possible by electrodeposition plating in accordance with Safran Power Standard Practice Document (SPD) 1000.

NOTE: If armature shaft is out of concentricity, machine shaft within concentricity before plating.

(2) Maximum allowable thickness of plating must be 0.01 in. (0.254 mm), or 0.02 in. (0.508 mm) measured across a diameter.

(3) Armature shaft bearing journals may be plated to final dimensions, or overplated then ground to final dimensions listed in the FITS AND CLEARANCES section.

B. Bearing Liner Restoration

(1) If bearing liners are worn beyond acceptance limits, restoration can be possible. Refer to SPD 1000 for repair limitations and procedures for selective electrodeposition nickel plating. Components not in compliance with the dimensions as applicable, must be reworked or replaced.

(2) Stainless steel bearing liners cannot be repaired. Use a magnet to check if the bearing liner is stainless steel. If the bearing liner is stainless steel, the magnet does not attract to the bearing liner.

(3) Sintered metal bearing liners were used for a short time during the 1980's and cannot be repaired per SPD 1000. Determine if the bearing liner is sintered by measuring the outside diameter (OD) of the bearing liner.
See Figure 6007.

(a) For anti-drive end end bell bearing liners:

- Sintered bearing liner will have an exposed OD of approximately 1.67 in. (42,4 mm).
- Steel bearing liners will have an exposed OD of approximately 1.746 in. (44,35 mm).

(b) For drive end end bell bearing liners:

- Sintered bearing liners will have an OD of approximately 1.78 in. (45,2 mm) where it projects from the drive end end bell.
- Steel bearing liners will have an exposed OD of approximately 1.725 in. (43,82 mm).

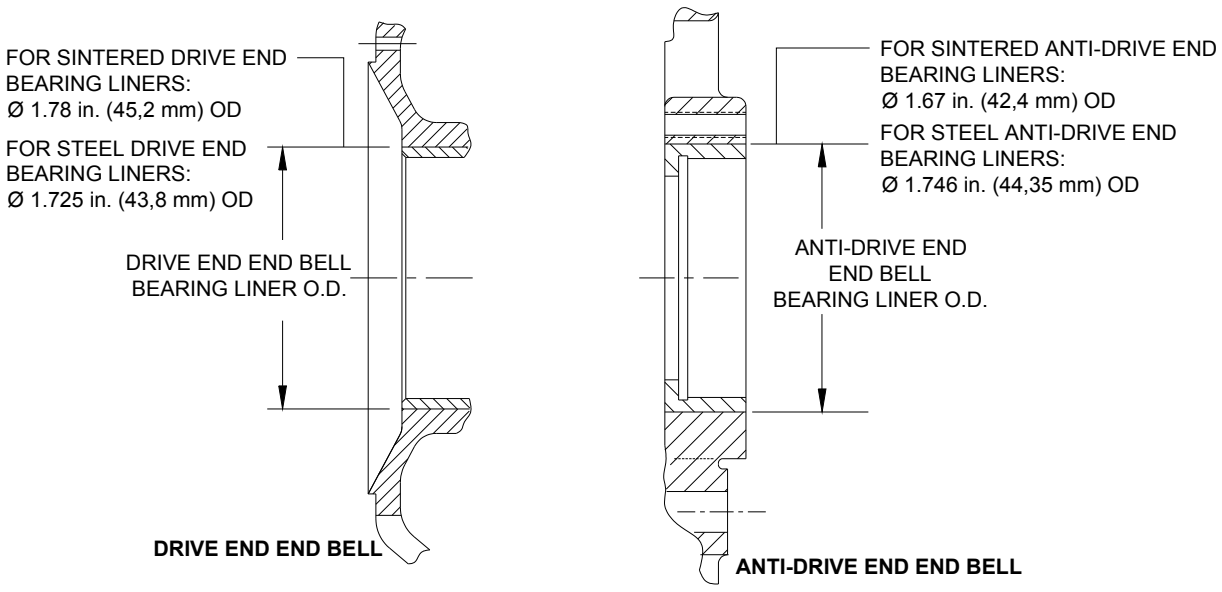


Figure 6007 - Measuring Bearing Liner Outside Diameter (OD)

(4) Anti-Drive End (ADE) End Bell Restoration

Refer to SPD 1000 for detailed instructions. Components not in compliance with the dimensions in Figure 6008, Figure 6009, Figure 6010 and Figure 6011 must be reworked, or replaced.

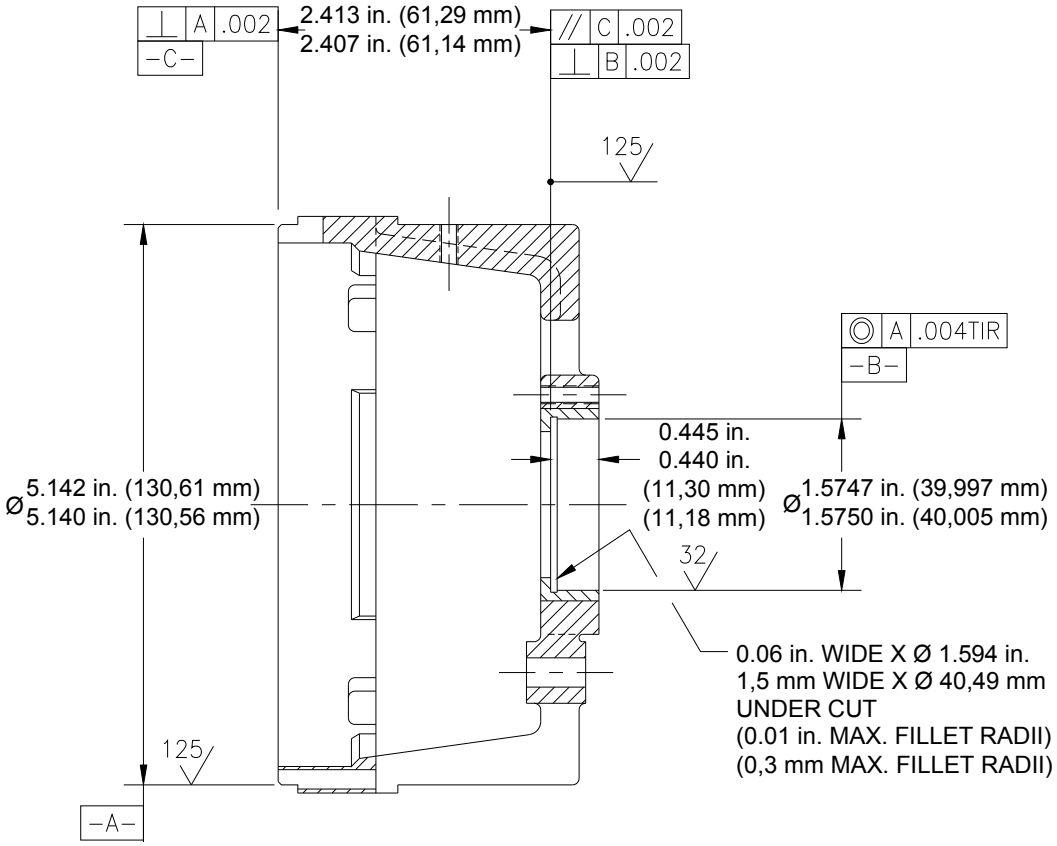


Figure 6008 - Anti-Drive End End Bell Bearing Liner Machining Specifications (IPL 10002, P/N 23081-1050 and 23032-2165)

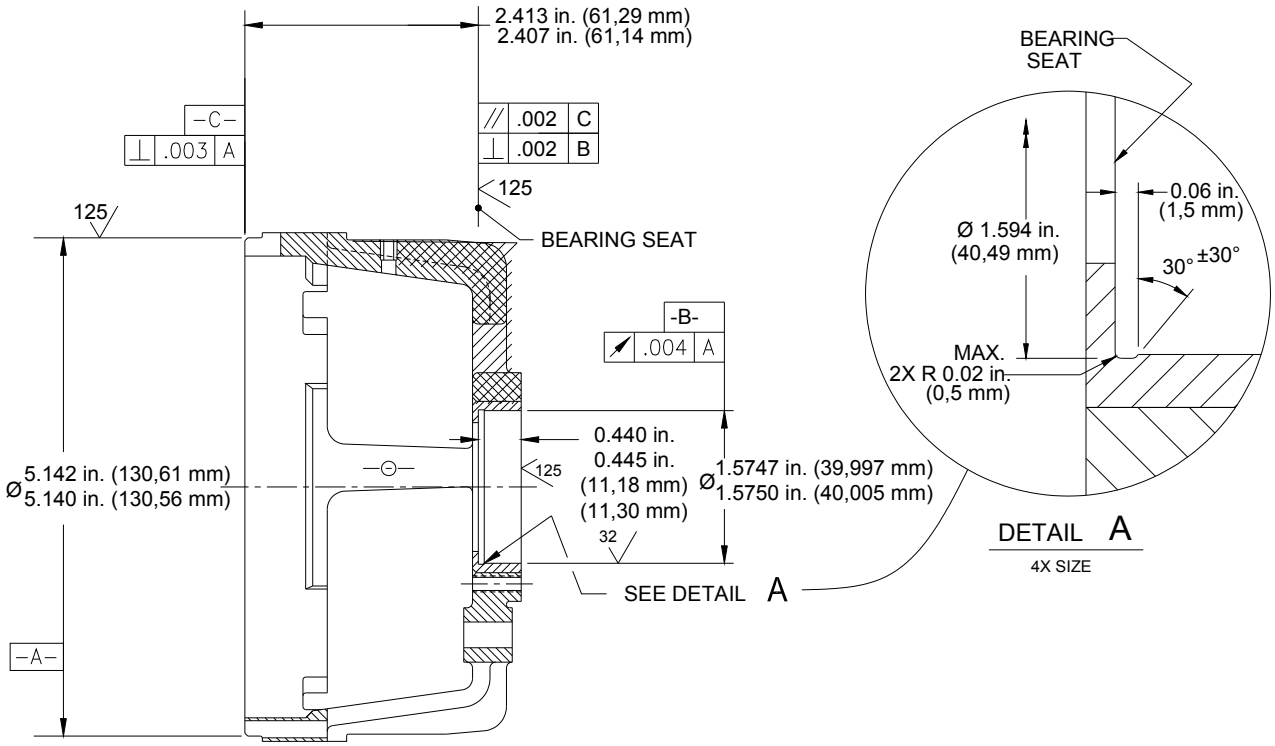


Figure 6009 - Anti-Drive End End Bell Bearing Liner Machining Specifications (IPL 10002, P/N 23081-3365)

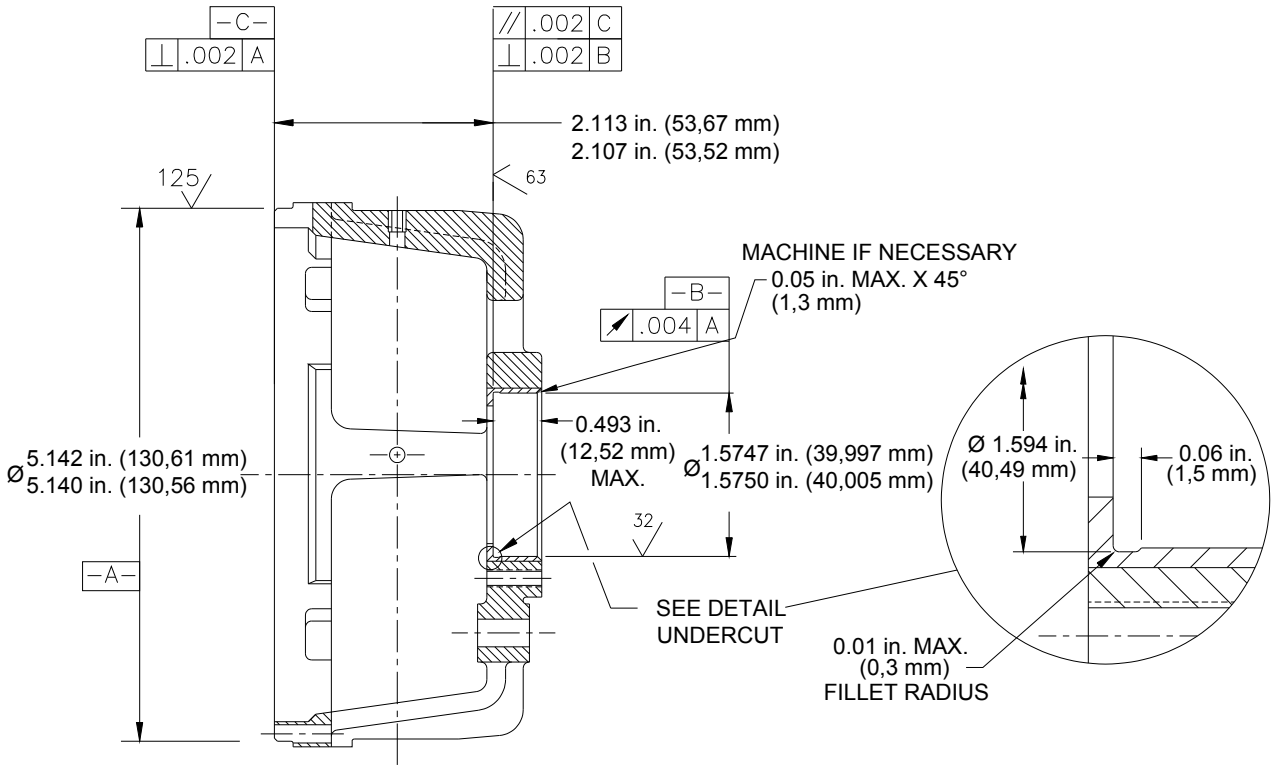


Figure 6010 - Anti-Drive End End Bell Bearing Liner Machining Specifications (IPL 10002, P/N 23032-3665)

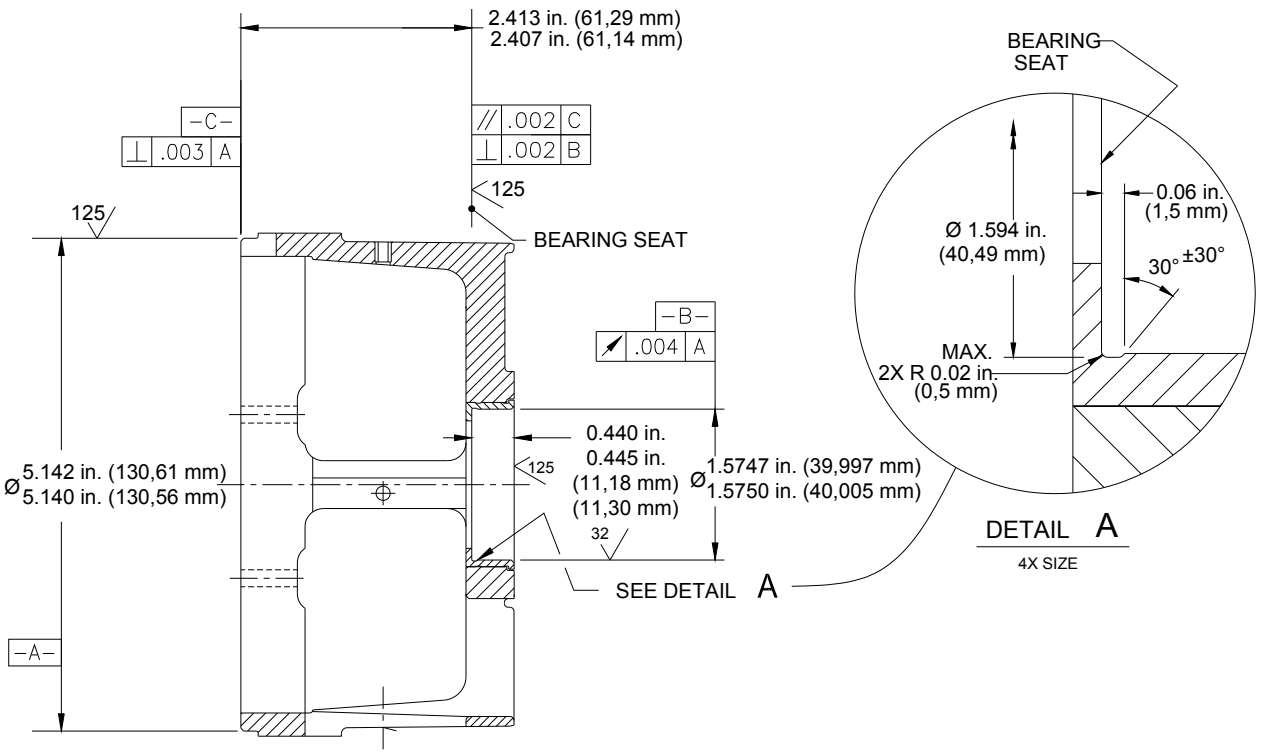


Figure 6011 - Anti-Drive End End Bell Bearing Liner Machining Specifications (IPL 10002, P/N 23081-3320/-3322)

(5) Drive End (DE) End Bell Restoration

Refer to SPD 1000 for detailed instructions. Components not in compliance with the dimensions in Figure 6012 and Figure 6013 must be reworked, or replaced.

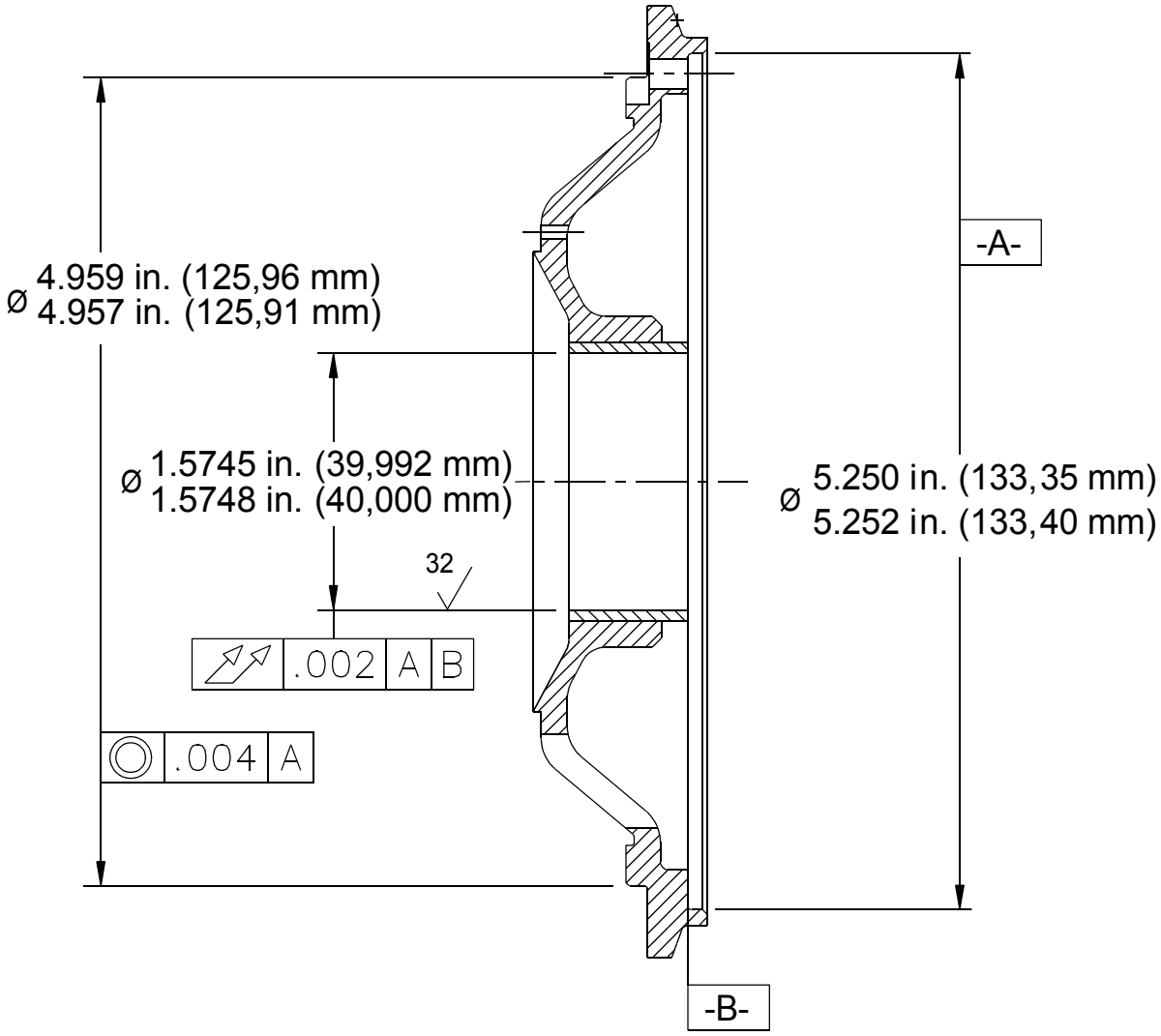


Figure 6012 - Drive End End Bell Bearing Liner Machining Specifications (IPL 10003, P/N 23081-1130/-1131, 23032-3652, 23081-1230)

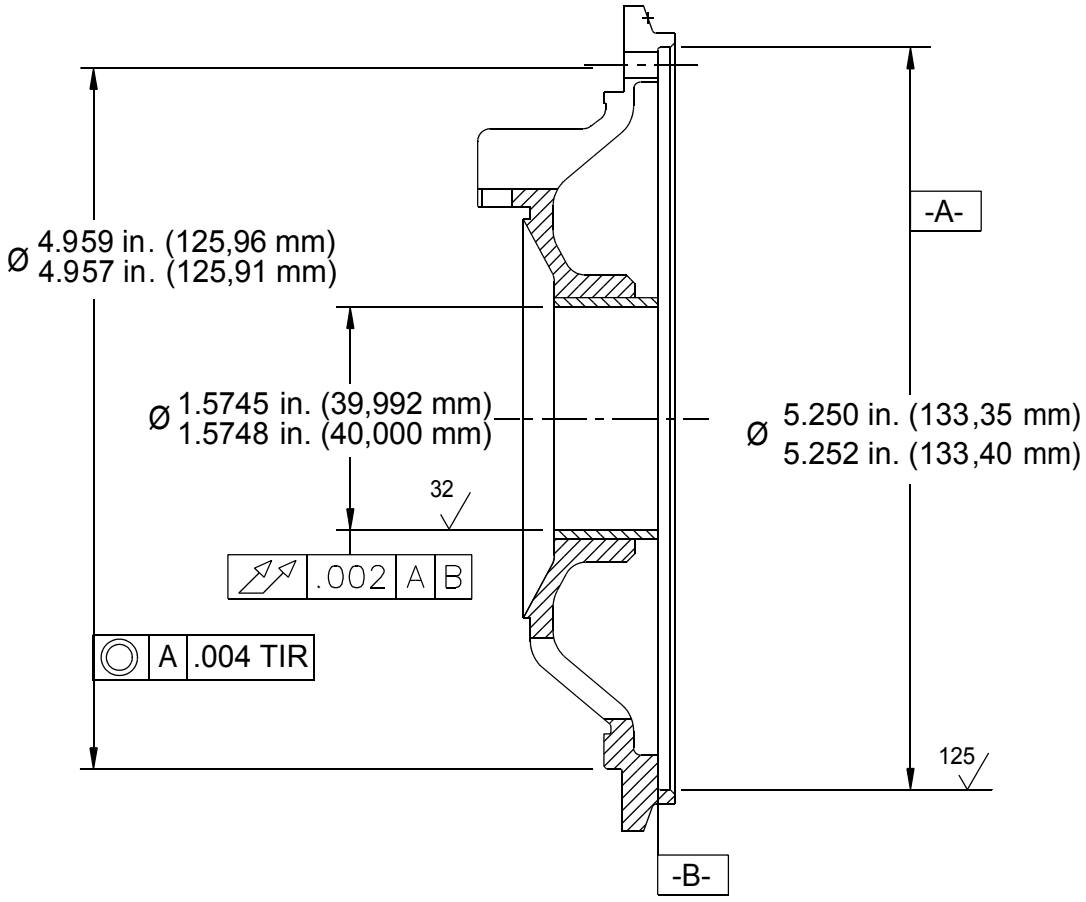


Figure 6013 - Drive End End Bell Bearing Liner Machining Specifications (IPL 10003, P/N 23081-1490)

12. Commutator Refinishing

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

If inspection reveals that the commutator is rough, pitted, scored, or burned, refinish the commutator on a lathe that is accurately set up and adjusted.

A. Setup

WARNING: MAKE SURE THE POWER TO THE LATHE IS SHUT OFF OR "LOCKED OUT" WHILE PREPARING THE MACHINE FOR COMMUTATOR RE-FINISHING. USE ALL SAFETY PRECAUTIONS WHILE WORKING WITH OR AROUND POWER MACHINE TOOLS. WEAR EYE PROTECTION.

(1) Install a bearing into the commutator turning fixture.

(2) Position the drive end of the armature (480) shaft at the lathe chuck head and the commutator turning fixture in the tail stock.

B. Repair Procedure

CAUTION: DO NOT REMOVE TOO MUCH MATERIAL FROM THE COMMUTATOR. IF YOU DO, THE LIFE OF THE COMMUTATOR WILL BE DECREASED.

CAUTION: DO NOT TOUCH THE COMMUTATOR WITH YOUR BARE HANDS. CONTAMINATION FROM YOUR SKIN CAN CAUSE CORROSION AND UNSATISFACTORY ELECTRICAL CONTACT.

(1) Cut the commutator to a surface finish of 64 to 100 microinches (1,6 to 2,5 microns) RMS. The finish surface must go from the end of the full undercut to the outboard end of the commutator.

NOTE: We recommend the feed rate is 0.006 to 0.007 in./rev (0,15 to 0,18 mm/rev) at a surface speed of 1000 to 1500 surface feet/min. (305 to 457 surface m/min.).

WARNING: WHEN YOU USE COMPRESSED AIR, ADJUST THE PRESSURE TO 29 PSI (200 KPA) MAXIMUM. PUT ON EYE PROTECTION TO PREVENT INJURY. FOLLOW NECESSARY PRECAUTIONS TO PREVENT INJURY TO OTHER PERSONNEL IN AREA.

CAUTION: MAKE SURE THAT COMPRESSED AIR IS FREE FROM OIL AND WATER WHEN YOU CLEAN OR DRY COMPONENTS. THIS PRECAUTION PREVENTS CONTAMINATION OF THE COMPONENTS.

(2) Clean the armature (480) surfaces with compressed air, 29 PSIG (200 kPa) maximum.

(3) Measure the depth of the mica undercut between the commutator bars. Refer to the FITS AND CLEARANCES section for the limits.

(4) If the undercut is out of limits, use a 0.31 to 0.50 inch (7,9 to 12,7 mm) max. diameter cutter wheel to undercut the mica to a depth of 0.050 inch (1,27 mm) min. to 0.070 inch (1,78 mm) max. and a width of 0.035 to 0.045 inch (0,89 to 1,14 mm).

(a) The beginning of mica undercut must be 0.01 to 0.03 inch (0,25 to 0,76 mm) max. from the finished face of the risers.

(b) All cuts must be equally spaced and parallel with the centerline of the armature shaft within 0.005 inch (0,13 mm) of true position.

(c) All mica must be removed from the edges of the undercut.

(5) Use a triangular scraping tool to remove sharp edges and burrs.

(6) Remove the undercut residue from between the commutator bars with a soft bristle brush.

WARNING: **WHEN YOU USE COMPRESSED AIR, ADJUST THE PRESSURE TO 29 PSI (200 KPA) MAXIMUM. PUT ON EYE PROTECTION TO PREVENT INJURY. FOLLOW NECESSARY PRECAUTIONS TO PREVENT INJURY TO OTHER PERSONNEL IN AREA.**

CAUTION: MAKE SURE THAT COMPRESSED AIR IS FREE FROM OIL AND WATER WHEN YOU CLEAN OR DRY COMPONENTS. THIS PRECAUTION PREVENTS CONTAMINATION OF THE COMPONENTS.

(7) Clean the armature (480) surfaces with compressed air, 29 PSIG (200 kPa) maximum.

(8) After the commutator is refinished, measure the commutator bar-to-bar and total indicator reading (TIR) run-out in full circumference of the commutator. Support the armature (480) on two “V” blocks.

(a) REPLACE the armature if the limits cannot be met in the FITS AND CLEARANCES section.

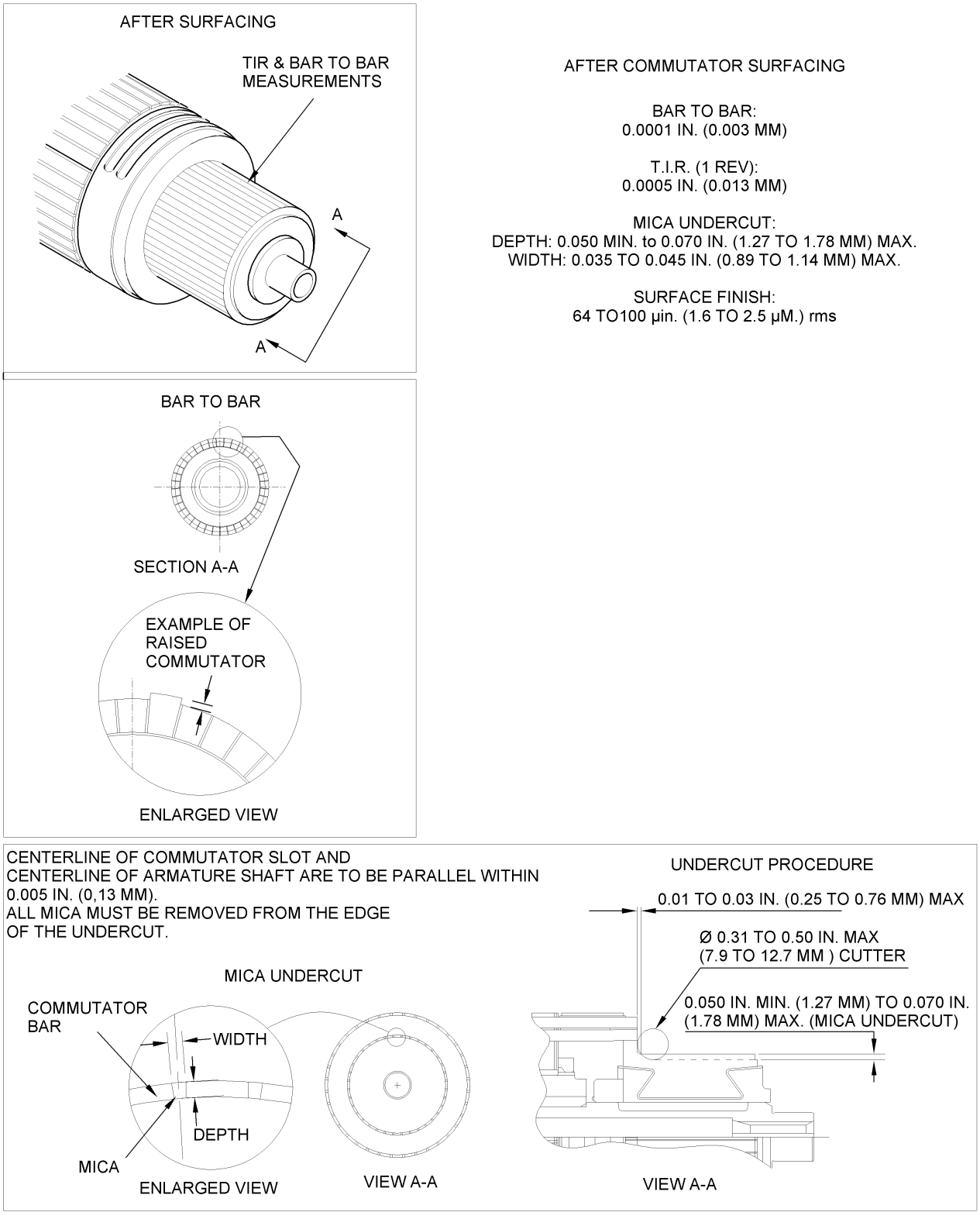


Figure 6014 - Armature Repair

13. Balancing the Armature

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

Balance the armature (480) to the limits given in FITS AND CLEARANCES and using the procedure in Safran Power Standard Practice Document (SPD) 1001.

14. Repair of Bearing and Brush Support Assembly

Refer to the DISASSEMBLY Paragraph 5. for disassembly instructions.

Refer to the ASSEMBLY Paragraph 6. for assembly instructions.

15. Polarizing the Output Voltage

NOTE: If the polarity of the output voltage of the model has been reversed, this can be corrected by polarizing the field.

A. Setup

CAUTION: NO OTHER POWER SUPPLY IS TO BE CONNECTED TO THE UNIT.

(1) Connect a 6 V DC, wet cell battery (or 6 V DC power supply) and bump switch in series with the model field, as shown in Figure 6015.

(2) Connect the negative lead to terminal stud E.

(3) Connect the positive lead and bump switch to terminal stud A.

B. Procedure

CAUTION: DO NOT POLARIZE THE FIELD WHILE THE UNIT IS IN OPERATION.

(1) Turn the power ON and turn bump switch ON for a maximum of five seconds to polarize the field.

NOTE: If the polarity of the field has not been corrected, check for incorrect connections or a defective field circuit.

(2) Turn the power OFF and disconnect the leads.

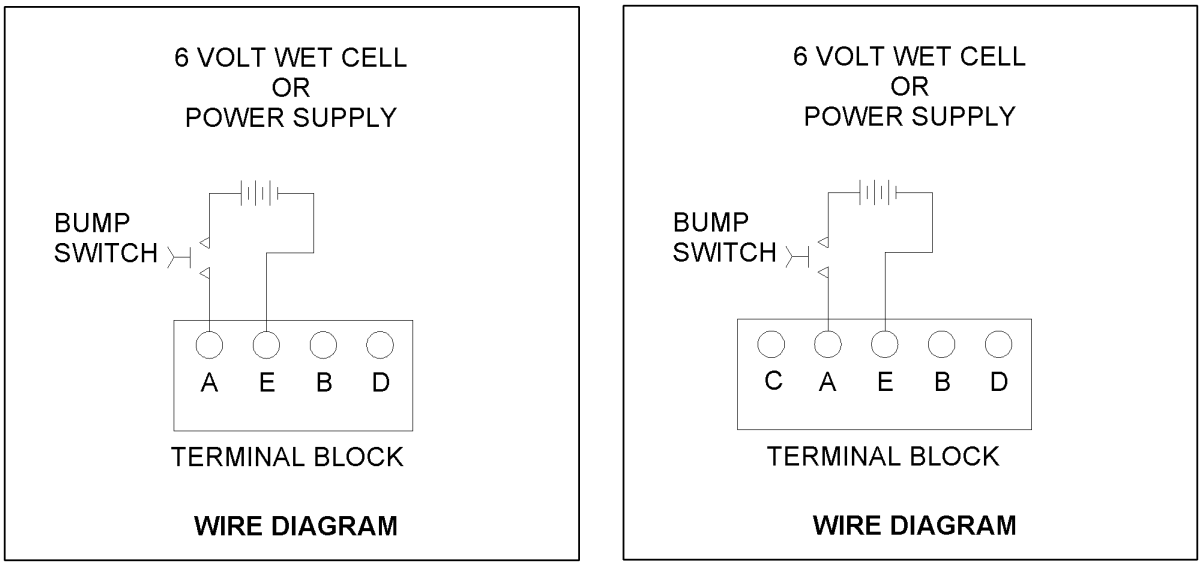


Figure 6015 - Terminal Block Schematic for Polarizing the Output Voltage

16. Removal and Replacement of B or E Terminal Block Studs (Figure 10004-50)

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers in Figure 10004 of ILLUSTRATED PARTS LIST.

A. Removal.

For terminal block P/N: 23081-1310, there are two options available for removal of terminal studs:

- Using a stud removal tool.
- Using two nuts.

B. Remove the Terminal Studs B and E from the Terminal Block (See Figure 6016)

(1) Remove terminal studs from the terminal block with the stud removal tool as follows:

(a) Screw the stud removal tool onto one of the terminal studs.

(b) Apply force in counter-clockwise direction to drive head of the stud removal tool.

(c) Rotate the stud removal tool until the terminal stud is removed from the terminal block.

(d) Remove the terminal stud from the stud removal tool:

1 Move the clutch ring away from the collet holder.

2 Hold the collet holder with a wrench and turn the drive head of the stud removal tool in clockwise direction until the tension is released between the stud removal tool and the terminal stud.

3 Screw the terminal stud out of the hex collet.

(e) Do these steps again to remove the other terminal stud.

(2) Clean the threads in the terminal block with a wire brush.

WARNING: ISOPROPYL ALCOHOL CAN BE DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF IGNITION. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(3) Use a cotton swab with Isopropyl alcohol to remove any residue.

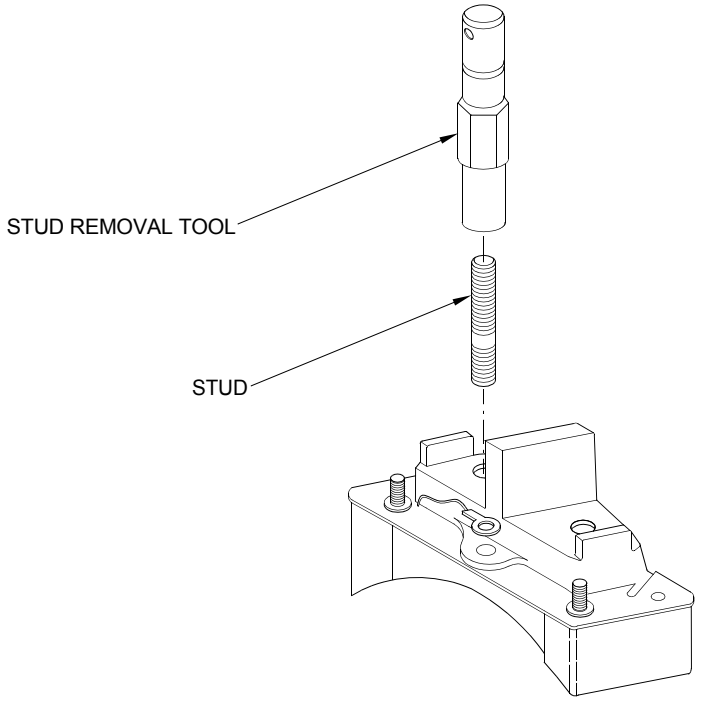


Figure 6016 - Removal of Terminal Studs with Stud Removal Tool

(4) Stud removal using two nuts.

(a) Put one nut (30) upside down on the stud (50).

(b) Put another nut (30), correct way up, on the same stud (50). See Figure 6017. Use two open ended wrenches to tighten the two nuts (30) together.

(c) Turn the bottom nut (30) in a counter-clockwise direction with an open ended wrench, to remove the stud (50).

(d) Remove the two nuts (30) from the stud (50).

(e) Repeat this process on the other terminal stud.

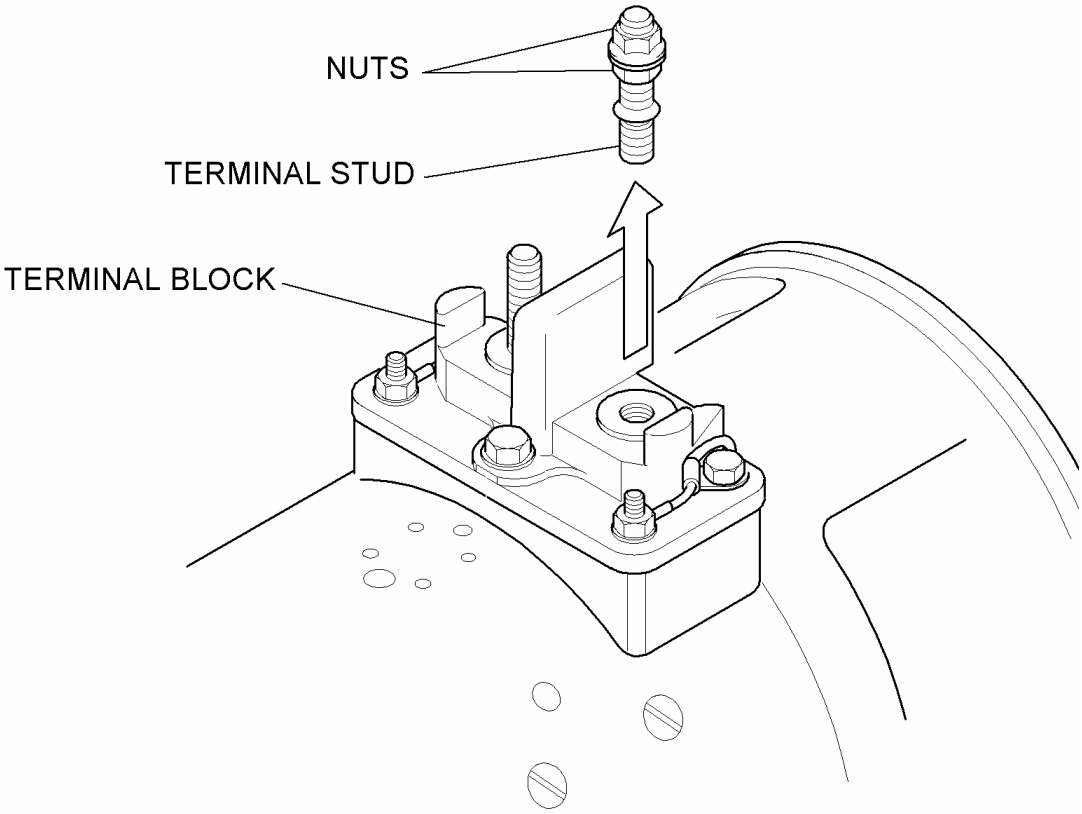


Figure 6017 - Terminal Block Stud Removal Using Two Nuts

C. Installation

For models 23081-022, 23081-022A, 23081-023, 23081-023A, 23081-056, 23081-059, 23081-069 and 23081-070:

- Using a stud driver.
- Using two nuts.

D. Install Terminal Studs B and E (50) into Terminal Block (See Figure 6018)

(1) Installation of terminal stud with stud driver tool:

(a) Screw the stud driver onto one of the two terminal studs.

NOTE: To make adjustments to the stud engagement length, lift the clutch ring and turn the drive head.

NOTE: The stud driver tool can be powered by hand or can be attached to a non-impacting power tool.

WARNING: DO NOT GET THREAD LOCK PRIMER ON YOUR SKIN. IF YOU GET SOME ON YOUR SKIN, FLUSH WITH CLEAN WATER. REFER TO THE APPLICABLE MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION.

(b) Spray threadlock primer (7649) on the threads of the threaded insert in the terminal block where the stud will be installed.

(c) Spray threadlock primer (7649) on the threads of the stud that will engage with the terminal block threaded insert threads.

(d) Let the threadlock primer (7649) dry for 70 seconds.

WARNING: DO NOT GET THREAD LOCK PRIMER ON YOUR SKIN. IF YOU GET SOME ON YOUR SKIN, FLUSH WITH CLEAN WATER. REFER TO THE APPLICABLE MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION.

(e) Apply threadlocker (243) on the threads of the stud that will engage with the terminal block threaded insert threads. Apply a full 360 deg around the threads.

(f) Immediately install the terminal stud through the hole in one of the large stator leads and into the terminal block by turning stud driver tool.

(g) Tighten the stud to 220 to 235 lbf.in. (24,86 to 26,55 Nm) torque.

NOTE: Make sure the flange on the terminal stud is fully seated against the terminal block.

(h) Remove the stud driver by turning it counter-clockwise until it releases from the terminal stud.

(i) Do these steps again to install the other terminal stud.

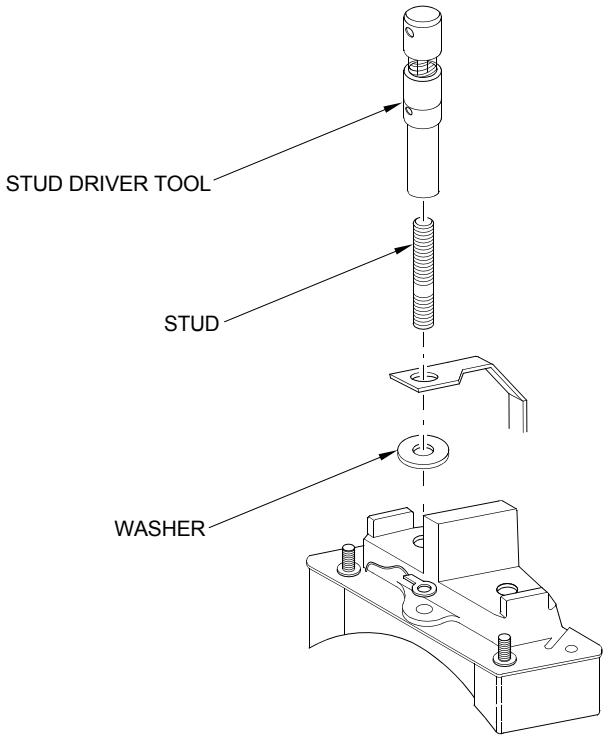


Figure 6018 - Installation of Terminal Studs with Stud Driver Tool

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ASSEMBLY

1. Introduction

This section gives assembly instructions for 23081 Series I models. Assemble the unit in a clean work area away from machining or other metal removing operations. Clean all parts in accordance with (IAW) instructions in the CLEANING section before final assembly.

In addition to specific procedures authorized by Safran Power in this manual, standard assembly procedures for the models are described in the following Safran Power Standard Practice Documents (SPDs).

- Surface Repair and Coating - Refer to SPD 1002.
- Brush Holder Alignment Fixtures - Refer to SPD 1004.
- Brush Installation, Seating, and Run-In - Refer to SPD 1006.

2. Assembly Tools

In addition to normal shop tools, specific tools for assembly of the model are listed in Table 7001.

NOTE: Equivalent substitutes can be used for the tools listed in Table 7001.

WARNING: YOU MUST OBEY THE TOOL AND EQUIPMENT MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Tool Description	Reference
Arbor Press	Commercially Available
Brush Holder Alignment Fixture	SPD 1004
Driver, Dampener Plate	Figure 9007
Driver, Inner Race Bearing	Figure 9004
Driver, Outer Race Bearing	Figure 9005
Heat Gun	Commercially Available
Leather or Plastic Mallet	Commercially Available
Pin Insertion/Extraction Tool	Commercially Available
External Snap Ring Pliers	Commercially Available
Speed Pickup Adjustment Plug	Figure 9008
Spline Wrench	Figure 9015

Table 7001 - Assembly Tools

Tool Description	Reference
Support, Armature	Figure 9010
Support, Bearing and Brush Support Assembly	Figure 9009
Support, Drive End Outboard Hub	Figure 9012
Support, Horizontal Stator and Housing Assembly	Figure 9013
Support, Vertical Stator and Housing Assembly	Figure 9014
Terminal Block - Unserviceable (Optional)	None
Torque wrench	Commercially Available
Wire Hook Tool	Commercially Available

Table 7001 - Assembly Tools (Continued)

3. Assembly Materials

Materials necessary for the model assembly are listed in Table 7002.

NOTE: Assembly materials are not available from Safran Power. All items can be purchased commercially.

WARNING: YOU MUST OBEY THE MATERIAL MANUFACTURER WARNINGS AND CAUTIONS SHOWN ON THE PACKAGE, CONTAINERS AND/OR INSTRUCTIONS. YOU CAN CAUSE DEATH OR INJURY TO PERSONS AND DAMAGE TO EQUIPMENT OR PROPERTY IF YOU DO NOT OBEY SAFETY PRECAUTIONS.

Material	Description/Specification	Source (CAGE Code)
Acrylic coating	HumiSeal Type 1B31, Type AR MIL-I-46058	Chase Corporation Woodside, NY 11377 Ph: (718) 932-0800 Fax: (718) 932-4345 www.humiseal.com (V0SR97)
Cleaning Pads/Wiping Cloths	Lint-free, soft fabric	Commercially Available

Table 7002 - Assembly Materials

Material	Description/Specification	Source (CAGE Code)
Enamel, Red Insulating, Baking	Synthite ER-41	John C. Dolph Company 320 New Road, PO Box 267 Monmouth, NJ 08852 Ph: (732) 329-2333 Fax: (732) 329-1143 www.dolphs.com (V72688)
Grease	Lubricating/MIL-PRF-81322	Commercially Available
Insulation Sleeving	Heat-shrinkable, MIL-I-23053/5, 1/8 inch	Commercially Available
Isopropyl Alcohol	TT-I-735, Grade A See **WARNING** before using this material. Flash Point: 53 °F (12 °C), FLAMMABLE Refer to the Material Safety Data (MSD) Sheet for the material for additional safety information	Commercially Available
Lockwire	NASM20995C20	Commercially Available
Lubricating and Assembly Paste	Altemp QNB 50	Klueber Lubrication Londonderry, NH Ph: (603) 647-4104 www.klueber.com (V3EZL6)
Masking Tape	Not Applicable	Commercially available
Sandpaper	180 grit, Non-aluminum Oxide	Commercially Available
Solder	Resin Core, ANSI J STD-006, Type Sn 95	Commercially available
Thread Locking Adhesive	Loctite Grade E MIL-C-22473, Class E	Loctite Corporation Aurora, IL Ph: (860) 571-5100 www.loctite.com (V7V827)
Thread Sealing Compound	Lead Free/Soft Set Gasoila	GSA Supply on-line www.gsasupplyco.com or Federal Process Co. 4620 Richmond Rd. Beachwood, OH 44128

Table 7002 - Assembly Materials (Continued)

Material	Description/Specification	Source (CAGE Code)
Zinc Chromate Primer	Composition G, color Y, TT-P-1757	Commercially Available
Wash Primer Coating	MIL-C-8507	Commercially Available
Epoxy Primer	MIL-P-23377F, Type I	PRC - De Soto International Incorporated 5454 San Fernando Road' P.O. Box 1800 Glendale, CA 91209 Ph: (818) 240-2060 FAX: (818) 549-7771 www.prc-desoto.com (V0LZE0)

Table 7002 - Assembly Materials (Continued)

4. Assembly of Stator and Housing Assembly

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers in Figure 10004 of ILLUSTRATED PARTS LIST.

A. Attach Terminal Block (60) to the Stator and Housing Assembly (See Figure 7001 and Figure 10004)

NOTE: Before acceptance testing, attach an unserviceable terminal block to the stator housing. Acceptance testing can damage internal capacitors of a new or serviceable terminal block.

(1) For stator and housing assembly effect codes A, B, D and E:

(a) Set the stator and housing assembly onto a horizontal stator support.

(b) Set the terminal block (60) onto stator and housing assembly and slide the terminal block studs into the three large stator leads.

(c) Attach the terminal block (60) to stator and housing assembly with two lock washers (90), two flat washers (100) and screws (80).

1 For stator and housing assembly effect codes A, B, F:

a Tighten two screws (80) to a torque of 28.0 to 37.6 lbf.in. (3,2 to 4,25 Nm).

2 For stator and housing assembly effect codes D and E:

a Tighten two screws (80) to a torque of 13.5 to 18.0 lbf.in. (1,5 to 2,0 Nm).

(2) For stator and housing assembly effect code C:

CAUTION: DO NOT BEND THE LARGE STATOR LEADS MORE THAN NECESSARY TO INSTALL THE TERMINAL BLOCK.

CAUTION: MAKE SURE SMALL TERMINAL LEADS A AND D ARE NOT UNDERNEATH TERMINAL BLOCK AS IT IS PUSHED INTO POSITION.

(a) Set terminal block (60) onto the stator and housing assembly and slide it into position in the large stator leads, B and E.

(b) Put stator terminal leads through grommet (110) onto terminal studs A and D.

(c) Put the small stator lead terminal lugs (120) on studs A and D.

(d) Place leads to terminal studs A and D in grooves in the terminal block (60).

(e) Put a lock washer (90) and flat washer (100) onto each of the three screws (80).

(f) Put the remaining screw (80) into the center hole on the terminal block (60).

(g) Tighten the three screws (80) to a torque of 8.0 to 12.0 lbf.in. (0,9 to 1,36 Nm).

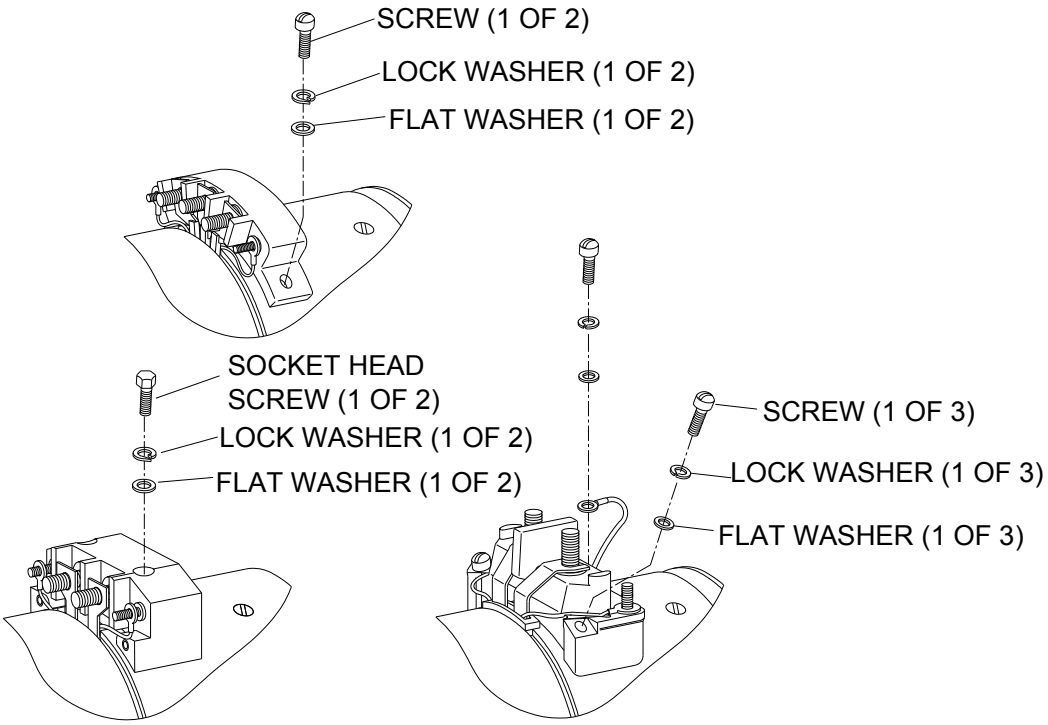

Figure 7001 - Terminal Block Attachment

B. Install Attaching Hardware on Terminal Block (60) (See Figure 7002)

(1) Set the stator and housing assembly onto a horizontal stator support.

(2) Position one terminal lug (120) on each of terminal block (60) terminals A and D. Secure each terminal lug (120) with one flat washer (20) and nut (10).

NOTE: Do not tighten the nuts (10) on terminal block (60) terminals A and D. They will be tightened at the time of installation into the aircraft. It is necessary to install the wires from the GCU at that time.

(3) For stator and housing assembly effect code A, B, F:

(a) Install one flat washer (40) and nut (30) on each of three terminals C, B and E.

NOTE: Do not tighten the nuts (30) on terminals C, B and E. They will be tightened at the time of installation into the aircraft.

(4) For stator and housing assembly effect codes C, D and E:

(a) Install one flat washer (40) and nut (30) on each of two terminals B and E.

NOTE: Do not tighten the nuts (30) on terminals B and E. They will be tightened at the time of installation into the aircraft.

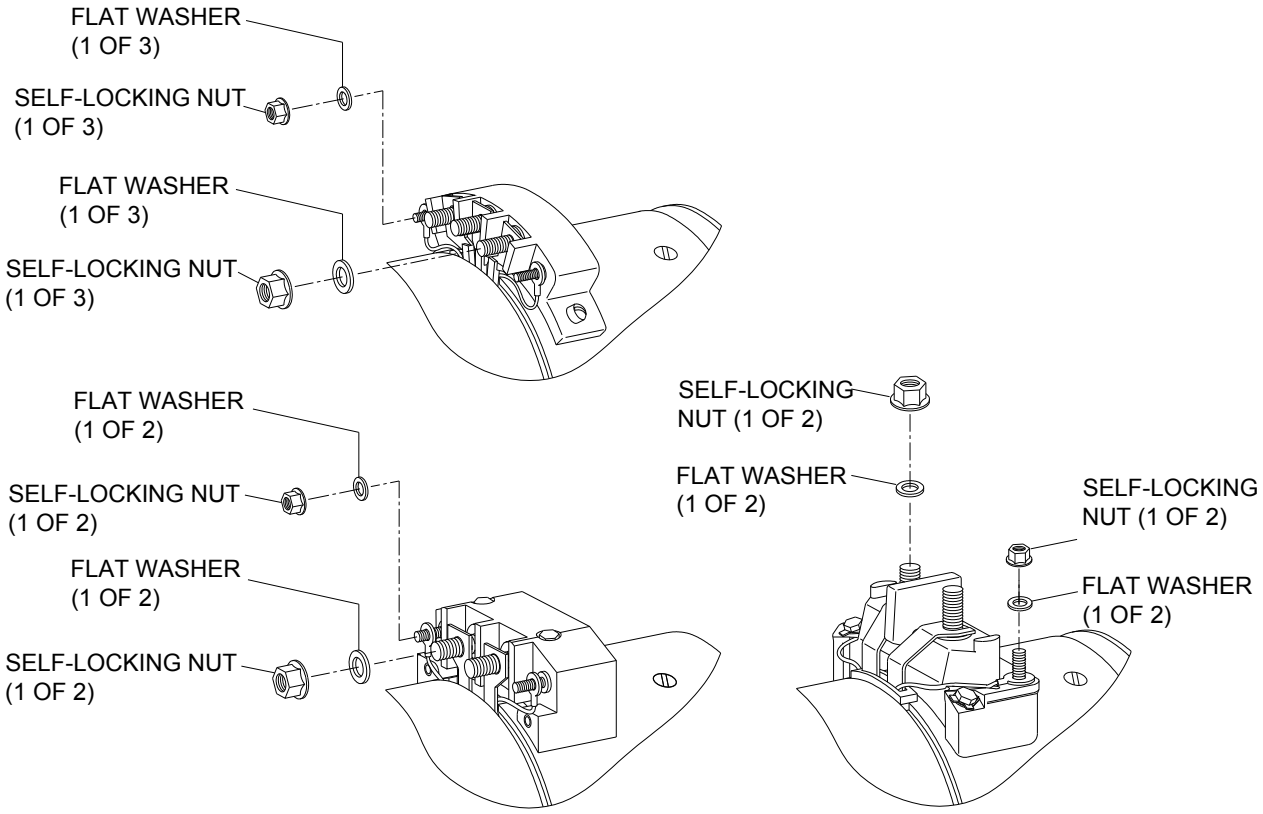

Figure 7002 - Install Attaching Hardware

C. Attach Terminal Block Cover (10001-130) (if present) (See Figure 7003)

NOTE: When the model is removed from aircraft for service, the terminal block cover usually stays on aircraft.

(1) Attach terminal block cover (10001-130) to the terminal block, with two screws (10001-140), if applicable.

(2) Tighten screws (10001-140) to a torque of 7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm).

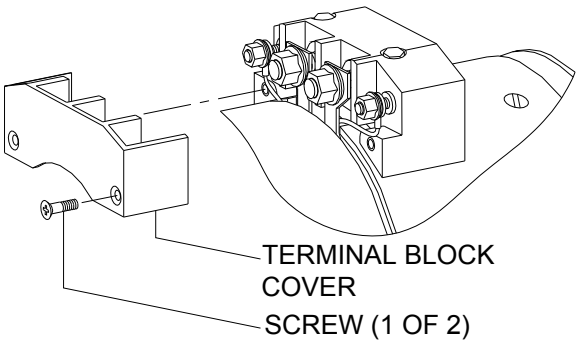

Figure 7003 - Terminal Block Cover

5. Assembly of the Drive End Bearing Support Assembly

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers in Figure 10003 of the ILLUSTRATED PARTS LIST.

A. If necessary, Attach the Screen Guard (20) to the Drive End Bearing Support Assembly (See Figure 7004)

(1) Put the screen guard (20) on the drive end bearing support and secure with four flat washers (40) and four drive screws (30).

(2) Installation of drive screws (30) will require a plastic mallet to pound the drive screws in place.

(3) For drive end bearing support assembly effect code E:

WARNING: DO NOT GET THREAD LOCKING ADHESIVE ON YOUR SKIN. IF YOU GET SOME ON YOUR SKIN, FLUSH WITH CLEAN WATER. REFER TO THE APPLICABLE MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION.

(a) Apply thread locking adhesive, grade E, to screws (60).

(b) Attach magnetic pickup bracket (50) to drive end end bell with two screws (60).

(c) Tighten screws (60) to a torque of 7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm).

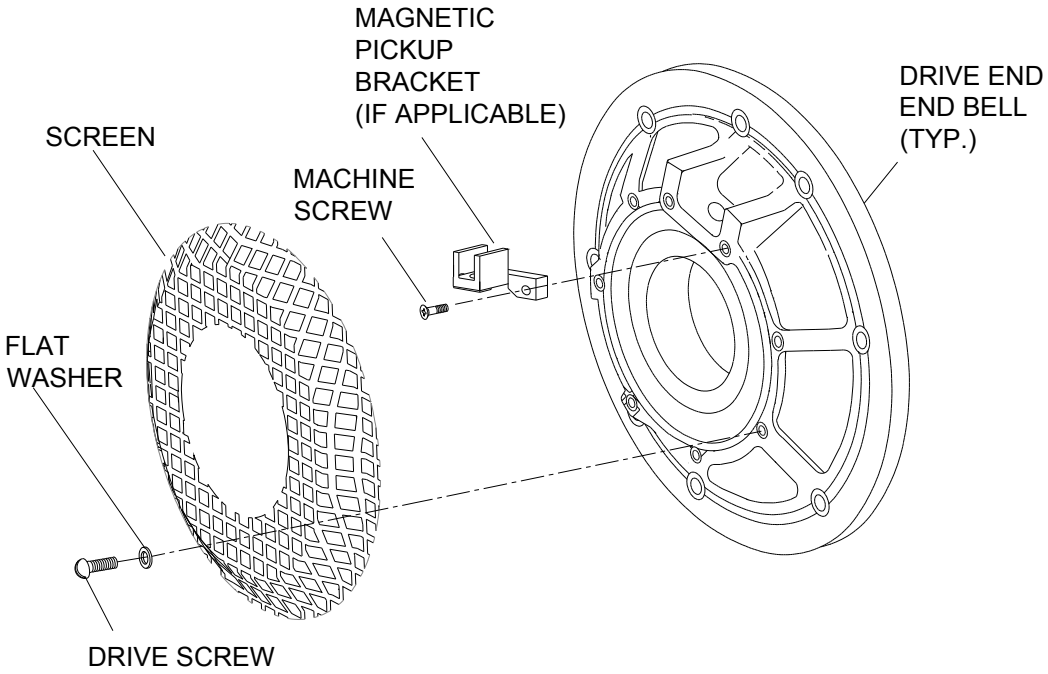

Figure 7004 - Assembling Drive End Bearing Support Assembly

6. Assembly of the Bearing and Brush Support Assembly

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers in Figure 10002 of the ILLUSTRATED PARTS LIST.

A. Install the Brush Springs (50) on the Complete Brush Holder (30) (See Figure 7005)

CAUTION: DO NOT WIND THE BRUSH SPRINGS TOO TIGHTLY OR THIS CAN RESULT IN REDUCED BRUSH SPRING RELIABILITY.

(1) Wind the brush spring (50) about 3/4 turn and put brush spring (50) onto brush holder (30). Repeat for remaining brush springs (50).

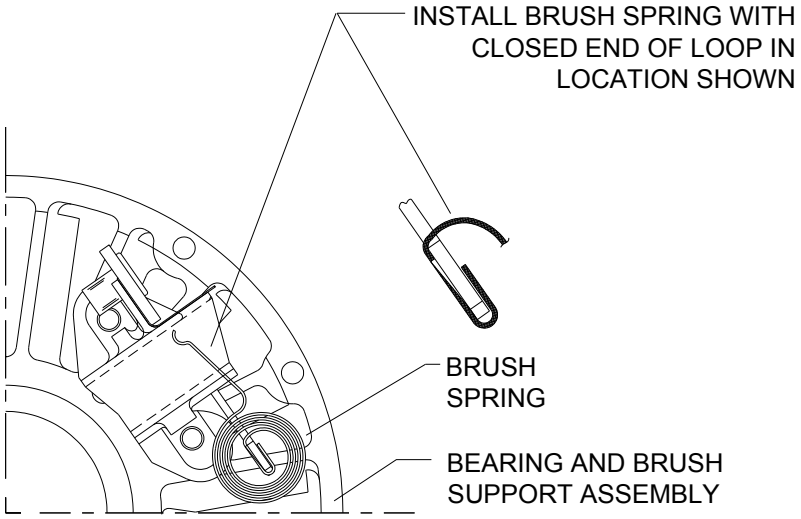

Figure 7005 - Brush Spring Installation

B. Attach each Complete Brush Holder (30) to the Anti-Drive End End Bell (10) (See Figure 7006, Figure 7007 and Figure 10002)

CAUTION: CORRECT INSTALLATION OF THE INSULATION SLEEVES IS CRITICAL. USE GREAT CARE WHEN INSERTING THE INSULATION SLEEVES INTO THE ANTI-DRIVE END END BELL. IF AN INSULATION SLEEVE IS PINCHED BETWEEN THE ANTI-DRIVE END END BELL AND A COMPLETE BRUSH HOLDER, CARBON DUST WILL COLLECT IN THE AREA WHERE THE INSULATION SLEEVE IS DAMAGED, CAUSING A PATH TO GROUND AND EQUIPMENT FAILURE. THE DAMAGE IS NOT DETECTABLE DURING THE DIELECTRIC TEST AFTER ASSEMBLY.

(1) Insert two insulation sleeves (80) at a brush holder location into two adjacent through holes in the anti-drive end end bell (10).

NOTE: Make sure the insulation sleeves (80) extend out of the through holes on both sides of the anti-drive end end bell (10).

(2) Put a non-metallic washer (110) onto the ends of the exposed insulation sleeves (80) on the inboard side of the anti-drive end end bell (10).

(3) Put a non-metallic washer (120) onto the ends of each exposed insulation sleeves (80) on the outboard side of the anti-drive end end bell (10).

NOTE: Make sure the insulation sleeves (80) do not slide and that the non-metallic washers (120) do not fall off.

(4) Put one flat washer (90) on each of two screws or bolts (100).

(5) Insert one screw or bolt (100) into each of two insulation sleeves (80) on the outboard side of the anti-drive end end bell (10).

NOTE: Make sure that the insulation sleeves (80) do not slide and that the non-metallic washers (110) do not fall off.

(6) Put a complete brush holder (30) against the two screws or bolts (100) on the inboard side of the anti-drive end end bell (10).

(7) Attach the complete brush holder (30) to the anti-drive end end bell (10) with the two screws or bolts (100).

(8) For bearing and brush support assemblies that have a filter board (60), effect codes B, C, E, F and G:

(a) Install a filter board assembly (60) onto screws or bolts.

NOTE: The filter board installs at the 3 o'clock and the 9 o'clock position when the notch in the ring is at 12 o'clock. See Figure 7007.

(b) Install an insulating washer (130) on each of the four screws or bolts that do not attach the filter board assemblies.

(9) For bearing and brush support assemblies that do not have a filter board (60), effect codes A and D:

(a) Install an insulating washer (130) on top of each screw or bolt.

(10) Put a flat washer (90) onto each screw or bolt.

(11) Loosely thread a self-locking nut (140) on the end of each screw or bolt.

NOTE: ATTACH LOOSELY. DO NOT TIGHTEN THE SCREWS OR BOLTS (100) AT THIS TIME.

(12) Repeat Paragraph 6.B.(1) through Paragraph 6.B.(11) for remaining brush holder locations.

(13) Lower the bearing and brush support assembly onto the brush holder alignment fixture as referenced in SPD 1004.

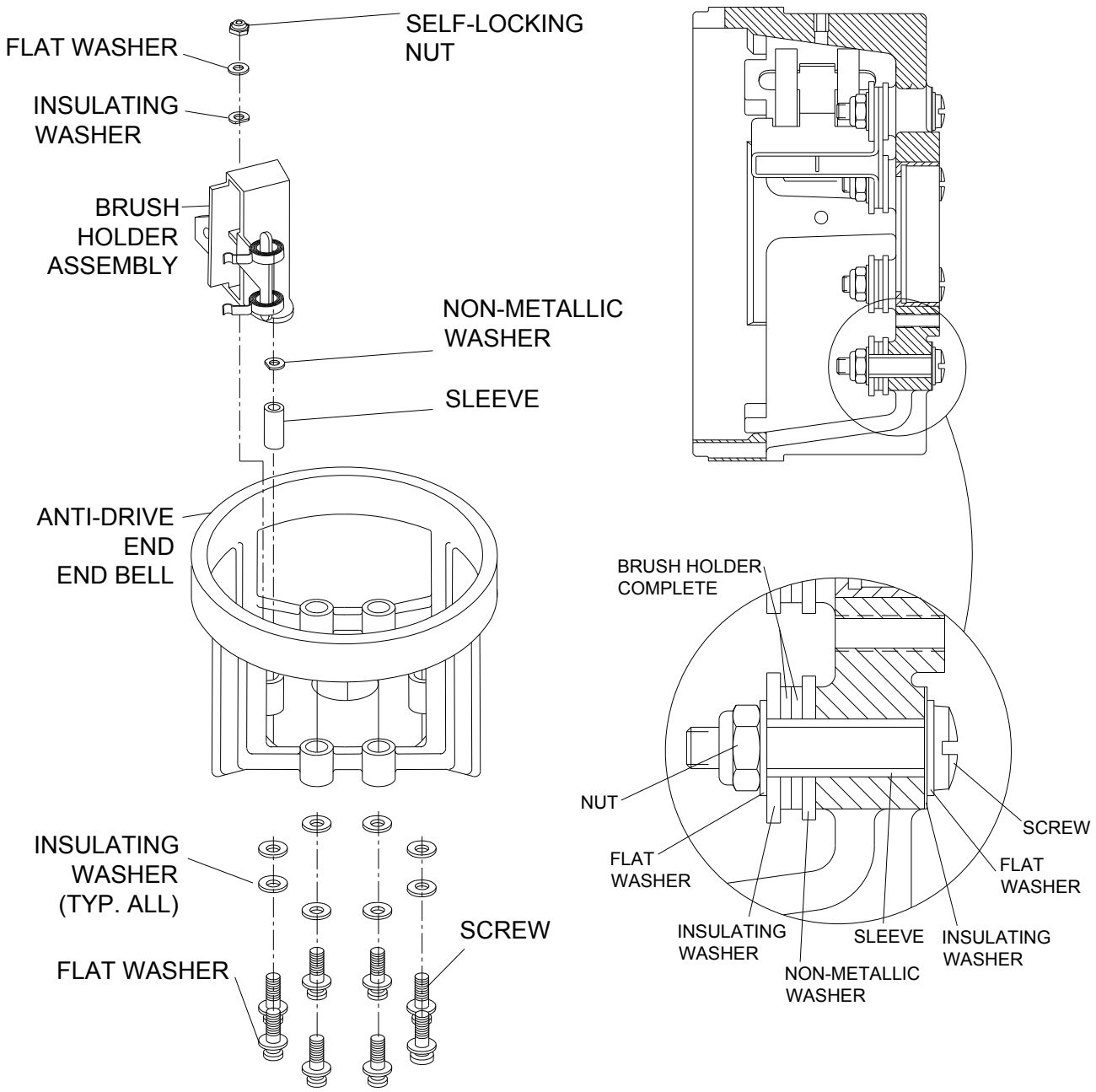

Figure 7006 - Attaching Brush Holders to Anti-Drive End End Bell (Without Filter Board)

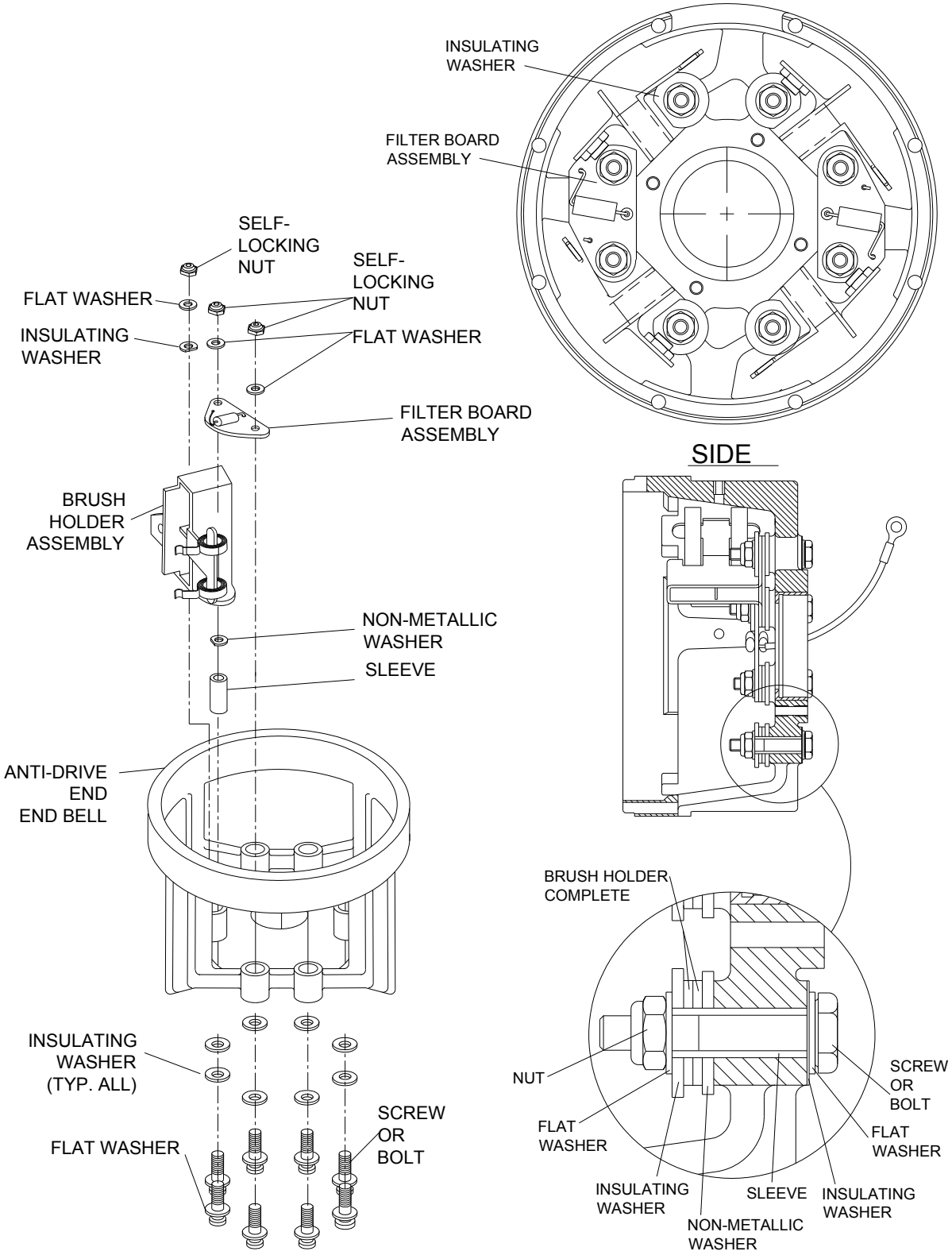

Figure 7007 - Attaching Brush Holders to Anti-Drive End End Bell (With Filter Board)

CAUTION: MAKE SURE THE COMPLETE BRUSH HOLDERS ARE PROPERLY ALIGNED IN THE BRUSH HOLDER ALIGNMENT FIXTURE. IMPROPER ALIGNMENT CAN CAUSE ELECTRICAL FAILURE.

(14) Adjust all complete brush holders (30) until they are properly aligned. Refer to SPD 1004.

(15) Tighten the nuts (140) to a torque of 27.0 to 36.0 lbf.in. (3,1 to 4,1 Nm).

(16) Remove the bearing and brush support assembly from the brush holder alignment fixture.

WARNING: **INSULATING ENAMEL IS TOXIC AND FLAMMABLE. DO NOT BREATHE VAPORS. USE IN A WELL VENTILATED AREA FREE FROM SPARKS, FLAME AND/OR HOT SURFACES. WEAR SPLASH GOGGLES, SOLVENT-RESISTANT GLOVES, AND OTHER PROTECTIVE GEAR. IN CASE OF EYE CONTACT, FLUSH WITH WATER AND SEEK MEDICAL ATTENTION. IN CASE OF SKIN CONTACT, WASH WITH SOAP AND WATER.**

(17) Apply insulating enamel to bearing and brush support assembly according to the procedure in SPD 1002.

C. Do a Dielectric Test

Do a dielectric test of the bearing and brush support assembly. Refer to the CHECK section.

7. Final assembly of the DC Starter-Generator / DC Generator

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

A. Install Drive End Baffle Disc (inboard) (530) and Drive End Ball Bearing (520) on Drive End of Armature (480) Shaft (See Figure 7008)

CAUTION: DO NOT TOUCH MACHINED SURFACE OF COMMUTATOR WITH BARE HANDS. SKIN ACIDS AND OILS CAN CONTAMINATE CONDUCTING SURFACES CAUSING CORROSION AND/OR POOR ELECTRICAL CONTACT.

(1) Set armature support on arbor press table.

(2) Set armature (480), commutator down, on armature support.

(3) Put drive end baffle disc (inboard) (530) on drive end of armature (480) shaft.

(4) Set drive end ball bearing (520) onto armature shaft (480).

(5) Set inner race bearing driver on drive end ball bearing (520).

(6) Press drive end ball bearing (520) onto armature shaft (480).

(7) Make sure that drive end ball bearing (520) is fully seated against inboard drive end baffle disc.

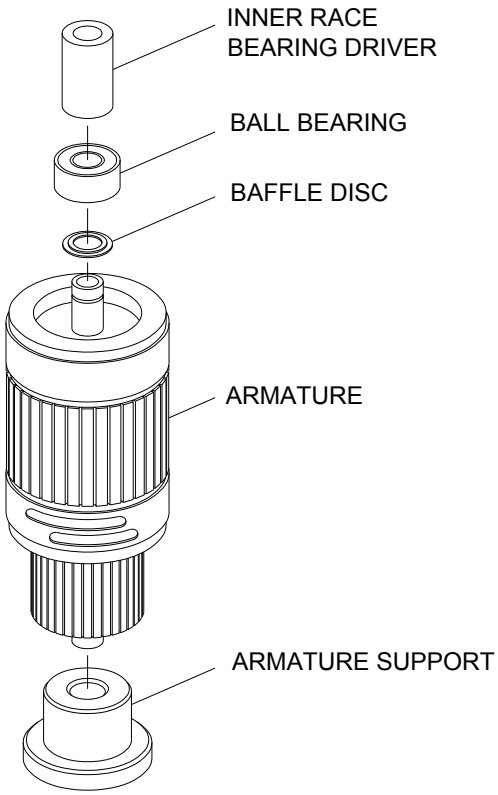

Figure 7008 - Installing Baffle Disc and Ball Bearing on the Armature Shaft

B. Installing Drive End Baffle Disc (outboard) (530) and Retaining Ring (540) onto Drive End of Armature (480) Shaft (See Figure 7009)

(1) Install a drive end baffle disc (outboard) (530) onto drive end of armature (480) shaft.

(2) Use external snap ring pliers to put retaining ring (540) in groove (on drive end of armature shaft) making sure the retaining ring (540) is fully engaged in the groove.

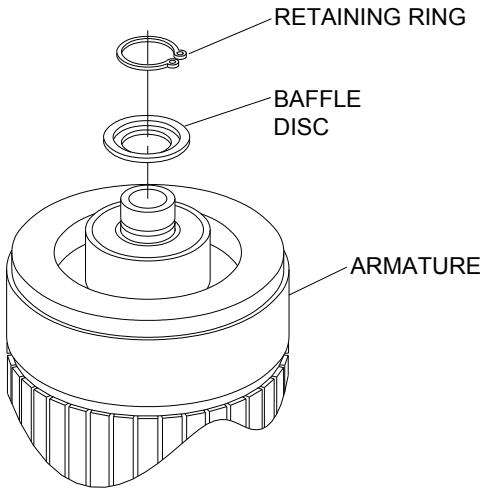

Figure 7009 - Spacer and Retaining Ring Installation

C. Press Anti-Drive End Ball Bearing (520) into Bearing and Brush Support Assembly (320) (See Figure 7010)

NOTE: Unless otherwise indicated, numbers in parentheses ( ) refer to item numbers on the illustration IPL Figure 10001.

CAUTION: FAILURE TO USE ANTI-DRIVE END HUB SUPPORT DURING ASSEMBLY OPERATIONS CAN CAUSE PERMANENT DAMAGE TO BEARING AND BRUSH SUPPORT ASSEMBLY.

(1) Set the anti-drive end hub support on the arbor press table.

(2) Put the bearing and brush support assembly (320), brush holders down, on the anti-drive end hub support.

(3) Put the anti-drive end bearing on bearing liner of bearing and brush support assembly.

(4) Set outer race bearing driver onto anti-drive end ball bearing (520).

(5) Press anti-drive end ball bearing (520) into bearing and brush support assembly bearing liner.

(6) Make sure that anti-drive end ball bearing (520) is fully seated against inner lip of bearing liner.

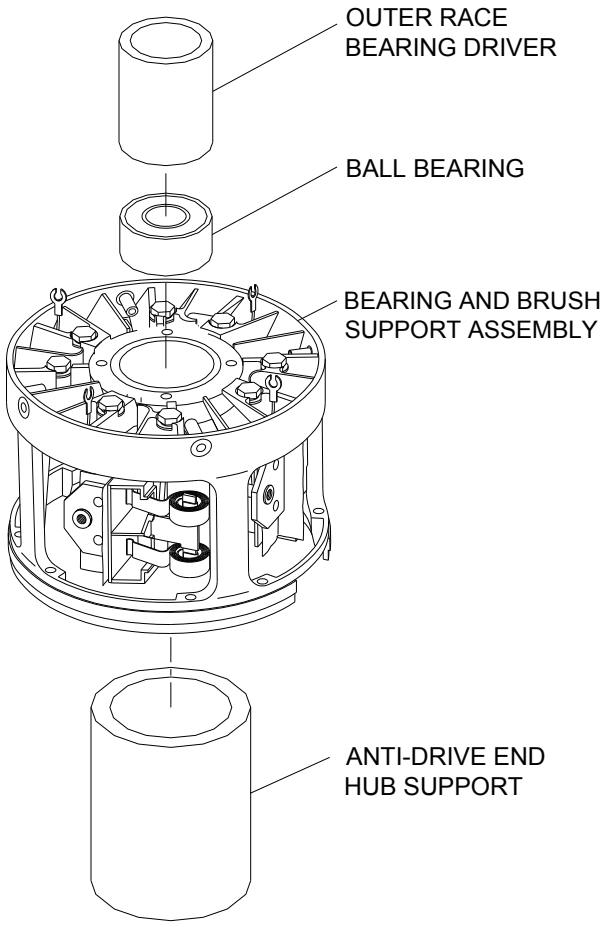

Figure 7010 - Anti-Drive End Ball Bearing Installation into Bearing and Brush Support Assembly

D. Attach Bearing Retainer (490) and Filter Board Leads (if applicable) to Bearing and Brush Support Assembly (320)

(1) Feed leads from filter board assembly through bearing and brush support assembly (where applicable).

CAUTION: DO NOT ATTACH FILTER BOARD TERMINALS TO ANTI-DRIVE END END BELL BEFORE ACCEPTANCE TESTING TO AVOID DAMAGE TO THE FILTER CAPACITORS.

(2) If applicable, secure filter board terminals away from cast surfaces of anti-drive end end bell.

(3) Install a lock washer (510) on each of the screws (500).

WARNING: **THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.**

CAUTION: IF BEARING AND BRUSH SUPPORT ASSEMBLY HAS FILTER BOARD ASSEMBLIES, DO NOT APPLY ANTI-SEIZE COMPOUND TO SCREWS AT THIS TIME. THE FILTER BOARD LEADS WILL BE RE-ATTACHED AFTER ACCEPTANCE TESTING.

(4) Apply thread sealing compound to threads of four screws (500).

(5) Attach bearing retainer to bearing and brush support assembly using attaching screws (500) and lock washers (510).

(6) For all models except 23081-078: Tighten four screws (500) to a torque of 13.5 to 18.0 lbf.in. (1,5 to 2,0 Nm).

(7) For model 23081-078: Tighten four screws (500) to a torque of 10.5 to 14.0 lbf.in. (1,2 to 1,6 Nm).

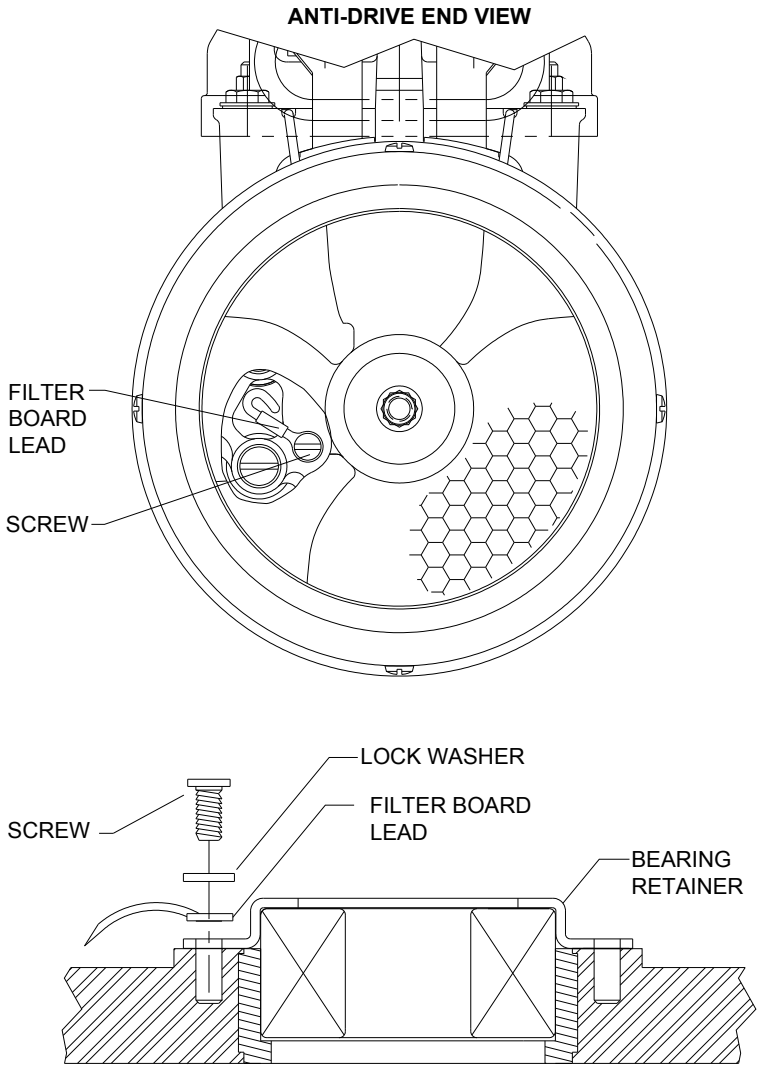

Figure 7011 - Attaching the Bearing Retainer and Filter Board Leads

E. Attach Grommet (470), Speed Pickup (460), and Speed Pickup Guard (440) to Drive End Bearing Support Assembly (390) (See Figure 7012)

(1) Press grommet into an opening in the screen of the drive end bearing support assembly.

NOTE: If a speed pickup adjustment plug is not available, do not adjust the speed pickup until after the dampener and sensor back plate is installed.

(2) Screw speed pickup through threaded hole in drive end bearing support assembly.

(3) Insert speed pickup adjustment plug into bearing liner of drive end bearing support assembly.

(4) Adjust speed pickup until tip of speed pickup touches the adjustment plug, and tighten the jam nut to a torque of 15 to 25 lbf.in. (1,7 to 2,9 Nm).

(5) If the heat shrink sleeving was removed during disassembly, put a piece of 1/8 inch (3,2 mm) diameter heat shrinkable sleeving over the speed pickup leads.

(6) Shrink the sleeving into place on the leads with a heat gun.

(7) Thread speed pickup leads through the grommet.

WARNING: THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(8) Apply thread sealing compound to the threads in the drive end bearing support assembly for the screws (450).

(9) Attach speed pickup guard to drive end bearing support assembly with two screws (450), and tighten the screws to a torque of 4.2 to 5.5 lbf.in. (0,5 to 0,6 Nm).

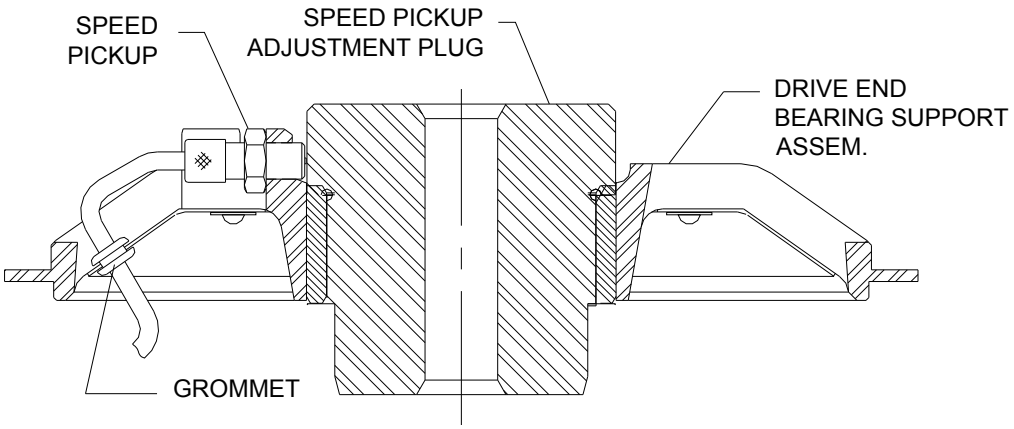

Figure 7012 - Assembling Grommet, Speed Pickup, and Guard to Drive End End Bell

F. Assemble the Drive End Bearing Support Assembly (390) to the Stator and Housing Assembly (550) (See Figure 7013 and Figure 7014)

(1) Place the stator and housing assembly vertically on the work bench with the drive end up.

WARNING: THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(2) Apply thread sealing compound to the threads in the stator and housing assembly for the screws (400).

(3) For effect codes A, B, C, D, E, F, J, K, L, M, N, P, Q, R, S, T, U, V, W, BA, EA, GA: See Figure 7013.

(a) Install eight spring lock washers (410) on all eight screws (400).

(b) On six of the screws (400), install six flat washers (420).

(c) On the remaining two screws (400), install two tooth lock washers (430).

WARNING: ZINC CHROMATE PRIMERS ARE POISONOUS AND CAN CAUSE EXPLOSIONS WHEN MIXED WITH ACIDS, REDUCING AGENTS, COMBUSTIBLE AND OXIDIZING MATERIALS. ISOLATED STORAGE OF THESE MATERIALS IS MANDATORY.

WARNING: BEFORE YOU USE ZINC CHROMATE PRIMER, PUT ON A RESPIRATOR, RUBBER APRON, RUBBER GLOVES AND EYE PROTECTION. THIS WILL PREVENT INJURY FROM SPILLS AND FROM THE FUMES.

WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

(d) Apply a wet coat of zinc chromate primer on two locations 180° apart on the surface of drive end bearing support assembly (390).

(4) For effect codes X, Y, Z, CA, DA, FA: See Figure 7014.

(a) Install eight spring lock washers (410), and eight flat washers (420) on all eight screws (400).

(5) While holding drive end bearing support assembly (390), thread the speed pickup (460) leads through the stator and housing assembly and out the hole.

NOTE: Sometimes it is easier to slide a separate 12 inch (305 mm) length of wire through the hole and pass between the stator poles out to the drive end. Attach this extra wire to the speed pickup leads. Pull out the extra wire as the speed pickup leads are pulled in on the same path. Disconnect the extra wire.

(6) Place the drive end bearing support assembly (390) on the stator and housing assembly. Align the speed pickup unit towards the terminal block (10004-60) on the stator and housing assembly.

(7) For effect codes A, B, C, D, E, F, J, K, L, M, N, P, Q, R, S, T, U, V, W, BA, EA, GA:
See Figure 7013.

(a) Attach two of the screws (400) that contain the tooth lock washers (430) 180° apart while the zinc chromate primer is still wet on the drive end bearing support assembly.

(b) Attach the remaining six screws on the drive end bearing support assembly.

(8) For effect codes X, Y, Z, CA, DA, FA:
See Figure 7014.

(a) Attach all eight screws on the drive end bearing support assembly.

(9) Tighten the eight screws (400) to a torque of 18.0 to 24.0 lbf.in. (2,03 to 2,71 Nm)

NOTE: Make sure that the head of the screws are flush or below face of the drive end bearing support assembly when installed.

NOTE: The speed pickup leads can dangle outside the stator and housing assembly until connected in later paragraphs.

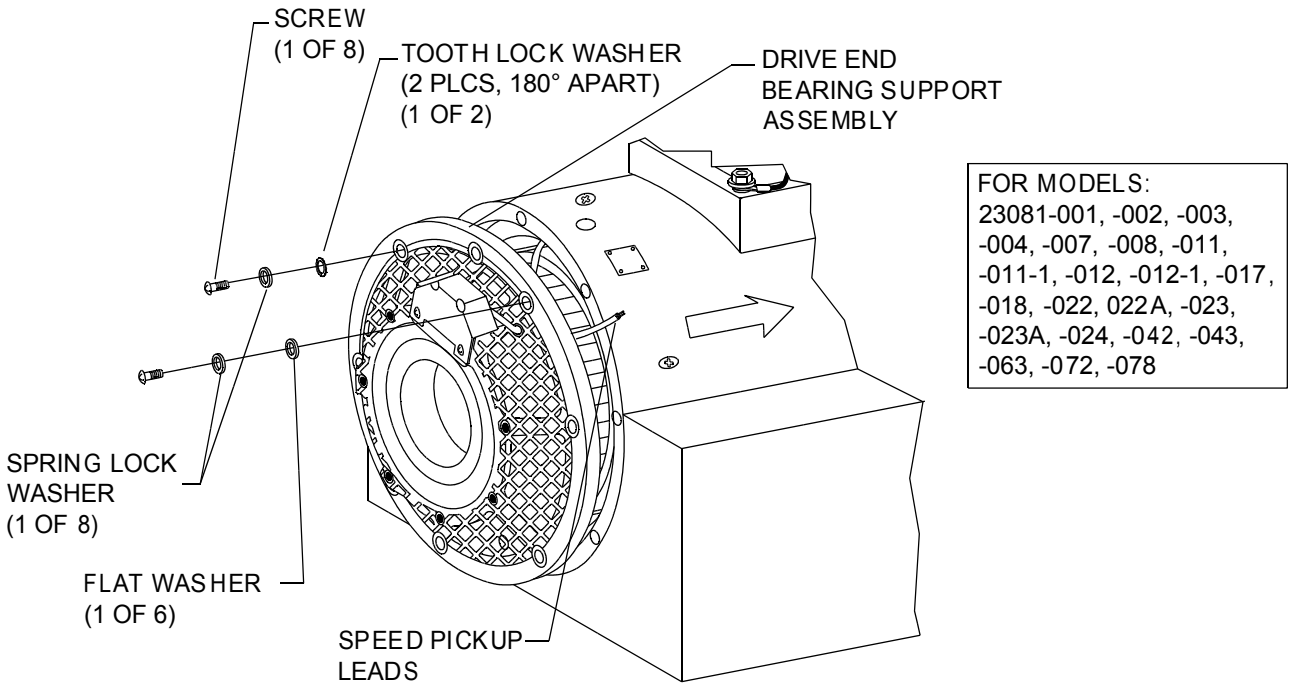

Figure 7013 - Attaching Drive End Bearing Support Assembly
(Effect Codes: A, B, C, D, E, F, J, K, L, M, N, P, Q, R, S, T, U, V, W, BA, EA, GA)

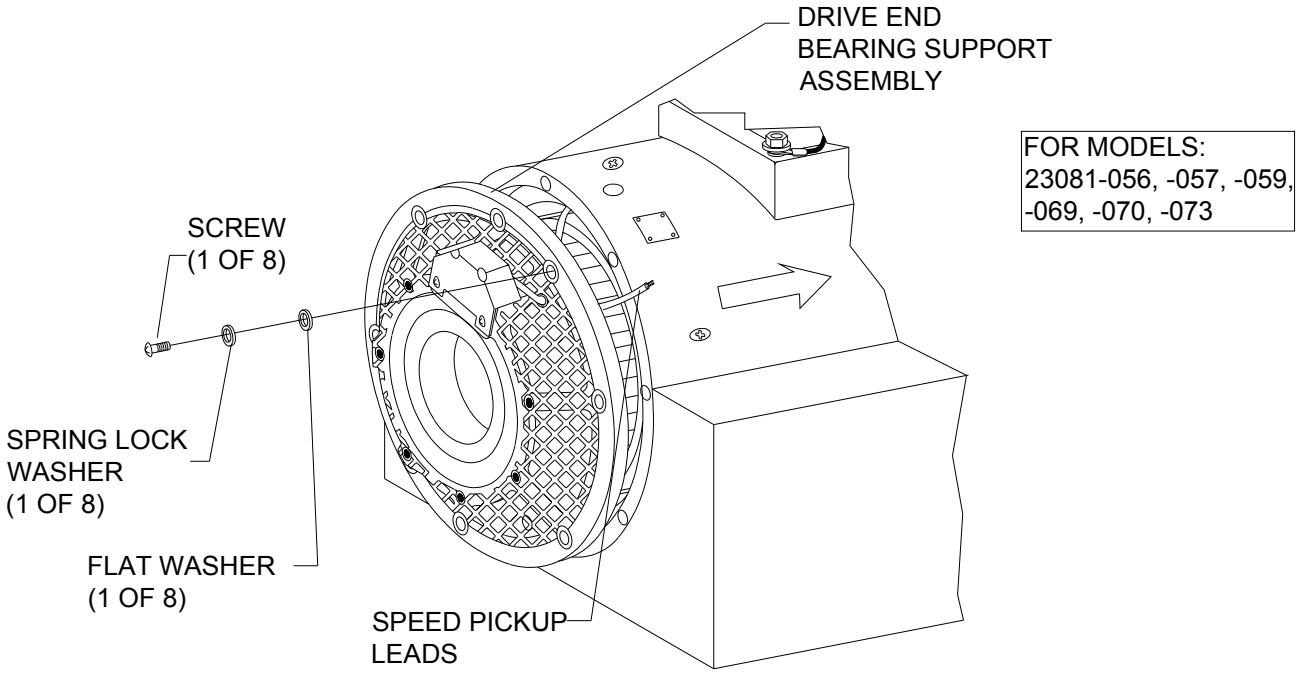

Figure 7014 - Attaching Drive End Bearing Support Assembly
(Effect Codes: X, Y, Z, CA, DA, FA)

G. Attach the Spacer (370) and Connector (360) to the Stator and Housing Assembly (550) (See Figure 7015)

NOTE: Allow enough lead length to reach through spacer.

(1) Solder black lead to pin A and white lead to pin B of connector.

NOTE: All soldering procedures must be done to ANSI/IPC J-STD-001.

(2) If needed, assemble wire adapter sleeve on each of three leads.

(3) Shrink sleeving in place with a heat gun.

(4) Thread magnetic speed pickup leads through slot in spacer.

(5) Use a pin insertion/extraction tool to insert pins into connector (360).

NOTE: When properly installed, the slot in the spacer (370) will be against the stator and housing assembly. The speed pickup leads route through the slot in the spacer.

(6) Position the 3-pin connector (360) on spacer (370).

NOTE: Position polarizing key of 3-pin connector as shown.

WARNING: THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(7) Apply thread sealing compound to threads of four screws (380).

(8) Attach spacer (370) and connector (360) to the stator and housing assembly using four screws (380).

(9) Tighten the screws (380) to a torque of 4.2 to 5.5 lbf.in. (0,47 to 0,62 Nm).

(10) Check for continuity between speed pickup connector pins.

(11) Lockwire the four screws (380) with lockwire (MS20995C20) IAW MS33540.

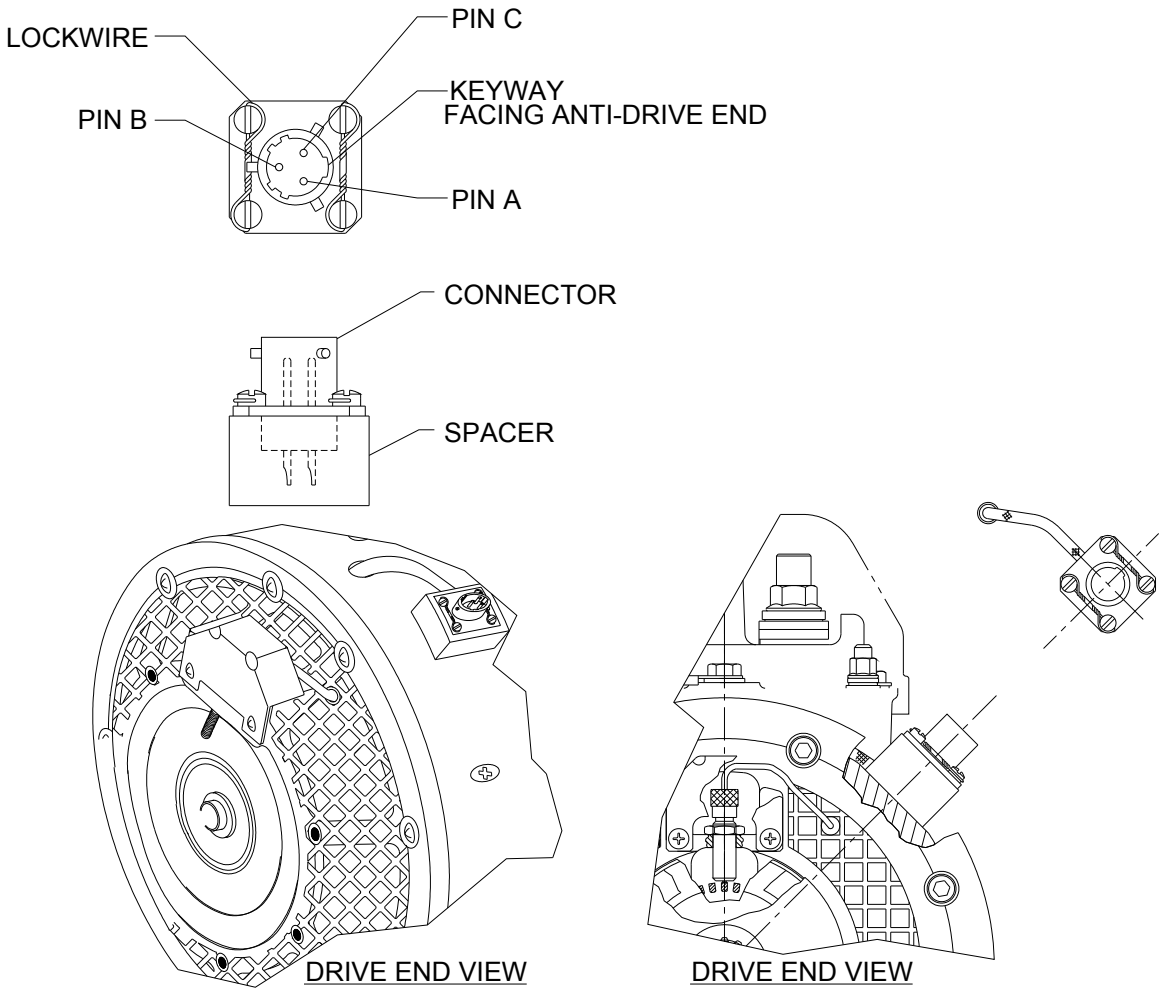

Figure 7015 - Attaching 3-Pin Connector to Stator and Housing Assembly

H. Prepare Armature (480) for Coarse Brush Seating

(1) Prepare the armature for coarse brush seating. Refer to SPD 1006.

NOTE: Make sure taped end of sandpaper is in the normal direction of rotation and abrasive side of sandpaper faces away from the commutator. See Figure 7016.

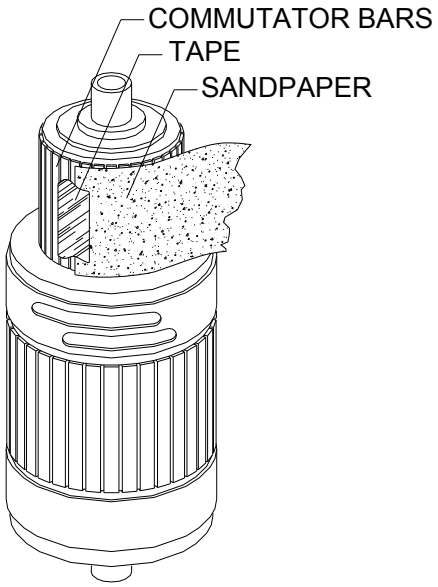

Figure 7016 - Preparing Armature for Rough Seating

I. Press Bearing and Brush Support Assembly (320) onto Armature (480) Shaft (See Figure 7017)

CAUTION: DO NOT TOUCH MACHINED SURFACE OF COMMUTATOR WITH BARE HANDS. SKIN ACIDS AND OILS CAN CONTAMINATE CONDUCTING SURFACES CAUSING CORROSION AND/OR POOR ELECTRICAL CONTACT.

(1) Put the armature (480) on a stand. Put the stand on an arbor press table so that the commutator points up.

(2) Set bearing and brush support assembly (320), brush holders down, on commutator end of armature (480) shaft.

(3) Use an inner race bearing driver to push the bearing and brush support assembly (320) onto the anti-drive end of the armature (480).

(4) Make sure that anti-drive end ball bearing (520) is fully seated against shoulder of armature (480) shaft.

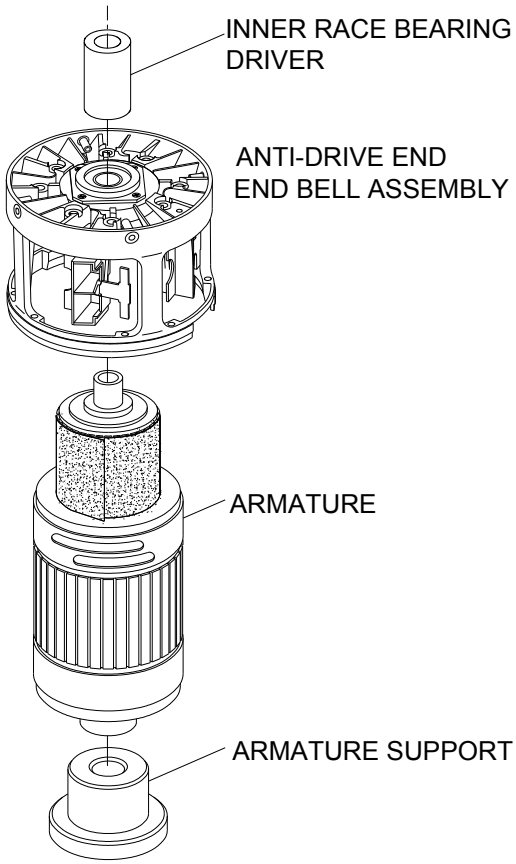

Figure 7017 - Pressing Bearing and Brush Support onto the Armature

J. Attach Bearing and Brush Support Assembly (320), with Attached Armature (480) to Stator and Housing Assembly (550) (See Figure 7018)

(1) Set the drive end hub support on the arbor press table.

(2) Set the stator and housing assembly with attached drive end bearing support assembly (390) (drive end down) onto drive end outboard hub support.

WARNING: DO NOT LET PASTE TOUCH THE EYES OR SKIN. OBEY THE MANUFACTURER'S INSTRUCTIONS. REFER TO MSDS SHEET BEFORE PASTE IS USED.

(3) Apply lubricating and assembly paste to the inside of the bearing liner of the drive end bearing support (390).

(4) Insert armature (480) with attached bearing and brush support assembly (320) into the stator and housing assembly making sure the drive end ball bearing (520) on armature shaft is aligned with bearing liner of drive end bearing support assembly (390).

(5) Set an inner race bearing driver on anti-drive end bearing (520).

(6) Press drive end ball bearing (520) into bearing liner of drive end bearing support assembly (390) making sure screw holes (of bearing and brush support assembly) are aligned with holes in stator and housing assembly and that the machined faces are fully flush.

(7) For effect codes A, B, C, D, J, K, L, M, N, P, Q, R, S, T, U, V, W, X, Y, Z, BA, CA, DA, EA, GA:

(a) Install a lock washer (340) and a flat washer (350) on each of the eight screws (330).

(8) For effect codes E, F:

(a) Install eight lock washers (340) and six flat washers (350) on eight screws (330).

WARNING: THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(9) Apply thread sealing compound to threads of the eight attaching screws (330).

WARNING: ZINC CHROMATE PRIMERS ARE POISONOUS AND CAN CAUSE EXPLOSIONS WHEN MIXED WITH ACIDS, REDUCING AGENTS, COMBUSTIBLE AND OXIDIZING MATERIALS. ISOLATED STORAGE OF THESE MATERIALS IS MANDATORY.

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WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

(10) Apply a wet coat of zinc chromate primer over unpainted area on two locations 180° apart on the surface of the bearing and brush support assembly (320) and install bearing and brush support assembly (320) to stator and housing assembly with eight screws (330) while the zinc chromate primer is still wet.

(11) Torque the eight screws (330) from 18.0 to 24.0 lbf.in. (2,03 to 2,71 Nm).

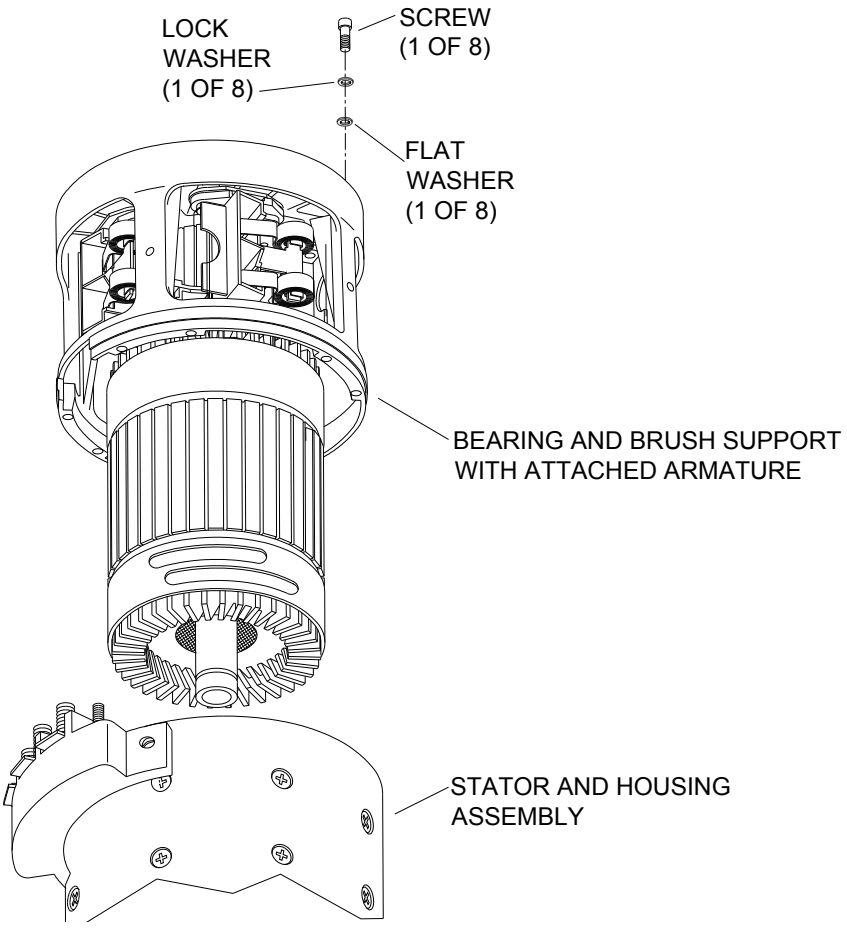

Figure 7018 - Attach Bearing and Brush Support Assembly with attached Armature

K. Install Dampener or Dampener and Gear Backplate (310) and Friction Ring (280) onto Armature Shaft (See Figure 7019)

(1) Set stator and housing assembly on a horizontal stator support.

(2) Twist dampener or dampener and gear backplate (310) onto drive end of armature shaft until fully seated.

(3) Put friction ring (280) onto the recess of the dampener and sensor back plate.

NOTE: Friction ring cannot stay in place until drive shaft with dampener plate is installed.

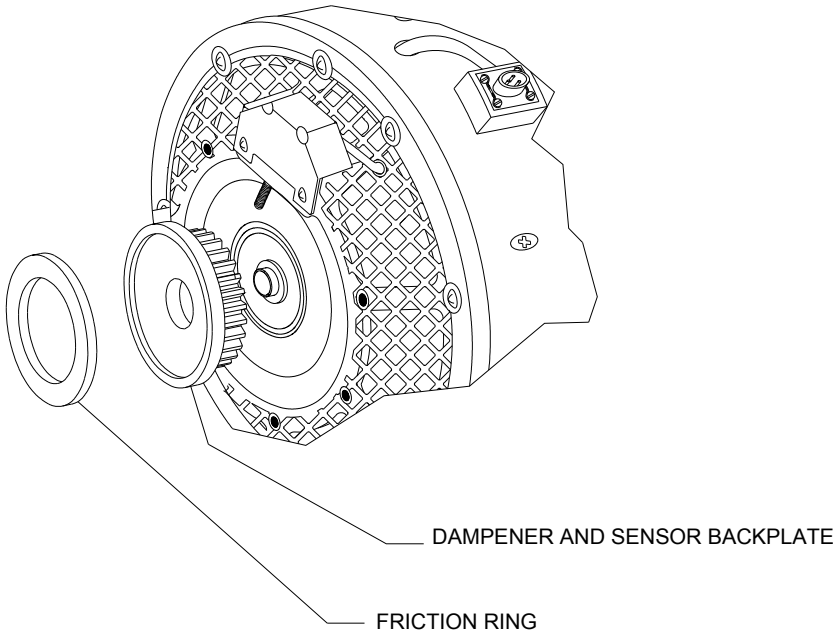

Figure 7019 - Installing Dampener or Dampener and Gear Backplate and Friction Ring

L. Assemble Dampener Hub (300) and Dampener Plate (290) on Drive Shaft (260) (See Figure 7020)

CAUTION: DO NOT FORCE DAMPENER HUB ON DRIVE SHAFT MATING TAPER. TOO MUCH FORCE CAN CAUSE THE DAMPENER HUB TO FRACTURE.

(1) Using hand pressure, press dampener hub (300) on drive shaft (260) if it was removed.

(2) Put drive shaft (260) and dampener hub (300) through dampener plate (290) and driver. Align splines.

(3) Use a leather or plastic mallet to lightly tap drive end of drive shaft to seat dampener plate on dampener hub.

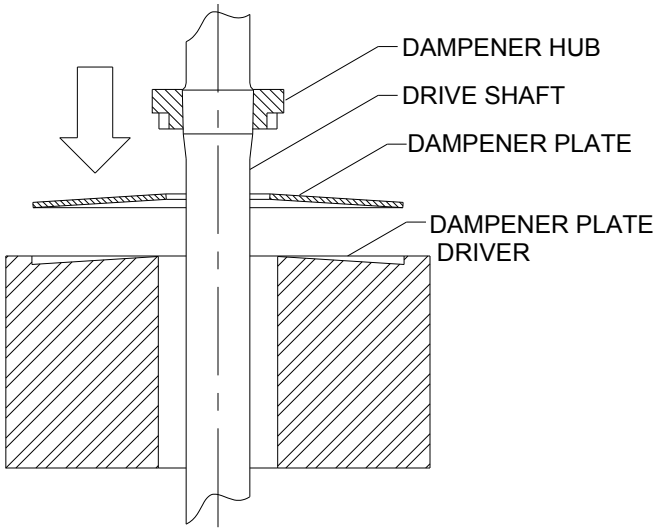

Figure 7020 - Dampener Plate and Driver

M. Insert Drive Shaft (260) into Armature Shaft (150) (See Figure 7021)

CAUTION: DO NOT USE TOO MUCH FORCE TO ENGAGE THE DRIVE SHAFT AND ARMATURE SHAFT MATING SPLINES. FAILURE TO CORRECTLY ENGAGE THE SPLINES CAN CAUSE DAMAGE TO THE DRIVE SHAFT AND ARMATURE SHAFT.

(1) Lubricate internal mating spline on anti-drive end of drive shaft with grease. Do not apply grease to the screw thread at end of drive shaft.

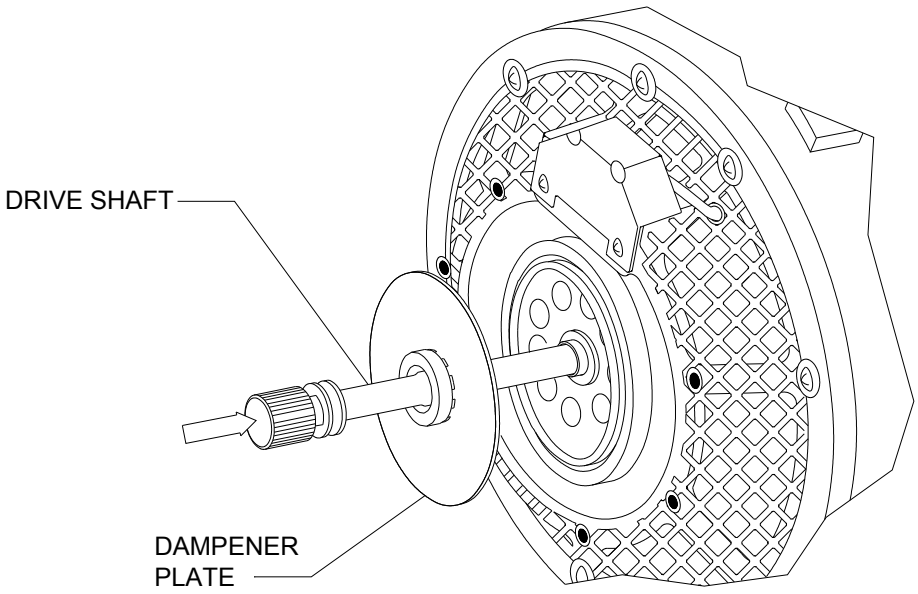

Figure 7021 - Installing Drive Shaft into Armature Shaft

(2) Insert anti-drive end of drive shaft into drive end of armature shaft.

(3) Push drive shaft through armature shaft until dampener plate is fully engaged against friction ring.

(4) Turn drive shaft in the direction of rotation to make sure that armature shaft and drive shaft splines are correctly engaged.

N. Attach Fan (230) to Drive Shaft (See Figure 7022)

(1) Put fan onto drive shaft and engage internal spline on fan with mating spline on drive shaft.

(2) Attach fan (230) to drive shaft with a flat washer (250) and a self-locking nut (240).

(3) Use a spline wrench to hold the drive shaft (260) in place.

(4) Tighten self-locking nut (240) to a torque of 100 to 120 lbf.in. (11,3 to 13,6 Nm).

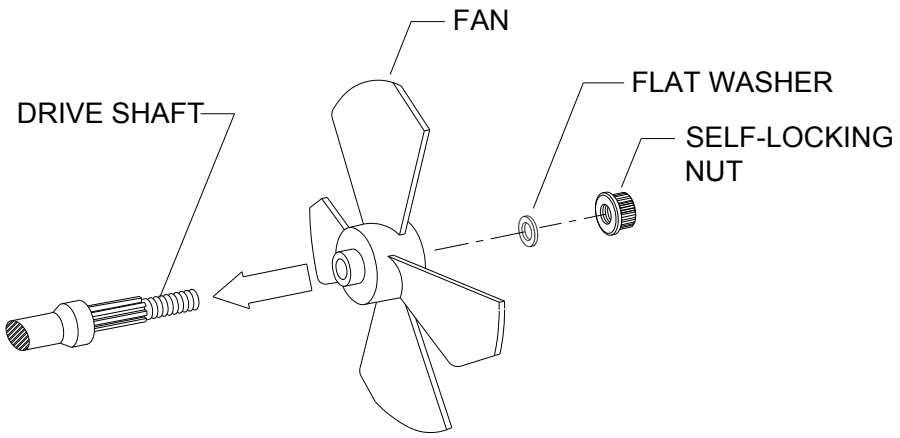

Figure 7022 - Attaching the Fan

O. Insert Brushes (210) into DC Starter-Generator / DC Generator (See Figure 7023)

NOTE: If new brushes (210) are to be used, identify the brushes (210) with the numbers 1 through 4.

CAUTION: RAISE AND LOWER BRUSH SPRINGS SLOWLY. DO NOT LIFT BRUSH SPRINGS MORE THAN NEEDED TO INSERT BRUSH SETS INTO BRUSH HOLDER ASSEMBLY.

(1) Install four brushes (210) into the corresponding complete brush holders (10002-30).

(a) Set the model, anti-drive end up, onto a vertical stator and housing assembly support.

(b) At each brush holder location, lift one brush spring at a time with a wire hook tool and insert brush set into a brush holder assembly.

(c) Slowly lower springs on top of brushes. Make sure that brush leads are not caught under brush springs.

(2) Secure the four brush (210) leads and four braided stator leads to complete brush holders (10002-30) with four screws (220) to a torque of 22.7 to 35.0 lbf.in. (2,6 to 4,0 Nm).

(a) If applicable, install the ground lead (10004-120) from the stator and housing assembly to the nearest negative brush holder.

CAUTION: FAILURE TO PROPERLY FORM THE BRUSH LEAD CAN RESULT IN BRUSH HANG UP.

(3) Form the brush leads IAW SPD 1006.

NOTE: Also reference GSIL 2007-01 for brush lead installation instructions for applicable models.

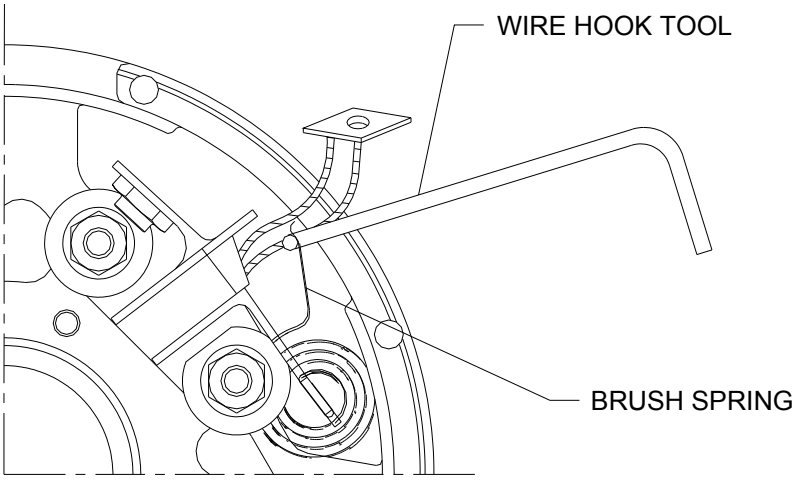

Figure 7023 - Installing Brush Sets

P. Coarse Seat the New Brushes (210)

(1) Coarse seat the brushes (210) IAW SPD 1006.

NOTE: The sandpaper should first touch the leading edge (short side) of the brush (210) when the armature (480) is rotated in its normal direction.

(2) Remove any remaining sandpaper IAW SPD 1006 when done with brush run-in.

Q. Do Brush (210) Run-in

CAUTION: FAILURE TO FULLY SEAT THE BRUSHES CAN DECREASE BRUSH LIFE, LOWER UNIT PERFORMANCE, OR CAUSE UNIT FAILURE.

CAUTION: DO NOT LET THE UNIT HANG UNSUPPORTED DURING INSTALLATION ONTO AND REMOVAL FROM THE DRIVE STAND. TOO MUCH LOAD ON THE DRIVE SHAFT SHEAR SECTION CAN DAMAGE THE UNIT.

(1) Run-in the brushes as given in Safran Power SPD 1006.

NOTE: A correctly seated brush (210) has a smooth and semi-gloss contact surface.

R. If applicable, Assemble the Air Inlet Assembly (150)

(1) Place the hexagonal screen (170) inside the air inlet (160) and line up the holes with the screen.

(2) Put a flat washer (-190) on each rivet (-180).

(3) Insert the rivet in each hole through an opening in the screen.

(4) Put another flat washer on the rivet and flatten the head.

S. Attach Air Inlet or Air Inlet Assembly (150)

CAUTION: USE AN INSULATED AIR INLET ASSEMBLY WITH MODELS FEATURING NON-INSULATED BRUSH LEADS. SEE THE ILLUSTRATED PARTS LIST SECTION FOR MODELS THAT REQUIRE INSULATED AIR INLETS WITH MATCHING BRUSHES.

(1) Use a vertical stator and housing assembly support to put the model, fan end up, on a work bench.

(2) Install four screws (200) onto the air inlet and tighten the four screws (200) to a torque of 7.7 to 10.3 lbf.in. (0,87 to 1,2 Nm).

8. Identification and Other Plates

A. Attach Replacement Identification Plate (60), Information Plate (80), Hi-pot Decal (100), FAA-PMA Label (-110) and Modification Status Label (-120) to DC Starter-Generator / DC Generator

NOTE: See ILLUSTRATED PARTS LIST for applicable model and modification status when re-identifying the model.

CAUTION: DO NOT STAMP INFORMATION DIRECTLY ONTO ANY PART OF STATOR AND HOUSING ASSEMBLY.

(1) Identification plate replacement (60), if necessary.

(a) Copy the information from old identification plate to the replacement identification plate (60).

(b) Assemble the replacement identification plate (60) on the stator and housing assembly and attach with four drive screws (70).

WARNING: KEEP ACRYLIC COATING AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ACRYLIC COATING IS FLAMMABLE.

WARNING: DO NOT GET ACRYLIC COATING ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ACRYLIC COATING IS A POISONOUS MATERIAL.

(c) Apply acrylic coating to the replacement identification plate (60).

(2) If information plate was damaged, attach a replacement information plate (80) to stator and housing assembly with two drive screws (90).

(3) If the replacement information plate has an adhesive backing then cover the two holes on the stator and housing assembly by one of the following methods:

(a) Install two drive screws (90) in the empty holes on the stator housing where the information plate (80) was removed.

(b) Paint over the two drive screw holes.

1 Pretreat the drive screw area by applying wash primer per MIL-C-8507. Refer to SPD (Standard Practice Document) 1002. (See Table 1)

WARNING: PRIMER CAN BE DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF IGNITION. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION. IF NECESSARY, PUT ON A RESPIRATOR.

2 Cover with epoxy primer per MIL-P-23377F, Type I.

(4) Install hi-pot instruction decal (100), if required.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(a) Clean stator and housing assembly surface where decal is to be applied using isopropyl alcohol and a clean, lint-free cloth.

(b) Allow the alcohol to dry.

(c) Remove the protective backing on the hi-pot instruction decal (100) and install hi-pot instruction decal (100) on stator and housing assembly.

(5) Install FAA-PMA label (-110), if required.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(a) Clean stator and housing assembly surface where decal is to be applied using isopropyl alcohol and a clean, lint-free cloth.

(b) Allow the alcohol to dry.

(c) Remove the protective backing on the FAA-PMA label (-110) and install FAA-PMA label (-110) on stator and housing assembly.

(6) Install modification status label (-120), if required.

WARNING: ISOPROPYL ALCOHOL IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(a) Clean stator and housing assembly surface where decal is to be applied using isopropyl alcohol and a clean, lint-free cloth.

(b) Allow the alcohol to dry.

(c) Remove the protective backing on the modification status label (-120) and install modification status label (-120) on stator and housing assembly.

9. Do Acceptance Test on DC Starter-Generator / DC Generator

CAUTION: BEFORE ACCEPTANCE TESTING, ATTACH AN UNSERVICEABLE TERMINAL BLOCK TO THE STATOR AND HOUSING ASSEMBLY.

Do acceptance test procedure on the assembled generator as detailed in the TESTING AND FAULT ISOLATION section.

10. Final Assembly after Acceptance Testing

NOTE: Numbers in parentheses ( ) refer to item numbers given in Figure 10001 through Figure 10004 of the ILLUSTRATED PARTS LIST.

A. If applicable, attach Filter Board Leads (10002-70) to Bearing and Brush Support Assembly (10001-320) (See Figure 7011)

(1) Remove the air inlet assembly (10001-150) by removing four screws (10001-200).

(2) Feed leads (10002-70) from filter board assembly (10002-60) through bearing and brush support assembly (10001-320) (where applicable).

WARNING: THREAD SEALING COMPOUND IS DANGEROUS TO PERSONS. USE ONLY IN AN AREA WITH A GOOD FLOW OF AIR. KEEP AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. DO NOT BREATHE THE FUMES. PREVENT SKIN CONTACT. PUT ON PROTECTIVE CLOTHING AND EYE PROTECTION.

(3) Remove the screws (10001-500) that attach the filter leads and apply thread sealing compound to threads of screws (10001-500).

(4) Attach the filter board leads (10002-70) using attaching screws (10001-500) and lock washers (10001-510).

(5) For all the models except 23081-078: Tighten four screws (10001-500) to a torque of 13.5 to 18.0 lbf.in. (1,5 to 2,0 Nm).

(6) For model 23081-078: Tighten four screws (10001-500) to a torque of 10.5 to 14.0 lbf.in. (1,2 to 1,6 Nm).

(7) Attach the air inlet assembly (10001-150) using attaching screws (10001-200).

(8) Tighten four screws (10001-200) to a torque of 7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm).

B. Attach a Serviceable Terminal Block (10004-60) to DC Starter-Generator / DC Generator or reconnect the Grounding Lead

NOTE: A dummy terminal block is used during acceptance testing, or the grounding lead was isolated.

(1) If the grounding lead was disconnected and taped, remove the tape and reconnect the grounding lead.

(2) Remove dummy terminal block according to instructions in Paragraph 7.B. of the DISASSEMBLY section.

(3) Attach a terminal block according to instructions in Paragraph 4.A. of this section.

C. Put the Attaching Hardware onto the Terminal Block (10004-60)

(1) Attach terminal block attaching hardware according to instructions in Paragraph 4.B. of this section.

D. Attach Terminal Block Cover (10001-130) to DC Starter-Generator / DC Generator, if present

(1) Attach terminal block cover according to instructions in Paragraph 4.C. of this section.

E. If present, Attach QAD Mounting Kit (10001-10) to DC Starter-Generator / DC Generator

NOTE: When the model has been removed from service, the QAD mounting kit usually remains attached to the engine.

(1) Be sure that pilot diameters of mounting adapter and drive end bearing support assembly are fully engaged.

(2) While holding mounting adapter (10001-50) firmly in place, put rim-clenching clamp (10001-20) over flanges of mounting adapter and drive end bearing support assembly.

(3) Tighten self-locking nut (10001-30) onto T-bolt (10001-40).

(4) Torque to 50 lbf.in. (5,7 Nm) to lock the QAD mounting kit to the model.

11. Preparation for Shipment/Storage

Refer to STORAGE section for shipment/storage instructions.

12. Package the DC Starter-Generator / DC Generator for Shipment or Storage

Coat drive spline with grease MIL-G-81322 and wrap the drive spline with protective paper according to MIL-B-121A, Grade A, Type II, Class 1.

Put a new O-ring (10001-270) into a suitable container and label container with instructions to user to lubricate and install O-ring on drive shaft prior to installation of the generator into the aircraft.

For shipment or storage, seal the unit in suitable plastic container to protect against corrosion and airborne contaminants. Refer to STORAGE section in this manual for packing materials.

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FITS AND CLEARANCES

1. Introduction

A. The following paragraphs provide information for determining the acceptability of fits and clearances of the model.

B. Examine the parts for damage. Refer to CHECK section, for details.

C. Repair the parts before assembly. Refer to REPAIR section, for details.

D. The required torque values to be used during repair and assembly of the model components and attaching parts are listed in Paragraph 2.

E. The acceptance limits for the model components and sub-assemblies are listed in Paragraph 3.

2. Torque Values

NOTE: Unless otherwise specified, numbers in parentheses ( ) refer to item numbers on the figure of ILLUSTRATED PARTS LIST.

Table 8001 gives information necessary to tighten fasteners to specified torque. Values shown do not include frictional torque caused by self-locking devices or rundown resistance. Frictional torque values must be added to the specified torque.

Nuts, bolts, and screws not listed in Table 8001 are to be tightened in accordance with Safran Power methods and techniques or practices acceptable to your administration as specified in FAR PART 43.

Hardware Description	Torque Acceptance Limits
V-Retainer Nut (10001-30)	50 lbf.in. (5,7 Nm)
Flat Head Screw (10001-140)	7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm)
Binding Head Screw (10001-200)	7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm)
Binding Head Screw (10001-220)	22.7 to 35.0 lbf.in. (2,6 to 4,0 Nm)
Nut (10001-240)	100 to 120 lbf.in. (11,3 to 13,6 Nm)
Screw (10001-330)	18.0 to 24.0 lbf.in. (2,03 to 2,71 Nm)
Fillister Head Screw (10001-380)	4.2 to 5.5 lbf.in. (0,47 to 0,62 Nm)
Socket Head Screw (10001-400)	18.0 to 24.0 lbf.in. (2,03 to 2,71 Nm)
Screw (10001-450)	4.2 to 5.5 lbf.in. (0,5 to 0,6 Nm)
Screw (10001-500) DC Starter-Generator Effect Codes: A,B,C,D,E,F,J,K,L,M,N,P,Q,R,S,T,U,V,W,X, Y,Z,BA,CA,DA,EA,FA	13.5 to 18.0 lbf.in. (1,5 to 2,0 Nm)
Screw (10001-500) DC Generator Effect Code: GA	10.5 to 14.0 lbf.in. (1,2 to 1,6 Nm)

Table 8001 - Torque Values

Hardware Description	Torque Acceptance Limits
Speed Pickup Jam Nut (10001-460)	15 to 25 lbf.in. (1,7 to 2,9 Nm)
Self-Locking Nut (10002-140)	27.0 to 36.0 lbf.in. (3,1 to 4,1 Nm)
Screw (10003-60)	7.7 to 10.3 lbf.in. (0,87 to 1,16 Nm)
Stud (10004-50) Stator Effect Code: C	220 to 235 lbf.in (24,86 to 26,55 Nm)
Fillister Head Screw (10004-80) Stator Effect Codes: A,B,F	28.0 to 37.6 lbf.in. (3,2 to 4,25 Nm)
Socket Head Screw (10004-80) Stator Effect Codes: D,E	13.5 to 18.0 lbf.in. (1,5 to 2,0 Nm)
Fillister Head Screw (10004-80) Stator Effect Code: C	8.0 to 12.0 lbf.in. (0,90 to 1,36 Nm)

Table 8001 - Torque Values (Continued)

3. Acceptance Limits

Refer to Table 8002 for the model component and subassembly acceptance limits. Paragraph designations in the CHECK column refer to the applicable inspection procedure found in the CHECK section.

NOTE: Refer to the IPL for illustrations. Numbers in parentheses ( ) refer to item numbers on the illustration, unless otherwise specified.

CHECK Para. Ref.	Nomenclature and IPL Number	Inspect for...	Acceptance Limits
9.B.	Mounting Adapter (50)	Pilot Flange and/or Pilot Bore	Model 23032-2452 3.183 to 3.185 in. (80,85 to 80,90 mm)
			Model 23032-2453 3.247 to 3.249 in. (82,47 to 82,52 mm)
9.H.	Drive Shaft (260)	12-tooth drive spline diameter	0.757 in. (19,23 mm) min. with gage pin dia. of 0.1094 in (2,779 mm)
		13-tooth armature mating spline diameter	0.4813 in. (12,225 mm) min. with gage pin dia. of 0.060 in. (1.52 mm)
9.I.	Friction Ring (280)	Thickness	0.060 in. (1,52 mm) min.

Table 8002 - Acceptance Limits

CHECK Para. Ref.	Nomenclature and IPL Number	Inspect for...	Acceptance Limits
9.J.	Dampener Plate (290)	Thickness	0.038 in. (0,97 mm) min.
		Distance between pins of spline teeth	0.6547 in. (16,629 mm) max. with gage pin dia. of 0.090 in. (2,29 mm)
9.L.	Bearing and Brush Support Assembly (320)	Bearing Liner Diameter	1.5747 to 1.5750 in. (39,997 to 40,005 mm) See Figure 8002
	Brush Spring (10002-50)	Force	Position “A” 2.50 lb (1,13 kg) max. Position “B” 1.75 lb (0,79 kg) min.
	Filter Assembly (10002-60)	Capacitance value	0.3 to 0.36 μFd
9.N.	Drive End Bearing Support Assembly (390)	Bearing Liner Diameter	1.5745 to 1.5748 in. (39,992 to 40,000 mm) See Figure 8002
9.O.	Speed Pickup (460)	Resistance, lead to ground	More than 1 MΩ
		P/N 23072-1400 Resistance between leads	20 to 45 Ω
		P/N 23072-1280 Resistance between leads	95 to 137 Ω

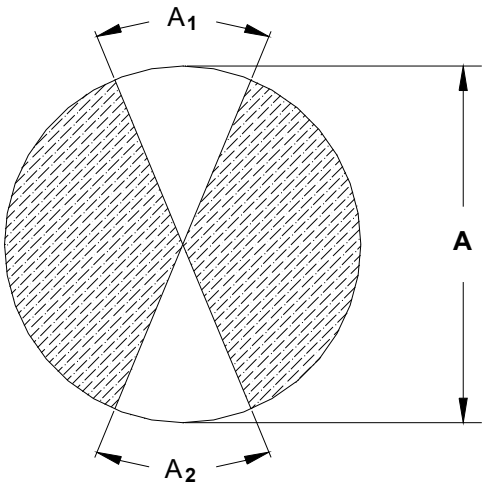
Table 8002 - Acceptance Limits (Continued)

CHECK Para. Ref.	Nomenclature and IPL Number	Inspect for...	Acceptance Limits
9.P.	Armature (480)	Bearing Journals (A, C)	0.6691 to 0.6694 in. (16,995 to 17,003 mm)
		Commutator Diameter (B)	1.960 in. (49,784 mm) min.
		Commutator Bar to Bar (Before Refinishing)	Bar to Bar: 0.0008 in. (0,020 mm) max. If max is exceeded, do not repair, replace armature
		Commutator Bar to Bar and concentricity (After Refinishing)	Bar to Bar: 0.0001 inch (0,0025 mm) max. T.I.R: 0.0005 inch (0,0127 mm) max.
		Mica Undercut (before recut)	Depth: 0.045 inch (1,143 mm) min. to 0.070 inch (1,780 mm) max. Width: 0.035 inch (0,889 mm) to 0.045 inch (1,142 mm).
		Mica Undercut (after recut)	Depth: 0.050 inch (1,270 mm) min. to 0.070 inch (1,780 mm) max. Width: 0.035 inch (0,889 mm) to 0.045 inch (1,142 mm).
		Armature Balance	See SPD 1001
		Surface Finish	64 to 100 μin. RMS (1,6 to 2,5 μ RMS)
		Internal Spline Diameter	0.3677 in. (9,345 mm) max. with gage pin dia. of 0.045 in. (1,14 mm)

Table 8002 - Acceptance Limits (Continued)

CHECK Para. Ref.	Nomenclature and IPL Number	Inspect for...	Acceptance Limits
9.T.	Terminal Block (10004-60)	P/N: 23032-1518 and P/N: 23032-1530 Capacitance Values B and E Capacitance Values B and Ground Capacitance Values C and Ground	2.0 µFd +50%/-20% 100 V DC/<1.0 µA See Figure 8004 0.022 µFd +50%/-20% 100 V DC/<1.0 µA 2.0 µFd +50%/-20% 100 V DC/<1.0 µA
		P/N: 23069-1236 and P/N: 23081-1310 Capacitance Values B and E Capacitance Values B and Ground	2.0 µFd ±10% 100 V DC/<1.0 µA See Figure 8003 2.0 µFd ±10% 100 V DC/<1.0 µA
	Capacitance measured at 77° F (25° C) ± 10%. Frequency at which capacitance is measured is 120 Hz ± 10 Hz.		

Table 8002 - Acceptance Limits (Continued)

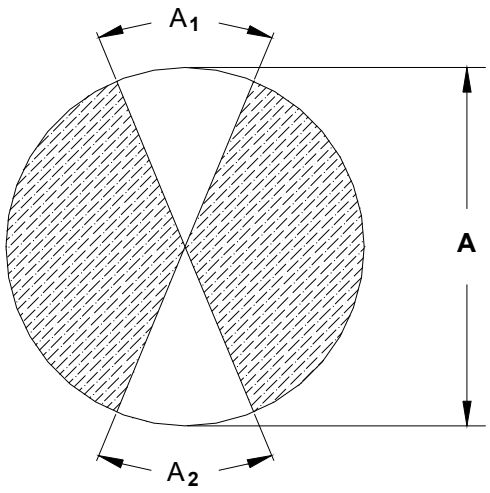


A1 + A2 < 25% of Diameter A Minimum

Figure 8001 - Measuring Armature Bearing Journal Diameters

NOTE: During overhaul/service inspection, diameter of bearing journal is considered to be acceptable if not more than 25% of circumference is below the minimum diameter limit (See Figure 8001). When the model is to be repaired and returned to service on a “continued time” basis, the minimum diameter limit of bearing journal diameter “A” is acceptable if up to 25% of the circumference is not more than 0.0001 in. (0,003 mm) below maximum diameter limit.

NOTE: Acceptance criteria for used journals, not new or repaired journals.



A1 + A2 < 25% of Diameter A Maximum

Figure 8002 - Measuring Bearing Liner Diameters

NOTE: During overhaul/service inspection, diameter of bearing liner is considered to be acceptable if not more than 25% of circumference is above the maximum diameter limit (See Figure 8002). When the model is to be repaired and returned to service on a “continued time” basis, the maximum diameter limit of bearing liner diameter “A” is acceptable if up to 25% of the circumference is not more than 0.0001 in. (0,003 mm) above maximum diameter limit.

NOTE: Acceptance criteria for used liners, not new or repaired liners.

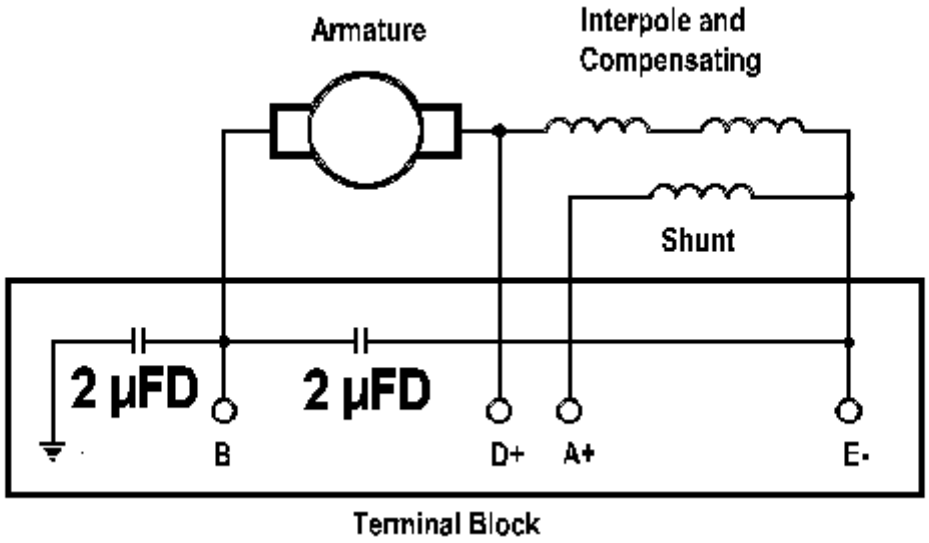


Figure 8003 - Terminal Blocks 23069-1236 and 23081-1310

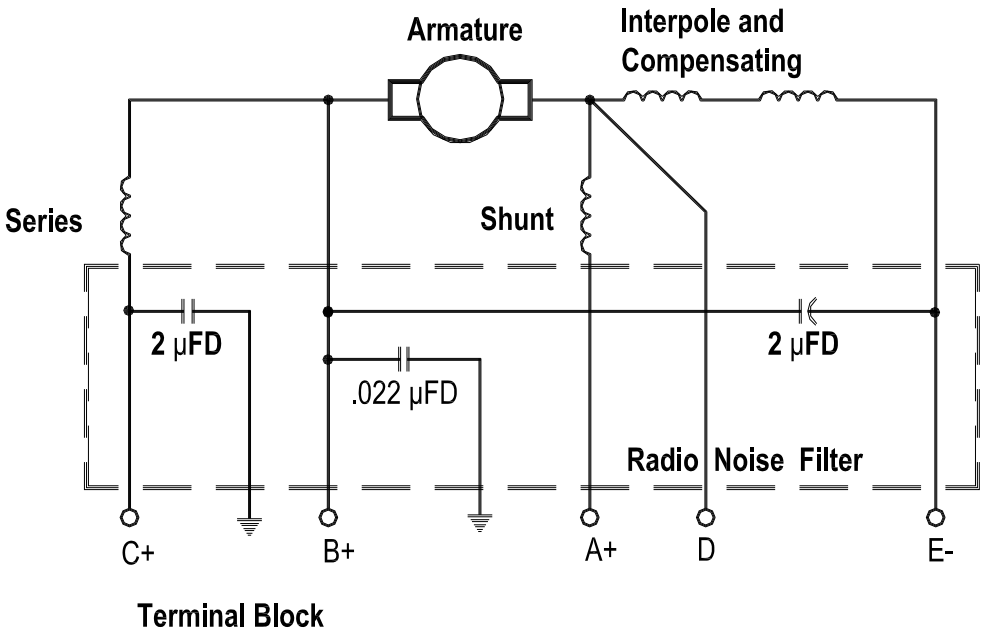


Figure 8004 - Terminal Block 23032-1518 and 23032-1530

SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

1. Introduction

Table 9001 lists the approved special tools, fixtures, and equipment necessary for the model service.

Nomenclature	Figure No.
Adapter, Anti-drive end Armature Shaft	Figure 9001
Adapter, Drive end Armature Shaft	Figure 9002
Adapter, Commutation Viewing	Figure 9003
Brush Holder Alignment Fixture	SPD 1004
Commutator Turning Fixture	Figure 9016
Driver, Dampener Hub	Figure 9006
Driver, Inner Race Bearing	Figure 9004
Driver, Outer Race Bearing	Figure 9005
Driver, Dampener Plate	Figure 9007
Speed Pickup Adjustment Plug	Figure 9008
Spline Wrench	Figure 9015
Support, Anti-drive End Hub	Figure 9011
Support, Armature	Figure 9010
Support, Bearing and Brush Support Assembly	Figure 9009
Support, Drive End Outboard Hub	Figure 9012
Support, Horizontal Stator and Housing Assembly	Figure 9013
Support, Vertical Stator and Housing Assembly	Figure 9014

Table 9001 - Special Tools, Fixtures, and Equipment

2. Tool Descriptions and Fabrication Instructions

The drawings in this section provide material and fabrication instructions for the tools listed in Table 9001. Where dimensions and fabrication instructions are provided, the tool or fixture is approved for local manufacture. Unless otherwise specified all measurements are in inches followed by metric equivalents. The tools and fixtures cannot be procured from Safran Power. Equivalent tooling and fixture requirements meeting with Safran Power specifications can be used.

A. Armature Shaft Adapter, Anti-Drive End (See Figure 9001)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Machined ends to be parallel within 0.001 in. and square with sidewalls to ± 0.5 degrees. Material is CD-260 Brass or equivalent

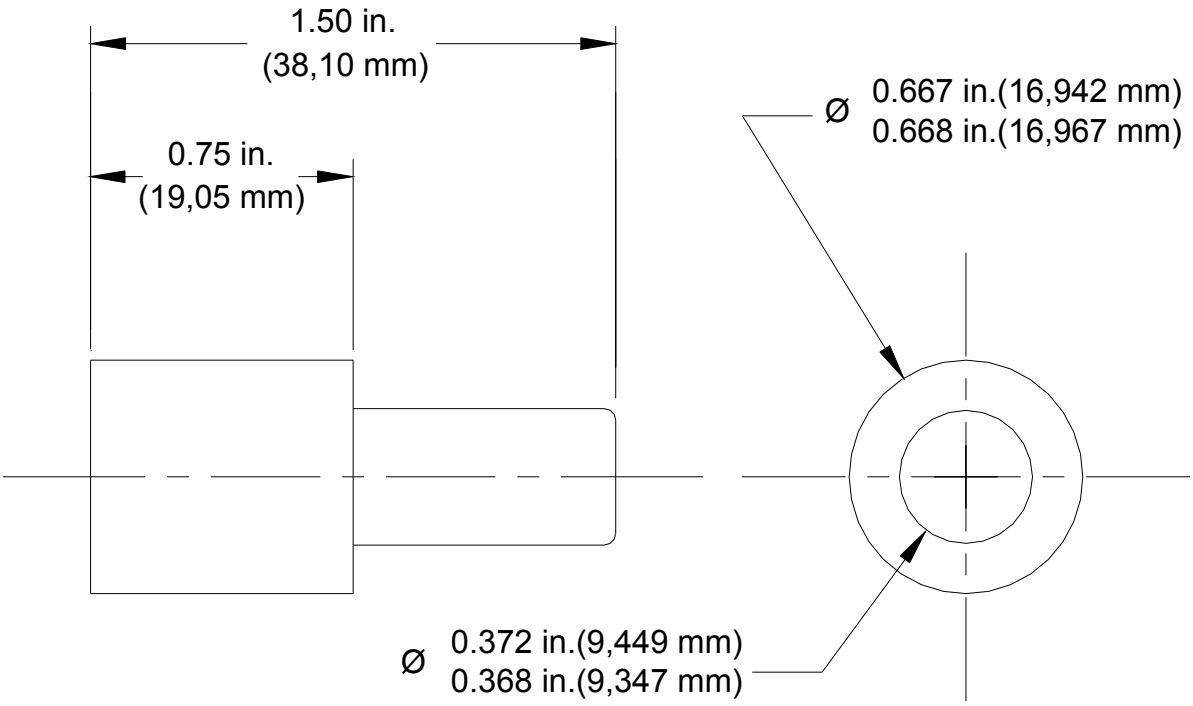


Figure 9001 - Armature Shaft Adapter, Anti-Drive End

B. Armature Shaft Adapter, Drive End (See Figure 9002)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Machined ends to be parallel within 0.001 in. and square with sidewalls to ± 0.5 degrees. Material is CD-260 Brass or equivalent.

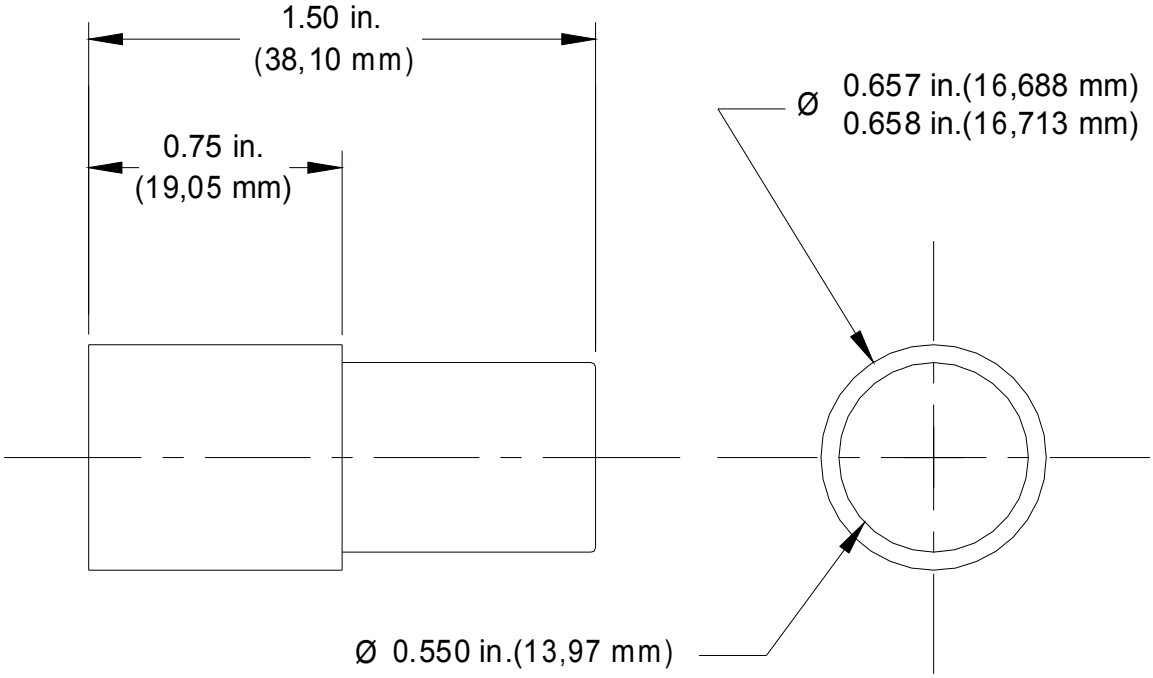


Figure 9002 - Armature Shaft Adapter, Drive End

C. Commutation Viewing Adapter (See Figure 9003)

This adapter is constructed using an extra air inlet that fits the model, 0.125 in. (3,175 mm) thick, impact-resistant plexi-glass, and 16 pop rivets. Construction is as follows:

(1) Cut four holes in the air inlet. Each hole must be positioned above one of the four brush holder assemblies to allow for viewing the brushes as they make contact with the commutator during test.

(2) Cut four pieces of plexi-glass to size to cover each hole in the air inlet.

(3) Attach the four pieces of plexi-glass to the viewing windows on the outer surface of the viewing adapter using four pop rivets at each location.

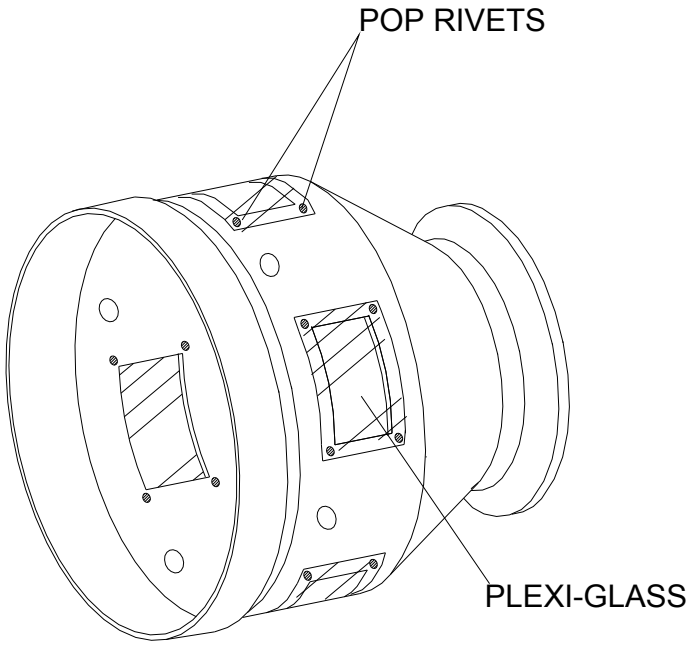


Figure 9003 - Commutation Viewing Adapter

D. Inner Race Bearing Driver (See Figure 9004)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Machined ends to be parallel within 0.001 in. and square with sidewalls to ± 0.5 degrees. Material is 01 tool steel or equivalent hardened to Rc 55-60.

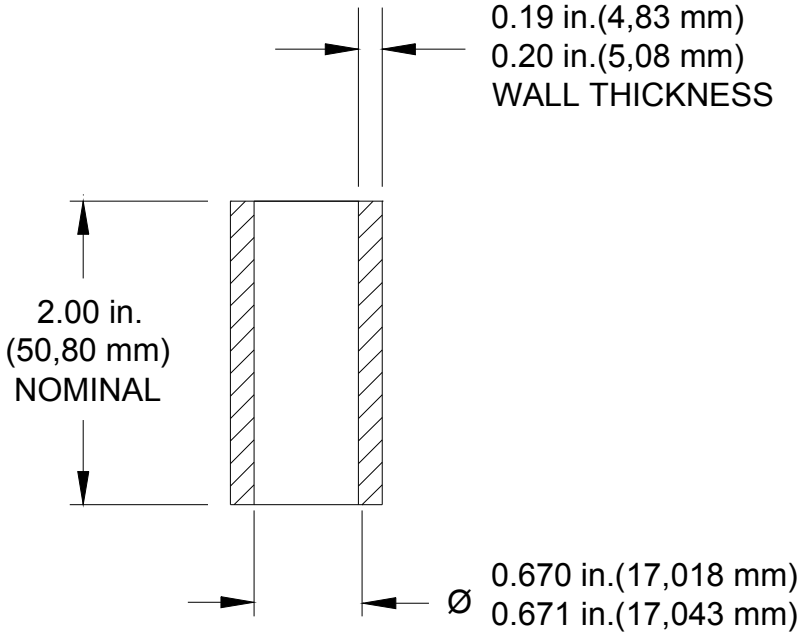


Figure 9004 - Inner Race Bearing Driver

E. Outer Race Bearing Driver (See Figure 9005)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Machined ends to be parallel within 0.001 in. and square with sidewalls to ± 0.5 degrees. Material is 01 tool steel or equivalent hardened to Rc 55-60.

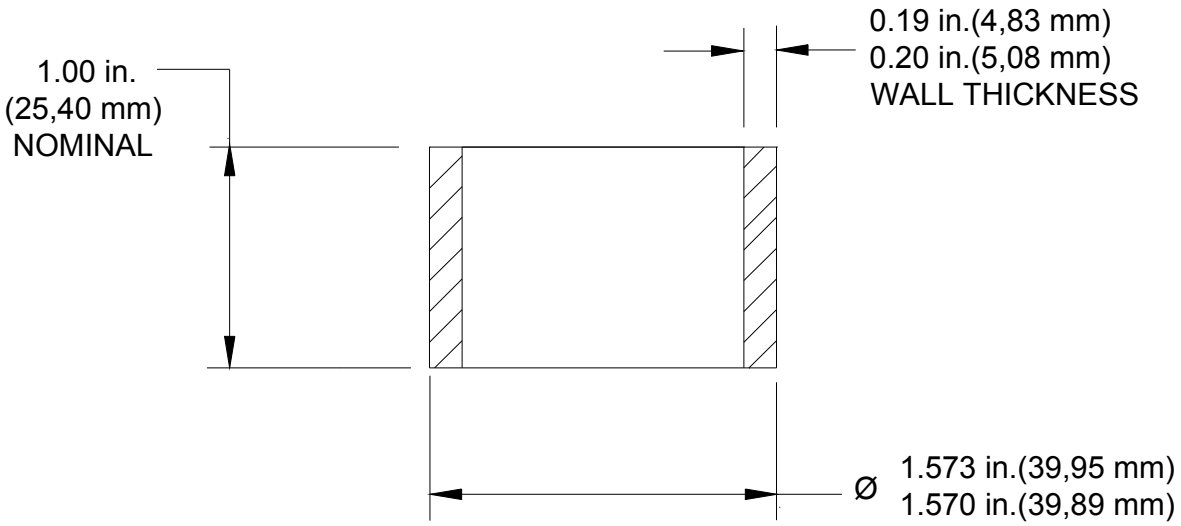


Figure 9005 - Outer Race Bearing Driver

F. Dampener Hub Driver (See Figure 9006)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Material is 01 tool or equivalent hardened to Rc 55-60.

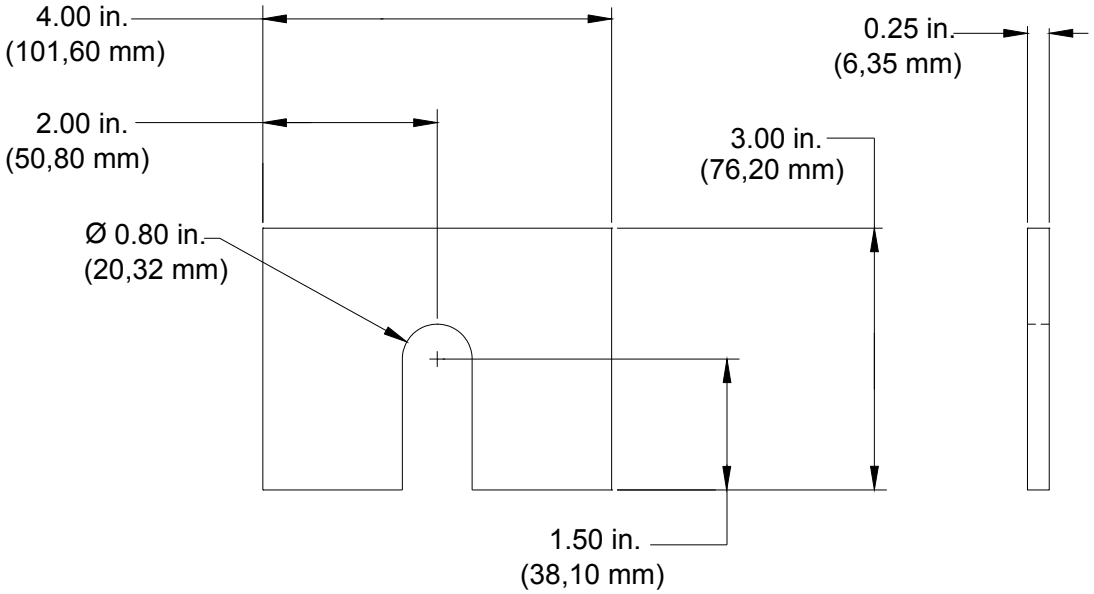


Figure 9006 - Dampener Hub Driver

G. Dampener Plate Driver (See Figure 9007)

Harden to Rockwell Rc 55-60.

Material:	01 tool steel or equivalent
Stock Size:	3.0 inch diameter (76,2 mm)
Tolerances on:	Decimals 0.XX ± 0.01 inch (0,25 mm) 0.XXX ± 0.005 inch (0,127 mm)
Angles:	± 1 Degrees

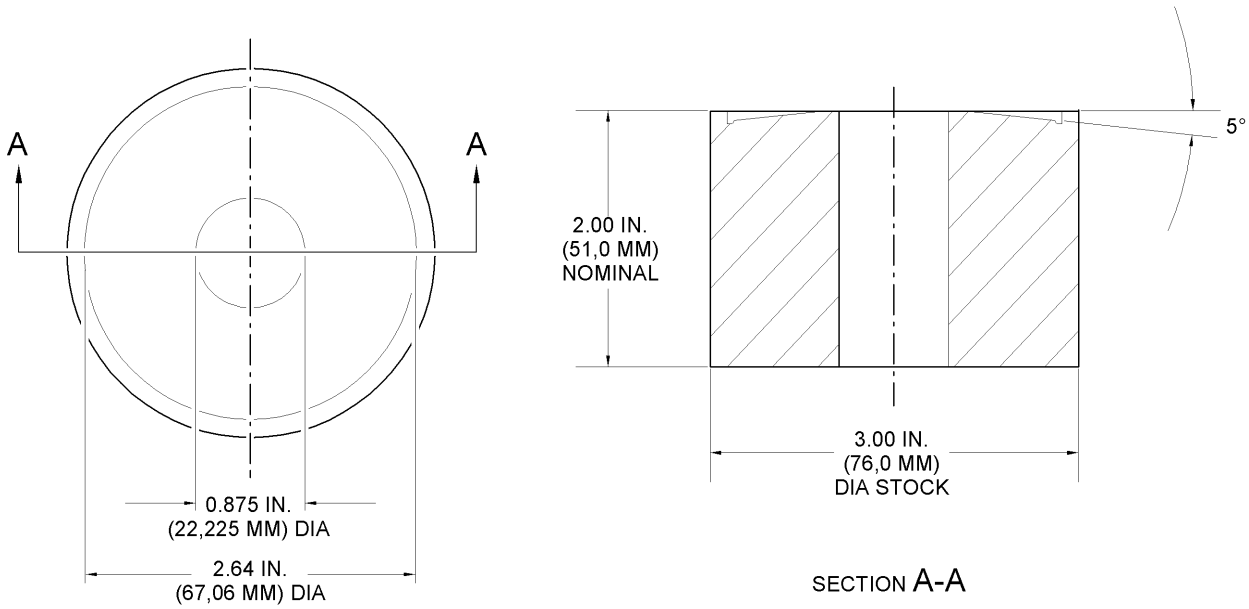


Figure 9007 - Dampener Plate Driver

H. Speed Pickup Adjustment Plug (See Figure 9008)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 2×0'. Machined ends to be parallel within 0.001 in. and square with sidewalls to ± 0.05 degrees. Material is 01 tool steel or equivalent hardened to Rc 58-60.

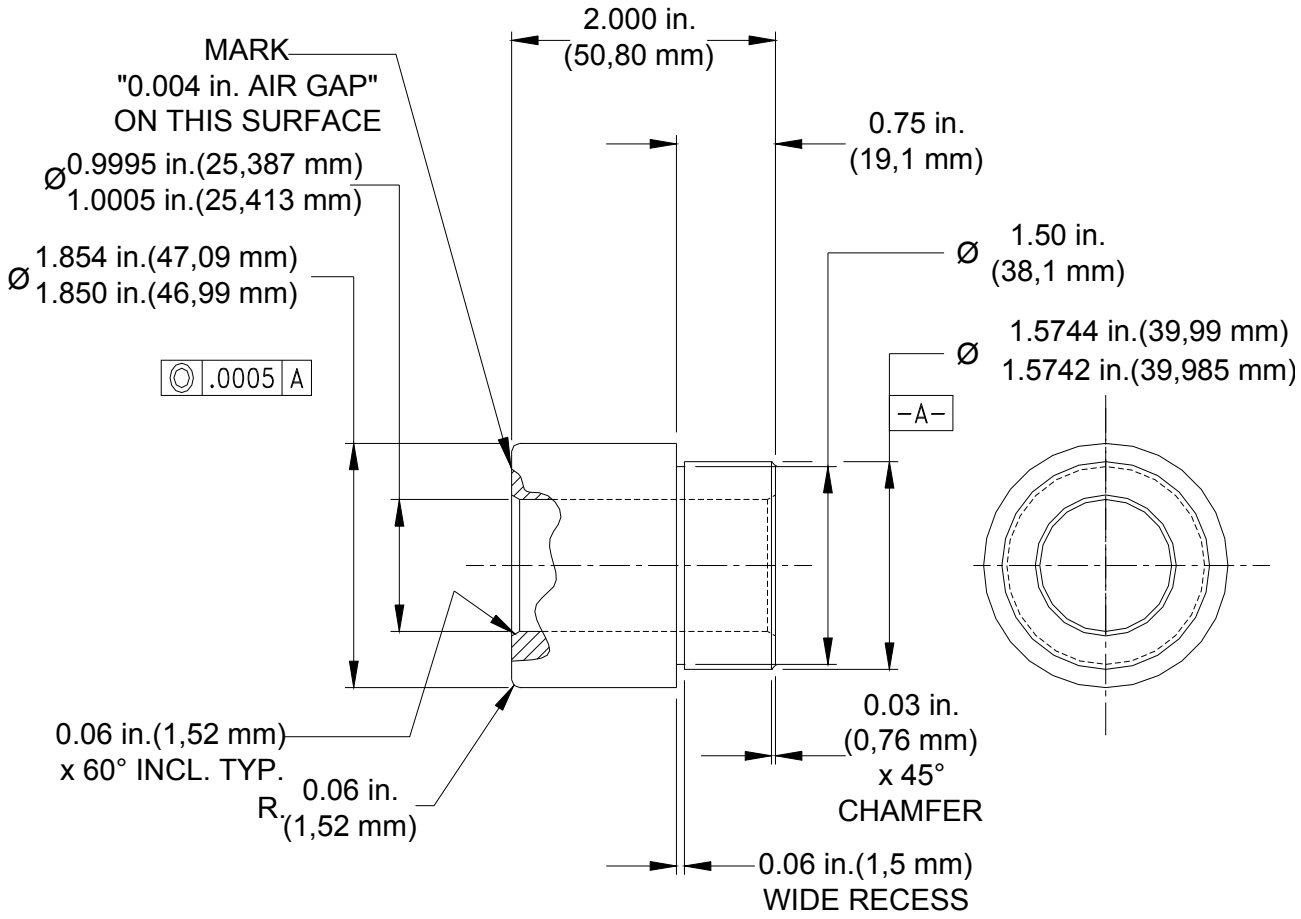


Figure 9008 - Speed Pickup Adjustment Plug

I. Bearing and Brush Support Assembly Support (See Figure 9009)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 5×0'. Material is 01 tool steel or equivalent.

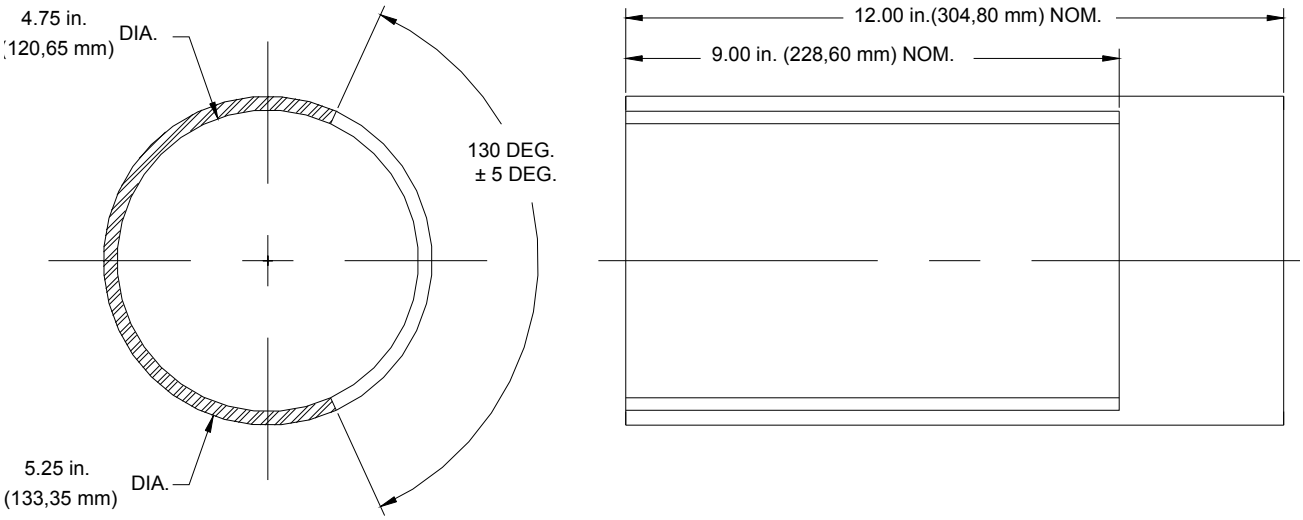


Figure 9009 - Bearing and Brush Support Assembly Support

J. Armature Support (See Figure 9010)

Material is any suitable hardwood.

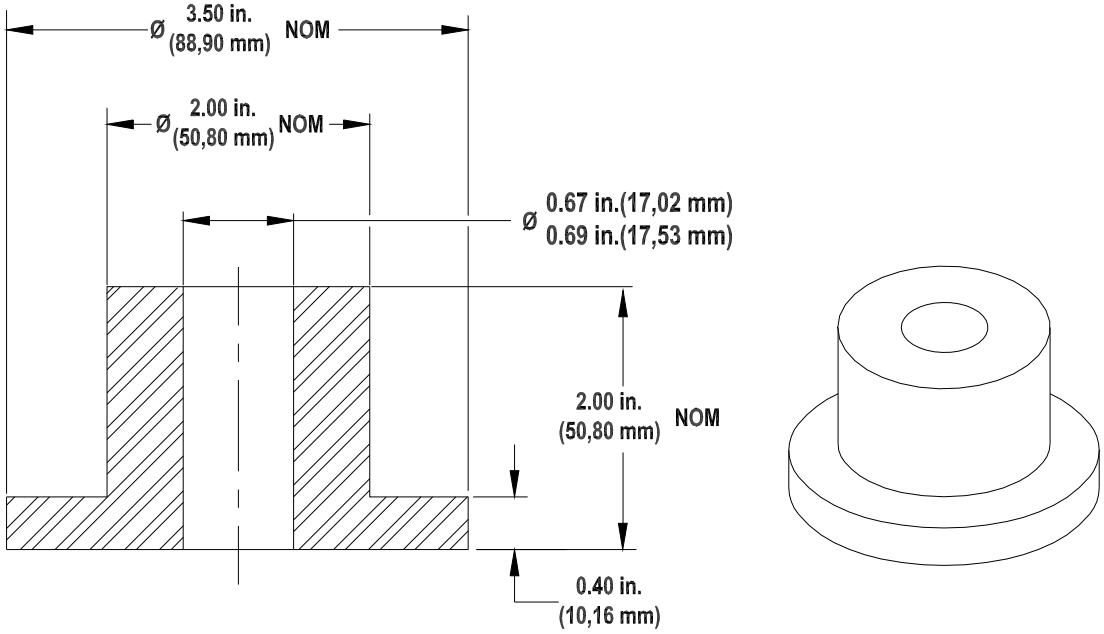


Figure 9010 - Armature Support

K. Anti-Drive End Bearing Hub Support (See Figure 9011)

Tolerances on decimals 0.XX ± 0.01 inch (0,25 mm), 0.XXX ± 0.005 inch (0,127 mm). Machined ends to be parallel to within 0.001 inch and square with sidewalls within ±0.05 degree. Material is 1040 Steel hardened to Rc 35 - 40, Stock size: 2.33 inch diameter

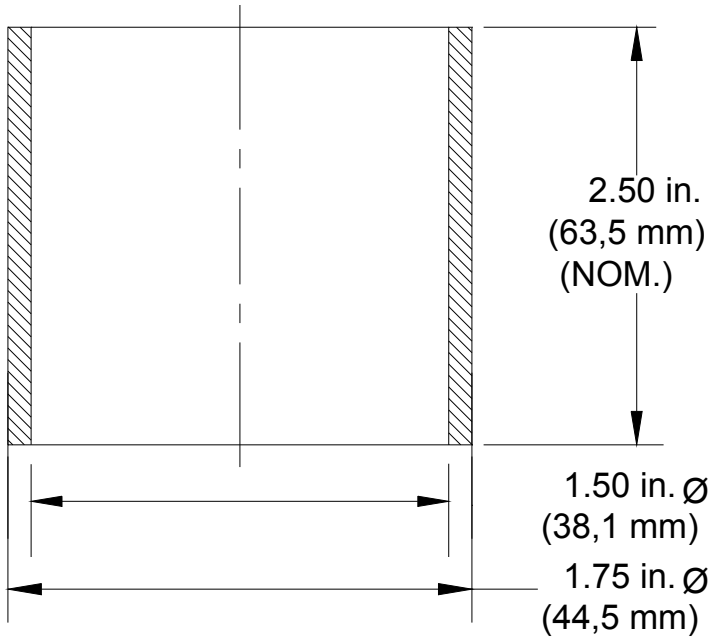


Figure 9011 - Anti-Drive End Bearing Hub Support

L. Drive End Bearing Hub Support (Outboard) (See Figure 9012)

Tolerances on decimals 0.XX ± 0.01 inch (0,25 mm), 0.XXX ± 0.005 inch (0,127 mm). Machined ends to be parallel to within 0.001 inch (0,025 mm) and square with sidewalls within ±0.05 degree. Angles ±2°0'. Material is 1040 Tool Steel hardened to Rc 35 - 40, Stock size: 2.50 inch (63,5 mm) diameter.

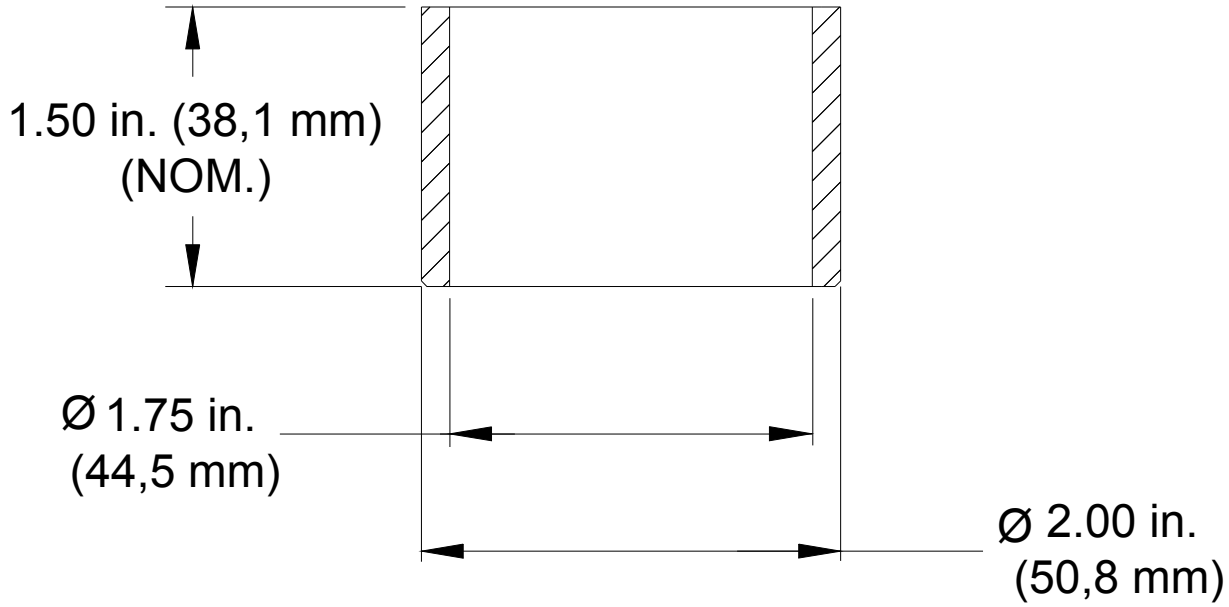


Figure 9012 - Drive End Bearing Hub Support (Outboard)

M. Horizontal Stator and Housing Assembly Support Fixture (See Figure 9013)

Material is any suitable hardwood.

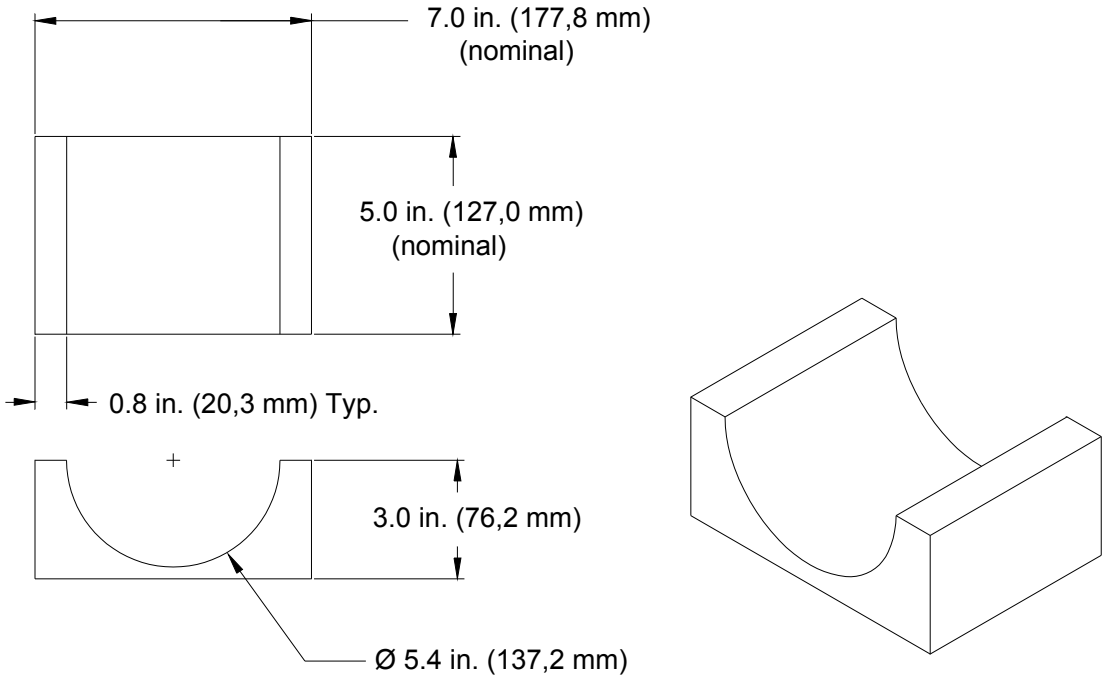


Figure 9013 - Horizontal Stator and Housing Assembly Support Fixture

N. Vertical Stator and Housing Assembly Support Fixture (See Figure 9014)

Material is any suitable hardwood.

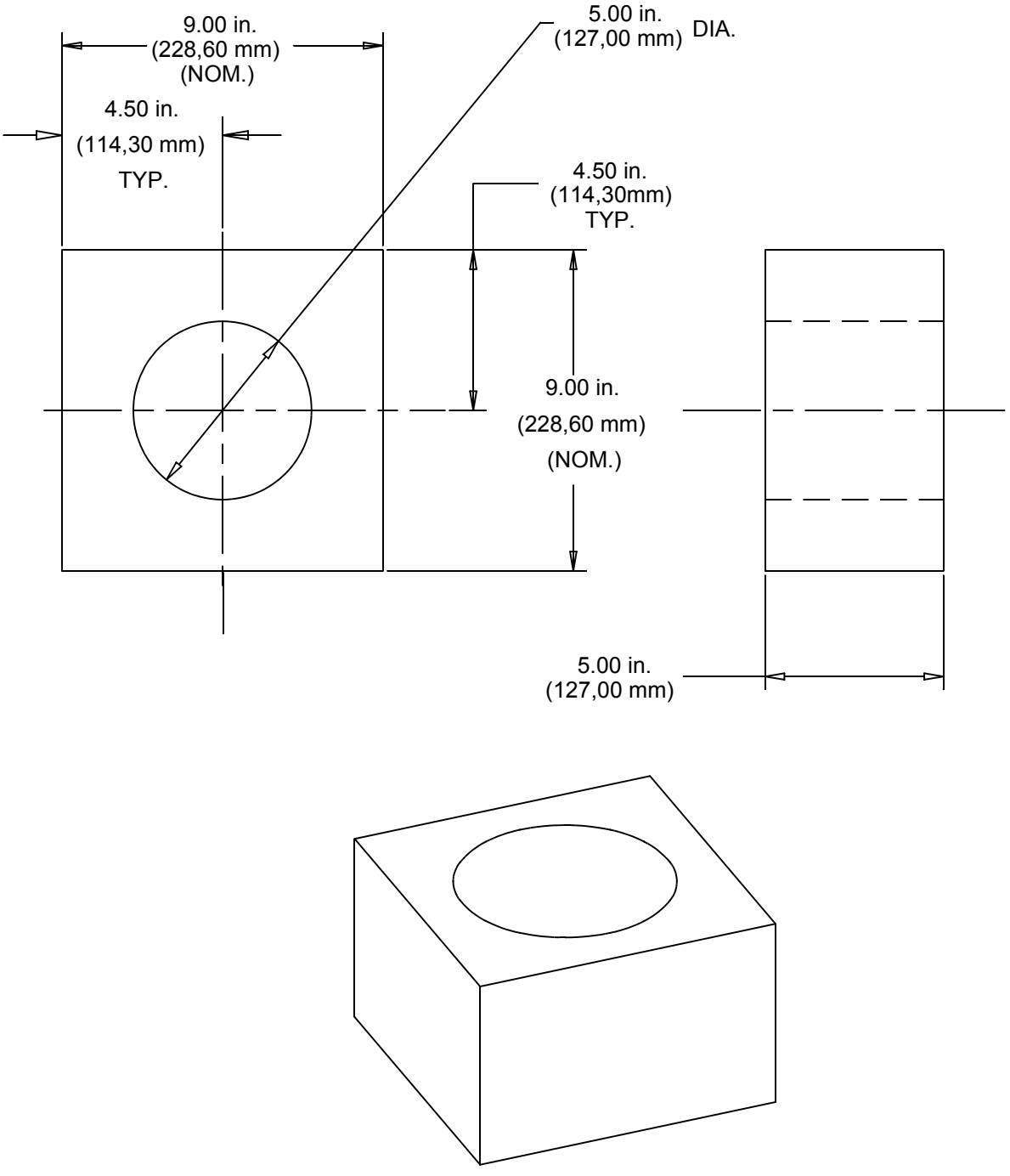
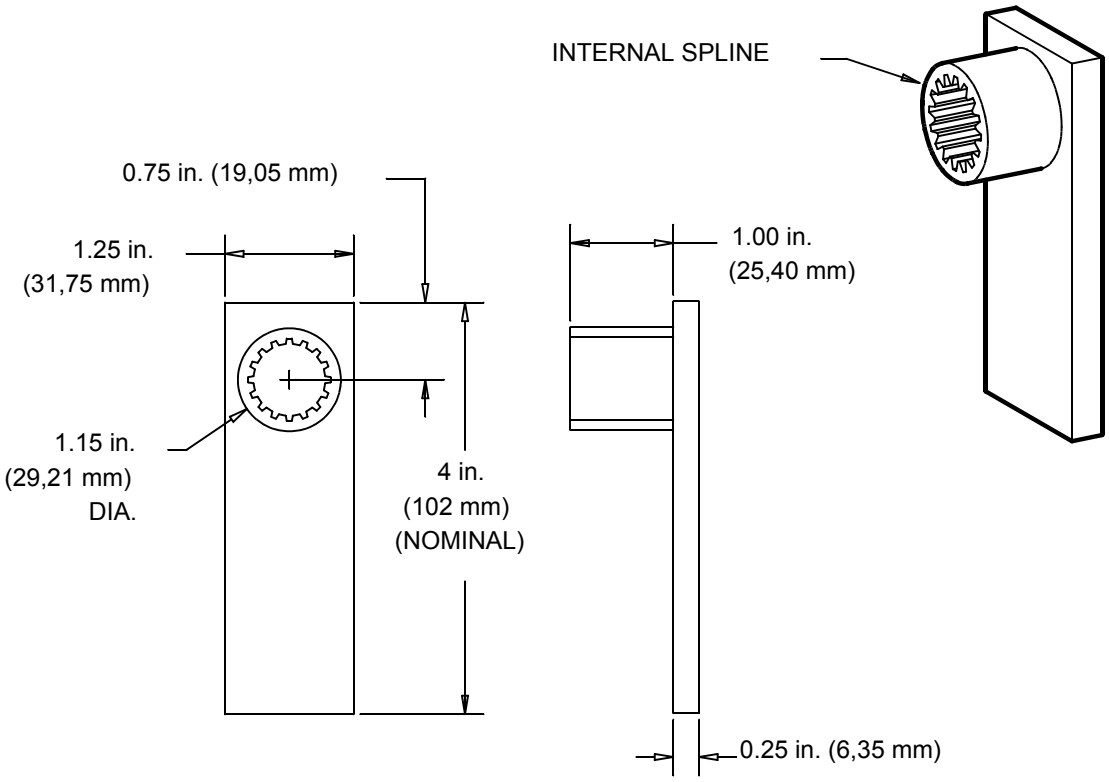


Figure 9014 - Vertical Stator and Housing Assembly Support Fixture

O. Spline Wrench (See Figure 9015)

Unless otherwise specified, dimensions are in inches. Tolerances on decimals are: 0.XX ± 0.01, 0.XXX ± 0.005. Angles are ± 2×0'. Material is 1040 Steel.



12 TOOTH SPLINE

Internal Involute Spline Data Fillet Root Side Fit	inch	mm
Number of Teeth	12	
Diametral Pitch	20/40	
Pressure Angle	30 DEG.	
Pitch Diameter	0.6000	15,240
Minor Diameter (min.)	0.5550	14,097
Major Diameter (min.)	0.6500	16,510
Chord Space (min.)	0.0730	1,853
Pin Diameter	0.0720	1,829
Between three .072 Pins (min.)	0.5095	12,941

Figure 9015 - Spline Wrench

P. Commutator Turning Fixture (See Figure 9016)

Tolerances on decimals 0.XX ± 0.01 inch (0,25 mm), 0.XXX ± 0.005 inch (0,127 mm). Machined ends to be parallel to within 0.001 inch (0,025 mm) and square with sidewalls within ±0.05 degree. Harden steel to Rockwell Rc 35-40. Material: 1040 Steel, Stock size: 2.50 inch (63,5 mm) diameter.

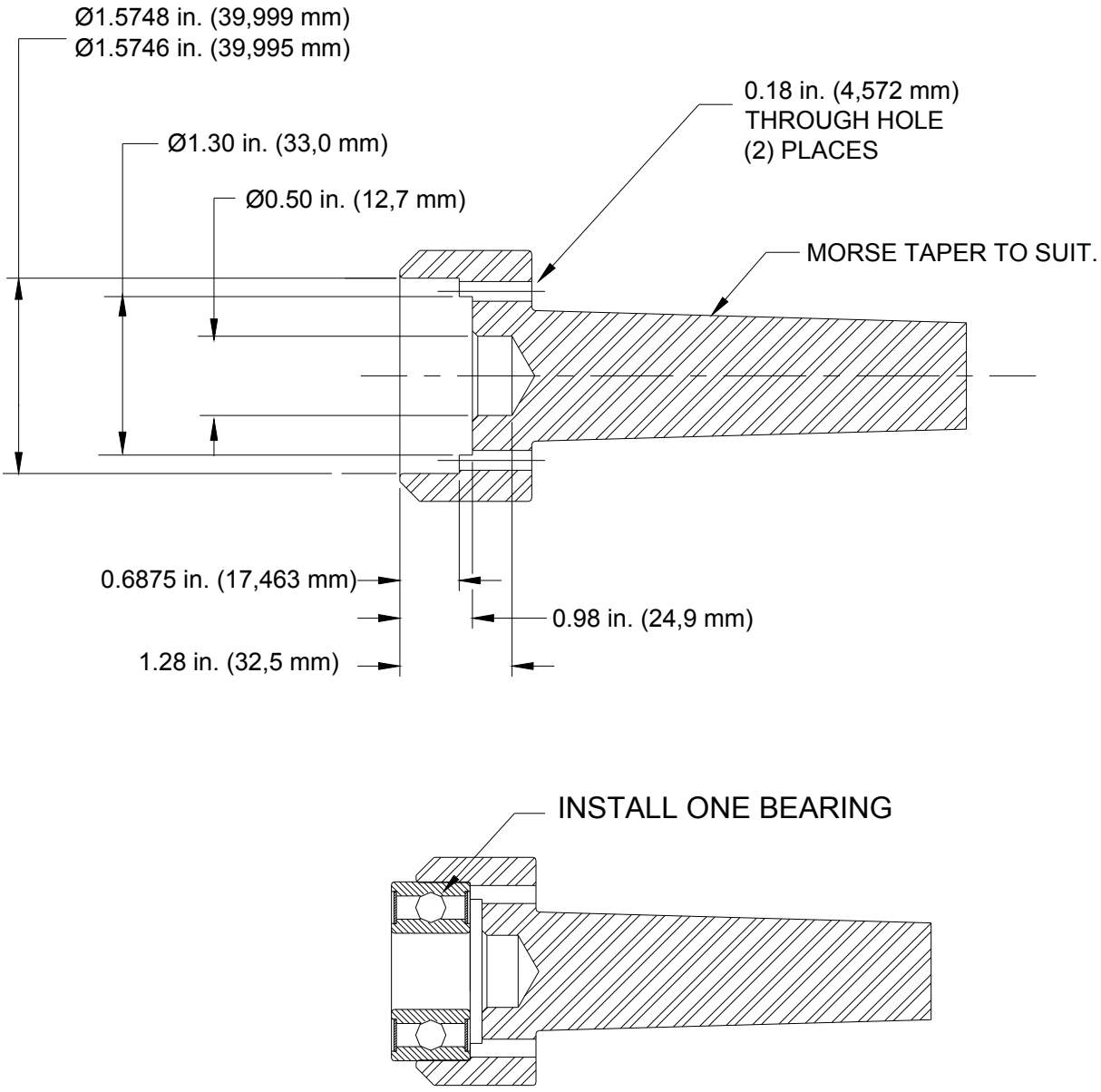


Figure 9016 - Commutator Turning Fixture

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SPECIAL PROCEDURES

1. Introduction

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REMOVAL

1. Introduction

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INSTALLATION

1. Introduction

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SERVICING

1. Introduction

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STORAGE

1. Storage

Materials required to pack the generator for storage or shipment are listed in Table 15001.

Description	Specification	Quantity
Bag, waterproof, vapor-proof	Commercially available. Bag must totally enclose instructions for installation and then be sealed.	1
Bag, waterproof, vapor-proof	Kraft-foil or suitable equivalent. Bag must totally enclose generator and then be sealed.	1
Box - domestic class, single wall, corrugated cardboard.	PPP-B-636 or suitable equivalent. Box must be large enough to totally enclose and restrain bagged and cushioned generator.	1
Box - WC5 overseas shipping container.	PPP-B-636 or suitable equivalent. Box must be large enough to completely enclose domestic class packaging.	1
Cardboard Tubing	Commercially available	AR
Chemically Neutral Protective Paper	Commercially available	AR
Grease	MIL-PRF-81322	AR
Packing Material - shock absorbing foam rubber, styrofoam, bubble wrap, or expanded foam. (Safran Power's recommended method: 3 inch (76,2 mm) thick minimum expanded foam surrounding machine on all sides.)	Commercially available	AR
Polyethylene (Plastic) Wrap	Commercially available	AR
Tag	Commercially available	1 (Domestic) 2 (Internat'l)
Tape - waterproof, pressure sensitive.	Commercially available	AR

Table 15001 - Packaging Material

A. General Information

CAUTION: IF MACHINE STORAGE TIME IS MORE THAN 24 MONTHS WITH NO USE, IT IS RECOMMENDED THAT ITS BEARINGS BE REPLACED. IT MUST THEN BE RE-TESTED ACCORDING TO TESTING AND FAULT ISOLATION SECTION BEFORE BEING PLACED INTO SERVICE.

(1) Unit must have successfully completed tests specified in TESTING AND FAULT ISOLATION section of this manual before preparing unit for shipment or storage.

(2) Record following information to tag(s):

- Model Number
- Serial Number
- Mod Status
- Test Date (PASSED)
- Packing date

(3) Use packaging materials as specified in Table 15001.

B. Documentation

Include all applicable documentation with unit:

- Testing Records
- Repair Reports
- Final Inspection/Check Records
- Packing List and Certificate of Conformance

C. Domestic Packaging

(1) If machine includes drive shaft with O-ring (10001-270)/oil sealing provision, place O-ring (10001-270) into a small plastic bag and attach to machine.

(2) Apply lubricating grease to drive spline according to MIL-PRF-81322 and wrap it in protective paper according to MIL-B-121A, Grade A, Type II.

(3) Place unit and desiccant into a waterproof and vapor-proof heat-seal bag and partially heat-seal it while forcing as much air as possible from bag.

(4) Insert vacuum tube into bag to draw remaining air out of bag.

(5) Withdraw vacuum tube quickly and complete heat-sealing of bag.

(6) Using machine's original shipping container if possible, place bagged machine into box surrounded with a minimum of 3 inch (76,2 mm) thick shock absorbing, cushioning material on all six sides.

(7) Securely and completely seal all flapped openings of box with tape.

(8) Tape tag to exterior surface of box. Make sure all information is visible.

D. Overseas Shipment On Surface Vessels

(1) Accomplish domestic packaging of machine in accordance with Paragraph C.

(2) Place domestically packaged model into WC5 shipping container.

(3) Securely and completely, seal all flapped openings of shipping container with tape.

(4) Tape tag to exterior surface of shipping container. Make sure all information is visible.

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REWORK

1. Introduction

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ILLUSTRATED PARTS LIST

1. Introduction

This section contains a listing of assemblies and detail parts for 23081 Series I models. All parts are listed, except for parts which lose their identities by being permanently fastened to other parts or are part of an assembly not subject to disassembly. Each list is arranged in disassembly sequence, except that attaching parts are listed immediately after the parts they attach, under the heading of (ATTACHING PARTS).

All replacement parts are manufactured or source-controlled by Safran Power with the exceptions listed in Paragraph 2.B.

WARNING: ANY USE OF PARTS, MATERIALS OR PROCEDURES NOT AUTHORIZED BY SAFRAN POWER FOR MAINTENANCE OR OVERHAUL OF UNIT(S) CAN AFFECT CONTINUED AIRWORTHINESS OR INVALIDATE CERTIFICATION.

To order authorized Safran Power parts, contact your regional Safran Power Customer Service Center.

2. Arrangement of Parts List

A. Figure and Item Number

The figure number indicates the figure where the part is illustrated. Each item number corresponds to a part illustrated in the applicable figure. Several item numbers can have a letter following a number (e.g. 10 A). This indicates that the part has the same function and location as the base number (e.g. 10), but can be different in form and material. An item number that is preceded by a dash (e.g. -30) is not illustrated in the applicable figure.

B. Part Number

The part numbers listed in this column are the only authorized parts for replacement and overhaul of the models. Part numbers in this IPL consists mainly of Safran Power part numbers, and does include Military Standard (MS), Army Navy (AN), National Aerospace Standard (NAS) and industry standard (ANSI, ASME, ISO, etc.) part numbers unless a Commercial and Government Entity (CAGE) code appears in the Nomenclature column. Refer to Paragraph 3. for details.

C. Nomenclature

The proper name and type of each part is provided in this column. The description of each item is indented by columns to indicate the relationship to the next higher assembly. The number of indentures and bullets depicts the relationship of the item to the associated next higher assembly as follows:

(1) The description of each item is indented by columns to indicate the relationship to the next higher assembly (NHA). Each listed item is placed in the NOMENCLATURE column one indenture (one dot) to the right of the assembly to which it belongs. Items at equal indentures are all components of a single assembly or subassembly. The number of indentures and bullets depicts the relationship of the item to the associated next higher assembly as follows:

1 2 3 4 5
Assembly, level 1, no bullets
Detail Parts for Assembly, level 2, 1 bullet
Sub-Assembly, level 3, 2 bullets
Attaching Parts for Sub-Assembly, level 4, 3 bullets
Detail Parts for Sub-Assembly, level 5, 4 bullets

The interchangeability relationship between parts is identified in the NOMENCLATURE column of the parts list. A list of the terms used to show interchangeability and their definition is as follows:

Term	Parts List Abbreviation	Definition
Alternate	ALT:	One of the two part numbers may be used. If the part number in the Nomenclature Column is NOT specified as 'ALT', it may not be used as an alternate. The information is for reference only or as a way to help identify the part.
Modification	MOD	Modification (MOD) status details information about effectivity of parts in regard to upgrades and modifications. Alpha variants (A through Y) (but I, O, Q, S, X, and Z) are assigned to existing model numbers when necessary.
Order separately		Part is not furnished as part of the generator.
Superseded	SUPSD BY	Part number listed is obsolete and must be replaced by the new part listed at the next repair. A superseded part is not to be installed or reinstalled.
Supersedes	SUPSDS	Part number listed must replace the obsolete part number at the next repair.
Replaced by	REPLD BY	Part number listed is discontinued and should be replaced by the new part number. Original part may be for use until current stock is depleted and then must be replaced by the new part listed.
Replaces	REPLS	Part listed replaces and is interchangeable with the item number shown in the notation.

D. Units Per Assy. Column

The numbers listed in this column indicate the quantity of parts used per assembly at the location shown and are not necessarily the total quantity per unit. For bulk items, the abbreviation AR is used to indicate the part quantity is "as required". The abbreviation NP indicates non-procurable and refers to items which are not procurable and can not be ordered. The abbreviation RF indicates that the item is listed for reference only.

E. Effectivity Code Column

This column establishes part relationships with the models, which are essentially the same, but have minor variations. These models are the end items on the detailed parts list and are assigned reference letters such as A, B, C, D, etc. Subassemblies or detail parts, which are not common to all configurations, but are associated with one or more of the coded end items, carry the letter or letters assigned to the end item(s) with which they are associated. When parts are used on all models, the column is left blank. Effectivity codes are redefined for each major subassembly figure.

3. Vendors

A. Manufacturer's Code

In the case of an item supplied by a vendor and not listed under the prime manufacturer's part number, a vendor CAGE code is prefixed by the capital letter V appearing in the nomenclature column. This CAGE code number designates the original manufacturer of non-Safran Power components, and is in accordance with Cataloging Hand Books H4-1, H4-2, and H4-3. CAGE codes are listed in the NOMENCLATURE column, except for the government codes below, which are not listed:

V80205	National Aircraft Standard (prefix NAS)
V81349	Military Specifications (prefix M)
V88044	Army/Navy Standard (prefix AN)
V96906	Military Standard (prefix MS)

The Customer Support division in your region is to be contacted for parts dispatch.

Vendor Code	Manufacturer's Name and Address

NOTE: Spec 200/2000, automated ordering users, refers to the EXCLUSIVE DISTRIBUTOR section in the front of this manual when ordering parts identified with V19527, Safran Power.

V3CPE0	Safran Power USA Twinsburg Technical Publications 8380 Darrow Road, Twinsburg, Ohio, USA

B. General Information

(1) Model numbers followed by an asterisk (*) are not supplied with a QAD kit, but can require a QAD kit for aircraft installation. See item 10 for applicable QAD kits that can be ordered separately.

(2) Model 23081-001 = Model 23081-002 and QAD kit P/N 23032-506. Model 23081-002 can still be purchased separately but does not include a QAD kit.

(3) Model 23081-003 = Model 23081-004 and QAD kit P/N 23032-507. Model 23081-004 can still be purchased separately but does not include a QAD kit.

(4) Model 23081-007 = Model 23081-008 and QAD kit P/N 23032-506. Model 23081-008 can still be purchased separately but does not include a QAD kit.

(5) Model 23081-011 = Model 23081-012 and QAD kit P/N 23032-507. Model 23081-012 can still be purchased separately but does not include a QAD kit.

(6) Model 23081-011-1 = Model 23081-012-1 and QAD kit P/N 23032-507. Model 23081-012-1 can still be purchased separately but does not include a QAD kit.

(7) Model 23081-017 = Model 23081-018 and QAD kit P/N 23032-506. Model 23081-018 can still be purchased separately but does not include a QAD kit.

(8) Model 23081-022 = Model 23081-023 and QAD kit P/N 23032-506. Model 23081-023 can still be purchased separately but does not include a QAD kit.

(9) Model 23081-022A = Model 23081-023A and QAD kit P/N 23032-506. Model 23081-023A can still be purchased separately but does not include a QAD kit.

(10) Model 23081-042 = Model 23081-043 and QAD kit P/N 23032-506. Model 23081-043 can still be purchased separately but does not include a QAD kit.

(11) Model 23081-069 = Model 23081-070 and QAD kit P/N 23032-506. Model 23081-070 can still be purchased separately but does not include a QAD kit.

(12) Models 23081-024, 23081-057, 23081-059 and 23081-073 are not supplied with a QAD kit. QAD kit P/N 23032-507 is required for installation and can be ordered separately.

(13) P/N 23081-1570 air inlet painted white can be used as an alternate for the 23081-1575 air inlet, when used on the Model 23081-018.
*Brush P/N 23081-1833 or 23081-1854 must not be used with these air inlets because the air inlets and the brush are both non-insulated.

(14) P/N 23081-1571 air inlet painted white can be used as an alternate for the 23081-1576 air inlet, when used on the Model 23081-018.
*Brush P/N 23081-1833 or 23081-1854 can only be used with these air inlets because the air inlets are insulated.

(15) Brush P/N 23081-1833 must not be used with this air inlet because the air inlet and the brush are both non-insulated.

(16) Brush P/N 23081-1833 can only be used with this air inlet because the air inlet is insulated.

(17) Models 23081-009 and 23081-010 have been deleted from this CMM.

(18) P/N 23032-1827 Stator can only be used to replace the 23032-351 Stator on the model 23081-018 if it is painted white.

(19) If the original TSO, ETSO or non TSO/ETSO plate is damaged, replace with (blank) plates that match the production information labels. See Table 10001.

(a) Information plates must be replaced with a replacement information plate that meets the criteria of the manufactured location:

1 Non-TSO/ETSO plates are for models produced that do not have FAA/TSO and EASA/ETSO.

2 TSO plates are for models produced under FAA/TSO.

3 ETSO plates are for models produced under EASA/TSO. These plates are only for models with a “P####” serial number.

(b) If a replacement plate is used, data must be transferred from the original plate to the replacement plate.

(c) For models that were converted using a service bulletin, follow the instructions in the service bulletin for what information plate to use.

Model(s)	Non TSO/ETSO Plate (Blank)	TSO Plate (Blank)	Original TSO Plate (For Ref.)	ETSO Plate
23081-001, -002	06-0017-01	06-0022-00	06-0022-01	06-201132
23081-003, -004			06-0022-04	06-201131
23081-007, -008			06-0022-24	None
23081-011, -012			06-0022-02	06-201131
23081-011-1, -012-1	None		06-0022-09	06-201132
23081-017, -018	06-0017-01		06-0022-21	06-201132
23081-022, -023			06-0022-22	06-201131
23081-022A, -023A, -024		None	None	None
23081-042, -043	None	06-0022-00	06-0022-10	06-201132
23081-056			06-0022-43	06-201134
23081-057		None	None	None
23081-059		06-0022-00	06-0022-44	06-201132 or 06-201144
23081-063			06-201117	06-201152
23081-069, -070			06-0022-46	06-201131
23081-072, -073		None	None	06-201152
23081-078		None	None	None

Table 10001 - TSO and ETSO Information Plate Usage

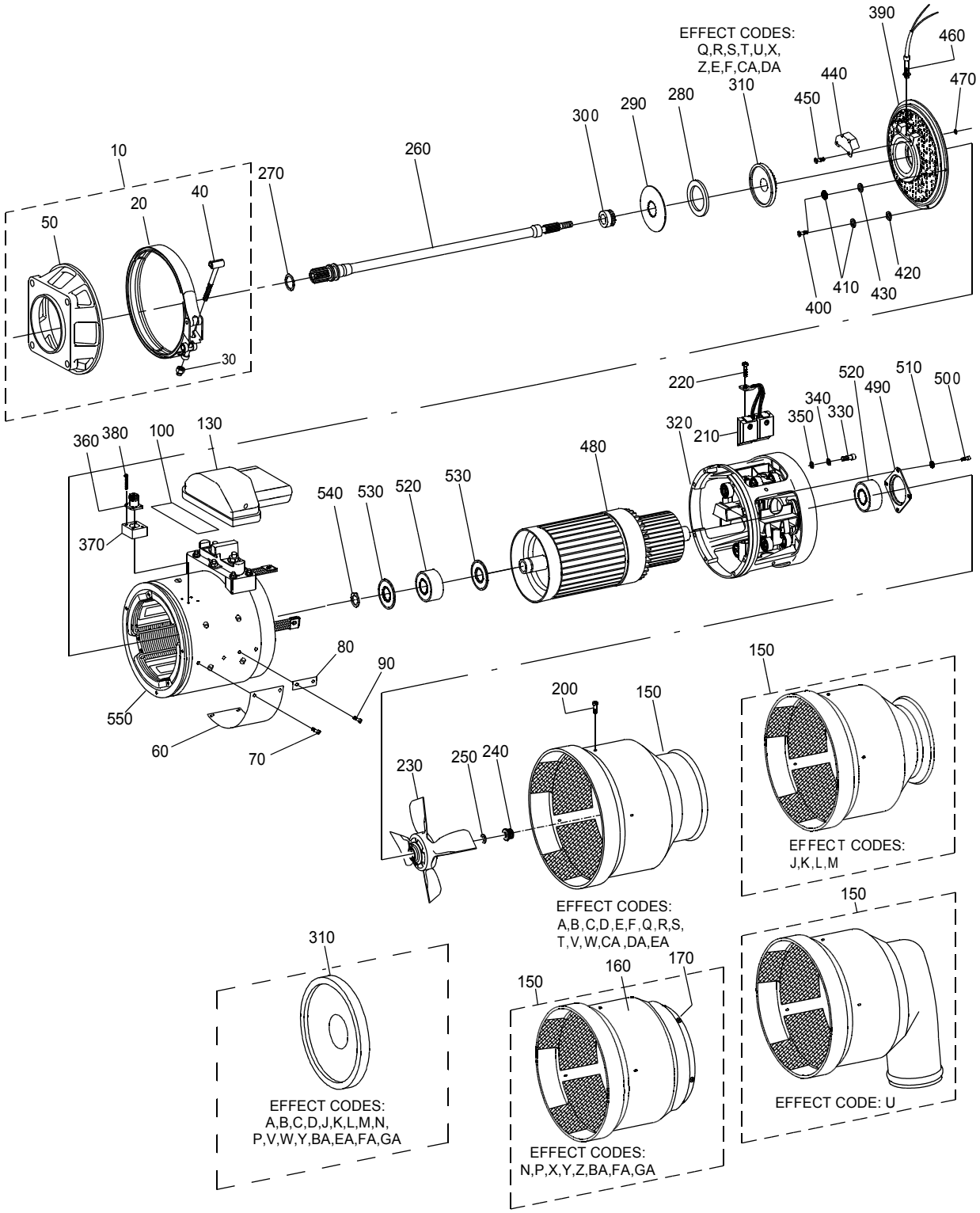

Figure 10001 - DC Starter-Generator / DC Generator Assembly, 23081 Series I

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
	23081-001	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(2) (Quick-Attach-Detach, QAD)	A	RF
	23081-002*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(2)	B	RF
	23081-003	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(3) (Quick-Attach-Detach, QAD)	C	RF
	23081-004*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(3)	D	RF
	23081-007	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(4) (Quick-Attach-Detach, QAD)	E	RF
	23081-008*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(4)	F	RF
	23081-009	• DELETED . . . . . . See Paragraph 3.B.(17)		RF
	23081-010*	• DELETED . . . . . . See Paragraph 3.B.(17)		RF
	23081-011	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(5) (Quick-Attach-Detach, QAD)	J	RF
	23081-011-1	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(6) (Quick-Attach-Detach, QAD)	K	RF
	23081-012*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(5)	L	RF
	23081-012-1*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(6)	M	RF
	23081-017	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(7) (Quick-Attach-Detach, QAD)	N	RF
	23081-018*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(7)	P	RF
	23081-022	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(8) (Quick-Attach-Detach, QAD)	Q	RF
	23081-022A	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(9) (Quick-Attach-Detach, QAD)	R	RF

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
	23081-023*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(8)	S	RF
	23081-023A*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(9)	T	RF
	23081-024*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(12)	U	RF
	23081-042	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(10) (Quick-Attach-Detach, QAD)	V	RF
	23081-043*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(10)	W	RF
	23081-056*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(1)	X	RF
	23081-057*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(12)	Y	RF
	23081-059*	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(12)	Z	RF
	23081-063	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(1)	BA	RF
	23081-069	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(11) (Quick-Attach-Detach, QAD)	CA	RF
	23081-070	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(11)	DA	RF
	23081-072	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(1)	EA	RF
	23081-073	• DC STARTER-GENERATOR . . . . . . See Paragraph 3.B.(12)	FA	RF
	23081-078*	• DC GENERATOR . . . . . . See Paragraph 3.B.(1)	GA	RF
10	23032-506	• KIT, Q.A.D. Mounting . . . . . . (Quick-Attach-Detach, QAD) (Kit Components)	ABEFN PQRS TVWX BA CA DA EA GA	1
	23032-507	• KIT, Q.A.D. Mounting . . . . . . (Quick-Attach-Detach, QAD) (Kit Components)	CDJK L MUYZ FA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
20	23032-1586	• • COUPLING, V-Retainer		1
		(ATTACHING PARTS)		
30	MS21045-L3	• • • NUT, Hex Self-locking . . . . . REPLD BY MS21045-3		1
	MS21045-3	• • • NUT, Hex Self-locking . . . . . REPLS MS21045-L3		1
40	23032-2800	• • • T-BOLT.		1
		---------- * ----------		
50	23032-2452	• • ADAPTER, Q.A.D. Mounting	ABEFN PQRS TVWX BA CA DA EA GA	1
	23032-2453	• • ADAPTER, Q.A.D. Mounting	CDJKL MUYZ FA	1
60	06-209264	• PLATE, Identification, Replacement . . REPLD BY 06-209285	ABCD EFJLN PQRS TUVW	1
	06-209286	• PLATE, Identification, Replacement . . REPLD BY 06-209285	KM	1
	06-209285	• PLATE, Identification, Replacement . . REPLS 06-209264 REPLS 06-209286	ABCD EFJKL MNPQ RSTU VW	1
	06-209285	• PLATE, Identification, Replacement . .	XYZ BA CA DA EA FA	1
	06-209289	• PLATE, Identification, Replacement . .	GA	1
		(ATTACHING PARTS)		
70	MS21318-14	• SCREW, Drive. . . . . SUPSD BY MS21318-13	ABCD EFJKL MNPQ RSTU VW	RF
	MS21318-13	• SCREW, Drive. . . . . SUPSDS MS21318-14	ABCD EFJKL MNPQ RSTU VW	4

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
70 (Cont'd)	MS21318-13	• SCREW, Drive.	XYZ BA CA DA EA FA GA	4
		---------- * ----------		
80	06-0022-00	• INFORMATION PLATE, ... Replacement, TSO (Blank) See Paragraph 3.B.(19)	ABCDJ KLMNP QSVWX Z CA DA	1
	06-0017-01	• INFORMATION PLATE, ... Replacement (Blank) See Paragraph 3.B.(19)	EF	1
	06-0017-01	• INFORMATION PLATE, ... Replacement (Blank) See Paragraph 3.B.(19)	NPQRS TU	1
	06-201117	• INFORMATION PLATE, ... Replacement, TSO See Paragraph 3.B.(19)	BA	1
	06-201128	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19) SUPSD BY 06-201152	BA	RF
	06-201128	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19) SB 23081-04X-24-02 SUPSD BY 06-201152	EA	RF
	06-201128	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19) SB 23081-057-24-01 SUPSD BY 06-201152	FA	RF
	06-201131	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19)	CDJLQ S CA DA	1
	06-201132	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19)	ABKMN PVWZ	1
	06-201134	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19)	X	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
80 (Cont'd)	06-201144	• INFORMATION PLATE, ... Replacement, ETSO/TSO See Paragraph 3.B.(19)	Z	1
	06-201152	• INFORMATION PLATE, ... Replacement, ETSO/TSO See 3.B.(19) SUPSDS 06-201128 SB 23081-0XX-24-06	BA EA FA	1
		(ATTACHING PARTS)		
90	MS21318-14	• SCREW, Drive. . . . . REPLD BY MS21318-13	ABCDE FJKLMN PQRST UVW	2
	MS21318-13	• SCREW, Drive. . . . . REPLS MS21318-14	ABCDE FJKLM NPQRS TUVW	2
	MS21318-13	• SCREW, Drive.	XYZ CA DA	2
		---------- * ----------		
100	06-201020	• DECAL, Caution, Hi-Pot		1
-110	06-123301	• LABEL, FAA-PMA	Y	1
-120	06-201100	• LABEL, Modification Status.	ABCDE FJKLMN PQRST UVWXY Z BA CA DA EA FA	RF
130	23076-1200	• COVER, Terminal Block . . . . . ALT: 23076-1200-1	XZ CA DA	1
	23069-1240	• COVER, Terminal Block . . . . . REPLD BY 23076-1200	QRST	1
	23076-1200	• COVER, Terminal Block . . . . . ALT: 23076-1200-1 REPLS 23069-1240	QRST	1
	23069-1240	• COVER, Terminal Block	EFJKL MU	1
		(ATTACHING PARTS)		
-140	05-350108	• SCREW, Flat Head	QRST	RF
	05-350108	• SCREW, Flat Head	JKLM	2

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
-140 (Cont'd)	NAS1189-06P14L	• SCREW, Flat Head . . . . . . ALT: 05-350108	U	2
	NAS1189-06P14L	• SCREW, Flat Head . . . . . . ALT: 05-350108	EF	2
		---------- * ----------		
150	23081-1090	• INLET, Air	CDVW	1
	23081-1090	• INLET, Air . . . . . . For non-MOD D models See Paragraph 3.B.(15) **CAUTION: MUST NOT BE USED WITH BRUSH P/N 23081-1833**	AB	1
	23081-1092	• INLET, Air . . . . . MOD D SB 23081-002-24-01 See Paragraph 3.B.(16) Used with Brush P/N 23081-1833	AB	1
	23081-1090	• INLET, Air	QS	1
	23081-1091	• INLET, Air . . . . . . REPLD BY 23081-1570 **CAUTION: MUST NOT BE USED WITH BRUSH P/N 23081-1833 or 23081-1854**	NP	1
	23081-1570	• INLET ASSEMBLY, Air . . . . . . REPLS 23081-1091 REPLD BY 23081-1575, 23081-1571, or 23081-1576 See Paragraph 3.B.(13) **CAUTION: MUST NOT BE USED WITH BRUSH P/N 23081-1833 or 23081-1854**	NP	1
	23081-1575	• INLET ASSEMBLY, Air . . . . . . REPLS 23081-1091 REPLS 23081-1570 See Paragraph 3.B.(13) **CAUTION: MUST NOT BE USED WITH BRUSH P/N 23081-1833 or 23081-1854**	NP	1
	23081-1571	• INLET ASSEMBLY, Air . . . . . MOD D REPLS 23081-1091 REPLS 23081-1570 SB 23081-018-24-02 See Paragraph 3.B.(14) Used with Brush P/N 23081-1833 or 23081-1854	NP	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
150 (Cont'd)	23081-1576	• INLET ASSEMBLY, Air . . . . . MOD D REPLS 23081-1091 REPLS 23081-1570 SB 23081-018-24-02 See Paragraph 3.B.(14) Used with Brush P/N 23081-1833 or 23081-1854	NP	1
	23081-1092	• INLET, Air . . . . . . SB 23081-023-24-05	RT	1
	23081-1092	• INLET, Air	CA	1
	23081-1092	• INLET, Air . . . . . . SB 23081-04X-24-02	EA	1
	23081-1092	• INLET, Air . . . . . . SB 23081-056-24-01	DA	1
	23081-1400	• INLET, Air	JKLM	1
	23081-1430	• INLET, Air . . . . . . REPLD BY 23081-1670	EF	1
	23081-1470	• INLET, Air	U	1
	23081-1670	• INLET, Air . . . . . . REPLD BY 23081-1570 REPLS 23081-1430	EF	1
	23081-1570	• INLET ASSEMBLY, Air . . . . . . REPLD by 23081-1571	X	1
	23081-1570	• INLET ASSEMBLY, Air . . . . . . REPLS 23081-1430 REPLS 23081-1670 REPLD BY 23081-1090	EF	1
	23081-1090	• INLET, Air . . . . . . REPLS 23081-1430 REPLS 23081-1670 REPLS 23081-1570	EF	1
	23081-1571	• INLET ASSEMBLY, Air	YZ FA	1
	23081-1571	• INLET ASSEMBLY, Air . . . . . . REPLS 23081-1570	X	1
	23081-1576	• INLET ASSEMBLY, Air	BA GA	1
160	23081-1560	• • INLET, Air . . . . . . Subassembly	NPXYZ BA FA GA	1
170	23081-1660	• • SCREEN, Hexagonal	NPXYZ BA FA GA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
-180	MS16535-246	• • RIVET, Aluminum Alloy	NPXYZ BA FA GA	6
-190	AN960JD6L	• • WASHER, Flat . . . . . ALT: NAS1149DN616J	XYZNP BA FA	12
	NAS1149DN616J	• • WASHER, Flat . . . . . ALT: AN960JD6L	XYZNP BA FA GA	12
		(ATTACHING PARTS)		
200	05-346371	• SCREW, Binding Head		4
		---------- * ----------		
210	30300-1380	• BRUSH . . . . . SUPSD BY 30300-1383	AB	RF
	30300-1380	• BRUSH . . . . . SUPSD BY 30300-1383, 23081-1833 or 23081-1834	NP	RF
	30300-1383	• BRUSH	U	4
	30300-1343	• BRUSH . . . . . SUPSD BY 30300-1383	KM	RF
	30300-1383	• BRUSH . . . . . SUPSDS 30300-1343 SB 23081-01	KM	4
	30300-1383	• BRUSH . . . . . SUPSDS 30300-1380 Original factory supplied brush. See 23081-1833/-1834 for MOD C or D	AB	4
	30300-1383	• BRUSH . . . . . SUPSDS 30300-1380 Original factory supplied brush. See 23081-1833/-1834 for MOD C or D	NP	4
	30300-1383	• BRUSH . . . . . Original factory supplied brush. See 23081-1834 for MOD C	VW	4
	23081-1802	• BRUSH	CA DA	4
	23081-1802	• BRUSH . . . . . SUPSDS 23081-1810	X	4
	23081-1802	• BRUSH . . . . . SUPSD BY 23081-1810	RT	RF
	23081-1803	• BRUSH	Y	4

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
210 (Cont'd)	23081-1810	• BRUSH . . . . . .MOD B SUPSDS 23081-1802 SB 23081-023-24-05	RT	4
	23081-1810	• BRUSH . . . . . . SUPSD BY 23081-1812	Z	RF
	23081-1810	• BRUSH . . . . . . SUPSD BY 23081-1802	X	RF
	23081-1812	• BRUSH . . . . . . SUPSDS 23081-1810	Z	4
	30300-1380	• BRUSH . . . . . . SUPSD BY 23081-1850	CDEFJ LQS	RF
	23081-1850	• BRUSH . . . . . MOD C SUPSDS 30300-1380 SB 23081-0XX-24-07 SB 23081-004-24-01	CDEFJ LQS	4
	23081-1830	• BRUSH . . . . . . SUPSD BY 23081-1831	BA	RF
	23081-1831	• BRUSH . . . . . . SUPSDS 23081-1830	BA	4
	23081-1831	• BRUSH . . . . . . SB 23081-04X-24-02 REPLD BY 23081-1854	EA	4
	23081-1854	• BRUSH . . . . . .MOD A REPLS 23081-1831 SB 23081-072-24-01	EA	4
	23081-1831	• BRUSH . . . . . . SB 23081-057-24-01 REPLD BY 23081-1854	FA	4
	23081-1854	• BRUSH . . . . . MOD D REPLS 23081-1831 SB 23081-073-24-01	FA	4
	23081-1834	• BRUSH . . . . . MOD C SUPSDS 30300-1380 SB 23081-002-24-01 Field use only	AB	4
	23081-1833	• BRUSH . . . . . MOD D SUPSDS 30300-1380 SB 23081-002-24-01 Field use only Used with 23081-1092 and 23081-303 **CAUTION: USED ONLY WITH AN INSULATED AIR INLET**	AB	4

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
210 (Cont'd)	23081-1834	• BRUSH . . . . . MOD C SUPSDS 30300-1380 SUPSD BY 23081-1851 SB 23081-018-24-02 Field use only	NP	RF
	23081-1851	• BRUSH . . . . . .MOD E SUPSDS 23081-1834 SB 23081-018-24-02 Field use only	NP	4
	23081-1833	• BRUSH . . . . . MOD D SUPSDS 30300-1380 SUPSD BY 23081-1854 SB 23081-018-24-02 Field use only Used with 23081-1571/-1576 and 23081-307/-303 **CAUTION: USED ONLY WITH AN INSULATED AIR INLET**	NP	RF
	23081-1854	• BRUSH . . . . . .MOD F SUPSDS 23081-1833 SB 23081-018-24-02 Field use only Used with 23081-1571/-1576 and 23081-307/-303 **CAUTION: USED ONLY WITH AN INSULATED AIR INLET**	NP	4
	23081-1834	• BRUSH . . . . . MOD C SB 23081-043-24-01 SB 23081-04X-24-02 SIL 23081-043-24-01 Field use only	VW	4
	23081-1854	• BRUSH . . . . . . **CAUTION: USED ONLY WITH AN INSULATED AIR INLET**	GA	4
		(ATTACHING PARTS)		
220	05-340201	• SCREW, Binding Head		4
		---------- * ----------		
230	23085-1121	• DELETED	ABCD	RF
	23081-1121	• FAN ASSEMBLY . . . . . . REPLD BY 23065-1770	ABCD	1
	23065-1770	• FAN	EFJKL MNPV WY BA EA FA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
230 (Cont'd)	23065-1770	• FAN . . . . . REPLS 23081-1121	ABCD	1
	23065-1770	• FAN . . . . . REPLD BY 23065-1870	QRSTU	1
	23065-1870	• FAN . . . . . Note: The fan 23065-1870 cannot be used with armature 23081-1010.	XZ CADA	1
	23065-1870	• FAN . . . . . Note: The fan 23065-1870 cannot be used with armature 23081-1010. REPLS 23065-1770	QRSTU	1
	23065-1877	• FAN	GA	1
		(ATTACHING PARTS)		
240	MS21042-4	• NUT, Self-locking.	ABCDX YZ BA CA DA EA FA GA	1
	02-4107-01	• NUT, Self-locking. . . . . REPLD BY MS21042-4 SIL 23703	EFJKLM NPQRS TUVW	1
	MS21042-4	• NUT, Self-locking. . . . . REPLS 02-4107-01 SIL 23703	EFJKLM NPQRS TUVW	1
250	AN960-416	• WASHER, Flat	ABCDE FJKLMN PQRS TUVWX Z BA CA DA EA	1
	NAS1149F0463P	• WASHER, Flat . . . . . ALT: AN960-416	Y FA	1
	NAS1149F0463P	• WASHER, Flat	GA	1
		---------- * ----------		
260	23081-1150	• SHAFT, Drive . . . . . SIL 23081-0XX-01	ABEFN PQRST X BA CA DA	1
	23081-1151	• SHAFT, Drive . . . . . SIL 23081-0XX-01	CDJKL MU	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
260 (Cont'd)	23081-1155	• SHAFT, Drive . . . . . . SIL 23081-0XX-01	Y EAFA	1
	23081-1155	• SHAFT, Drive . . . . . . SB 23081-02 SIL 23081-0XX-01	VW	1
	23081-1159	• SHAFT, Drive	Z	1
	23081-1149	• SHAFT, Drive	GA	1
270	MS29561-113	• O-RING . . . . . . REPLD BY M83248/1-113	ABEFN PQS	1
	M83248-1-113	• O-RING . . . . . . TRUE P/N M83248/1-113 REPLS MS29561-113	ABEFN PQS	1
	M83248-1-113	• O-RING . . . . . . TRUE P/N M83248/1-113	RTVWX YZ BA CA DA EA FA	1
	AS3209-113	• O-RING	GA	1
280	02-5600-05	• RING, Friction . . . . . . SUPSD BY 02-5600-13 **CAUTION: CAN CONTAIN ASBESTOS.**	ABCDE FJKLMN PQSUV W	RF
	02-5600-13	• RING, Friction . . . . . . SUPSDS 02-5600-05 SIL 02-5600	ABCDE FJKLMN PQSU VW	1
	02-5600-13	• RING, Friction	RTXYZ BA CA DA EA FA GA	1
290	23032-1910	• PLATE, Dampener		1
300	23032-1901	• HUB, Dampener		1
310	23032-2711	• BACK PLATE, Dampener	ABCDJ KLMNP VWY BA EA FA GA	1
	23081-1530	• BACK PLATE AND GEAR, Dampener .	QRSTU XZ CA DA	1
	23032-2980	• BACK PLATE AND GEAR, Dampener . REPLD BY 23081-1530 (Use with 23081-320 only)	EF	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
310 (Cont'd)	23081-1530	• BACK PLATE AND GEAR, Dampener . REPLS 23032-2980 (Use with 23081-1500 only)	EF	1
320	23081-300	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLD BY 23081-301	ABJL	1
	23081-300	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLD BY 23081-305	CD	1
	23081-301	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-300 REPLD BY 23081-303	AB	1
	23081-301	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLD BY 23081-303	EFKMQ SUVW	1
	23081-301	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-300 REPLD BY 23081-303	JL	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) SB 23081-023-24-05	RT	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS)	XZ CA DA	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-301 REPLS 23081-300 SB 23081-002-24-01	AB	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-301	EFKM QSU	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
320 (Cont'd)	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-301 SIL 23081-043-24-01	VW	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-301 REPLS 23081-300	JL	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) ALT: 23081-301 REPLD BY 23081-307 SB 23081-018-24-02	NP	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) REPLD BY 23081-306	Y	1
	23081-303	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) SB 23081-04X-24-02	EA	1
	23081-305	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) REPLS 23081-300	CD	1
	23081-306	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . .MOD A (SEE Figure 10002 FOR DETAILS) ALT: 23081-309 for MOD A	Y	1
	23081-307	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS)	BA GA	1
	23081-307	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . (SEE Figure 10002 FOR DETAILS) ALT: 23081-303 for MOD D REPLS 23081-303 REPLS 23081-301 SB 23081-018-24-02	NP	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
320 (Cont'd)	23081-309	• BEARING AND BRUSH SUPPORT ASSEMBLY . . . . . MOD C (SEE Figure 10002 FOR DETAILS) ALT: 23081-306 . . . . . MOD B ALT: 23081-303 . . . . . .MOD A SB 23081-057-24-01 (ATTACHING PARTS)	FA	1
330	05-341310	• SCREW, Socket Head	ABCDE FJKLMN PQRST UVWXZ BA CA DA EA GA	8
	05-341310	• SCREW, Socket Head . . . . . . (Used with 23081-303 only) Replaced by MS16995-30	Y, FA	8
	MS16995-30	• SCREW, Socket Head . . . . . . (Use with 23081-306 and -309 only) Replaces 05-341310 ALT: 05-341306	Y, FA	8
340	MS35338-42	• WASHER, Spring Lock	ABCDE FJKLMN PQRST UVWXY Z BA CA DA FA GA	8
	MS35338-42	• WASHER, Spring Lock . . . . . . REPLD BY MS51848-8	EA	8
	MS51848-8	• WASHER, Spring Lock . . . . . . REPLS MS35338-42 (ALT: NAS1676-8)	EA	8
350	05-370232	• WASHER, Flat	ABCDJ KLMNP QRSTU VWXYZ BA CA DA EA FA GA	8
	05-370232	• WASHER, Flat	EF	6
		---------- * ----------		
360	MS3112E8-3P	• CONNECTOR, Receptacle	EFQRS TUXZ CA DA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
370	23072-1350	• SPACER . . . . . . REPLD BY 23072-1313	EFQR ST	1
	23072-1313	• SPACER . . . . . . REPLS 23072-1350	EFQR ST	1
	23072-1313	• SPACER	UXZ CA DA	1
		(ATTACHING PARTS)		
380	MS35265-19	• SCREW, Machine Drilled Fillister Head	QRST UXZ CADA	4
	MS35265-19	• SCREW, Machine Drilled Fillister Head REPLD BY MS35265-20	EF	4
	MS35265-20	• SCREW, Machine Drilled Fillister Head REPLS MS35265-19	EF	4
		---------- * ----------		
390	23032-2216	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLD BY 23032-2212	Y	1
	23032-2212	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details)	ABCDJ KLMVW EA FA	1
	23032-2212	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLS 23032-2216	Y	1
	23032-2212	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLD BY 23032-2217	NP	1
	23081-320	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLD BY 23081-1500 (Use with 23032-2980 only)	EF	1
	23081-1500	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) SB 23081-023-24-05	RT	1
	23081-1500	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details)	QSUXZ CA DA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
390 (Cont'd)	23081-1500	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLS 23081-320 (Use with 23081-1530 only)	EF	1
	23032-2217	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details)	BA GA	1
	23032-2217	• BEARING SUPPORT ASSEMBLY, ... Drive End (See Figure 10003 for details) REPLS 23032-2212	NP	1
		(ATTACHING PARTS)		
400	MS16997-33	• SCREW, Cap Head Socket.		8
410	MS35338-42	• WASHER, Spring Lock		8
420	05-370176	• WASHER, Flat	ABCDE FJKLMN PQRS TUVW BA EA GA	6
	05-370176	• WASHER, Flat	XYZ CA DA FA	8
430	MS35333-38	• WASHER, Tooth Lock	ABCDE FJKLMN PQRS TUVW BA EA GA	2
		---------- * ----------		
440	23081-1210	• GUARD, Speed Pickup . . . . . . SB 23081-023-24-05	QSRT	1
	23081-1210	• GUARD, Speed Pickup	XZ CA DA	1
		(ATTACHING PARTS)		
450	MS35206-228	• SCREW, Machine, Pan Head . . . . . . REPLD BY MS35206-213	QRST	2
	MS35206-213	• SCREW, Machine, Pan Head . . . . . . REPLS MS35206-228 SB 23081-023-24-05	QRST	2

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
450 (Cont'd)	MS35206-213	• SCREW, Machine, Pan Head	XZ CA DA	2
		---------- * ----------		
460	23072-1280	• PICKUP, Speed . . . . . REPLD BY 23072-1400 SIL 23072-1400-01	EFU	1
	23072-1280	• PICKUP, Speed . . . . . ALT: 23072-1281 REPLD BY 23072-1281	QS	1
	23072-1281	• PICKUP, Speed . . . . . REPLS 23072-1280 REPLD BY 23072-1400 SB 23081-023-24-04	QS	1
	23072-1281	• PICKUP, Speed . . . . . REPLD BY 23072-1400	RT	1
	23072-1400	• PICKUP, Speed . . . . . REPLS 23072-1280 SIL 23072-1400-01	EFU	1
	23072-1400	• PICKUP, Speed . . . . . REPLS 23072-1281 SB 23081-023-24-05 SIL 23072-1400-01	RT	1
	23072-1400	• PICKUP, Speed . . . . . REPLS 23072-1280 and -1281 SIL 23072-1400-01	QS	1
	23072-1400	• PICKUP, Speed	XZ CA DA	1
470	MS35489-1	• GROMMET	EFQR STUXZ CA DA	1
480	23081-1010	• ARMATURE . . . . . Note: The Armature 23081-1010 must only be used with Fan 23065-1770. REPLD BY 23081-1011	QS	RF
	23081-1011	• ARMATURE . . . . . REPLS 23081-1010	QS	1
	23081-1011	• ARMATURE	RTUXY Z CA DA FA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
480 (Cont'd)	23081-1011	• ARMATURE . . . . . . ALT: 23081-1010	ABCDE FJKLM NPVW BA EA	1
	23081-1014	• ARMATURE	GA	1
490	23081-1440	• RETAINER, Bearing . . . . . . REPLD BY 23081-1080 Note: Not to be used with a fan.	EFQRS T	RF
	23081-1080	• RETAINER, Bearing . . . . . . REPLS 23081-1440 ALT: 23081-1081	EFQRS T	1
	23081-1080	• RETAINER, Bearing	BACA DA	1
	23081-1080	• RETAINER, Bearing . . . . . . ALT: 23081-1081	ABCDJ KLMNP UVWXY Z EA FA	1
	23081-1082	• RETAINER, Bearing	GA	1
		(ATTACHING PARTS)		
500	MS35265-45	• SCREW, Machine Drilled, Fillister Head	ABCDE FJKLMN PQRST UVWXY Z BA CA DA EA FA	4
	MS35265-46	• SCREW, Machine Drilled, Fillister Head	GA	4
510	MS35338-42	• WASHER, Spring Lock		4
		---------- * ----------		
520	07-111140	• BEARING, Ball . . . . . . SUPSD BY 03-6009-07	VW	RF
	07-111140	• BEARING, Ball . . . . . . SUPSD BY 03-6009-19	ABCDE FJKLMN PQSU	RF
	03-6009-07	• BEARING, Ball . . . . . . SUPSDS 07-111140 SUPSD BY 03-6009-18	VW	RF
	03-6009-18	• BEARING, Ball . . . . . .MOD A SUPSDS 07-111140 SUPSDS 03-6009-07 SUPSD BY 03-6009-23 SB 23081-0XX-24-05	VW	RF

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
520 (Cont'd)	03-6009-19	• BEARING, Ball . . . . . .MOD A SUPSDS 07-111140 SUPSD BY 03-6009-23	ABCDE FJKLMN PQSU	RF
	03-6009-19	• BEARING, Ball . . . . . . SUPSD BY 03-6009-23	RT	RF
	03-6009-23	• BEARING, Ball . . . . . .MOD B SUPSDS 07-111140 SUPSDS 03-6009-07 SUPSDS 03-6009-18 SB 23081-0XX-24-05 SIL 03-6009-XX-01	VW	2
	03-6009-23	• BEARING, Ball . . . . . .MOD B SUPSDS 07-111140 SUPSDS 03-6009-19 SB 23081-0XX-24-05 SIL 03-6009-XX-01	ABCDE FJKLMN PQS	2
	03-6009-23	• BEARING, Ball . . . . . .MOD B SUPSDS 07-111140 SUPSDS 03-6009-19 SIL 03-6009-XX-01	U	2
	03-6009-23	• BEARING, Ball . . . . . MOD C SUPSDS 03-6009-19 SB 23081-0XX-24-05 SIL 03-6009-XX-01	RT	2
	03-6009-23	• BEARING, Ball . . . . . . SIL 03-6009-XX-01	XYZ BA CA DA EA FA	2
	03-6009-23	• BEARING, Ball	GA	2
530	23032-1143	• DISC, Baffle		2
540	MS16624-1066	• RING, Retaining		1
550	23032-1827	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	ABCD VWY EA FA	1
	23032-1827	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details) REPLD BY 23032-351	NP	1
	23081-391	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details) REPLD BY 23081-330	QS	1
	23032-351	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	BA	1

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10001-				
550 (Cont'd)	23032-351	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details) REPLS 23032-1827 See Paragraph 3.B.(18)	NP	1
	23081-330	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	XZ CA DA	1
	23081-330	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details) REPLS 23081-391	QS	1
	23081-330	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	RT	1
	23081-390	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	JKLM	1
	23081-391	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	EFU	1
	23032-353	• STATOR AND HOUSING ASSEMBLY . (See Figure 10004 for details)	GA	1

- ITEM NOT ILLUSTRATED

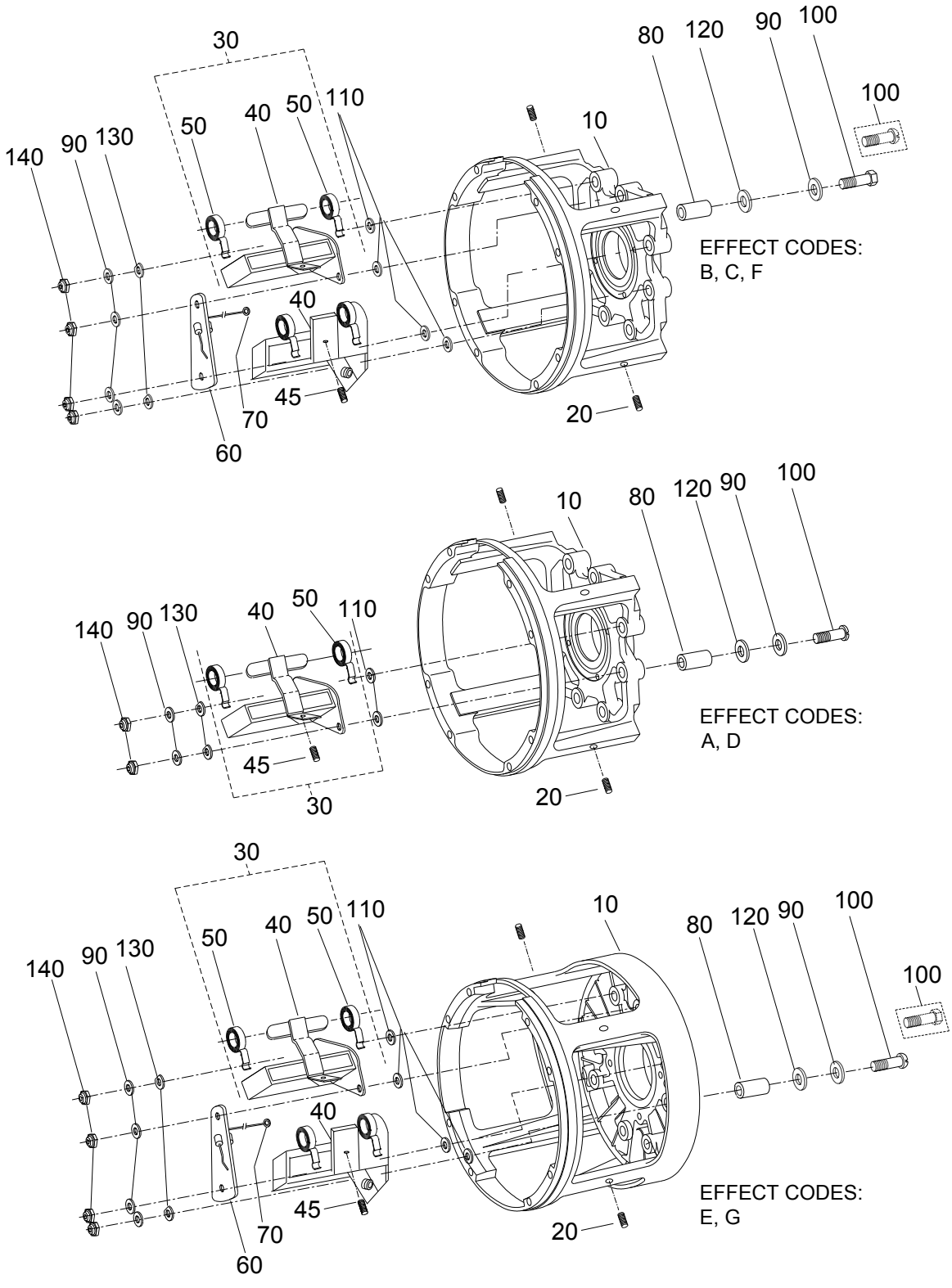

Figure 10002 - Bearing and Brush Support Assembly

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10002-				
	23081-300	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	A	RF
	23081-301	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	B	RF
	23081-303	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	C	RF
	23081-305	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	D	RF
	23081-306	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	E	RF
	23081-307	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	F	RF
	23081-309	SUPPORT ASSEMBLY, Bearing . . . . . and Brush (See IPL Figure 10001 for NHA)	G	RF
10	23081-1050	• END BELL, Anti-Drive End . . . . . REPLD BY 23032-2165	A	1
	23032-2165	• END BELL, Anti-Drive End . . . . . REPLS 23081-1050 REPLD BY 23081-3365	A	1
	23032-2165	• END BELL, Anti-Drive End	B	1
	23081-3365	• END BELL, Anti-Drive End . . . . . REPLS 23081-1050 REPLS 23032-2165	A	1
	23081-3365	• END BELL, Anti-Drive End	CD	1
	23032-3665	• END BELL, Anti-Drive End	F	1
	23081-3320	• END BELL, Anti-Drive End	E	1
	23081-3322	• END BELL, Anti-Drive End	G	1
20	MS21209C0615	• • INSERT, Helicoil	ABCD EF	4
30	23081-1020	• BRUSH HOLDER, Complete . . . . . REPLD BY 23081-1021	AB	4
	23081-1021	• BRUSH HOLDER, Complete . . . . . REPLS 23081-1020	AB	4
	23081-1021	• BRUSH HOLDER, Complete	CDEFG	4

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10002-				
40	23081-1030	• • BRUSH HOLDER . . . . . . Used on 23081-1020		1
	23081-1710	• • BRUSH HOLDER . . . . . . Used on 23081-1021		1
45	MS21209F1-15L	• • • INSERT, Helicoil. . . . . . Used on 23081-1710 with a larger brush screw mounting boss of 0.335 inch (8,5 mm)		1
-45A	NAS1130-3L10D	• • • INSERT, Helicoil. . . . . . Used on 23081-1710 with a smaller brush screw mounting boss of 0.250 inch (6,4 mm)		1
50	23081-1180	• • SPRING, Brush		2
60	23081-350	• ASSEMBLY, Filter Board.	BCEFG	2
70	05-652009	• • LUG, Terminal	BCEFG	1
		(ATTACHING PARTS)		
80	05-631145	• SLEEVE . . . . . . REPLD BY 02-2001-20	AB	8
	02-2001-20	• SLEEVE . . . . . . REPLS 05-631145	AB	8
	02-2001-20	• SLEEVE	CDEFG	8
90	AN960-10L	• WASHER, Flat	ABCD	16
	NAS1149F0332P	• WASHER, Flat . . . . . . ALT: AN960-10L	EFG	16
100	05-346561	• SCREW.	ADEF	8
	05-346561	• SCREW. . . . . . REPLD BY AN3-11A	BC	8
	05-346561	• SCREW. . . . . . REPLD BY AN3-12A	G	8
	AN3-11A	• BOLT, Hex. . . . . . REPLS 05-346561	BC	8
	AN3-12A	• BOLT, Hex. . . . . . REPLS 05-346561 SUPSD BY AN3-11A	G	RF
	AN3-11A	• BOLT, Hex. . . . . . REPLS 05-346561 SUPSDS AN3-12A	G	8
110	05-374094	• WASHER, Flat, Non-Metallic.	A	12
	05-374094	• WASHER, Flat, Non-Metallic.	BCDEFG	8
120	02-4212-15	• WASHER, Flat, Non-Metallic.		8

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10002-				
130	30059-1043	• WASHER, Insulating	ABCEFG	4
	30059-1043	• WASHER, Insulating	D	8
140	MS20364-1032C	• NUT, Self-Locking . . . . . REPLD BY MS21042-3	ABCD	8
	MS21042-3	• NUT, Self-Locking . . . . . REPLS MS20364-1032C REPLD BY MS21042L3	ABCD	8
	MS21042L3	• NUT, Self-Locking . . . . . REPLS MS21042-3	ABCD	8
	MS21042-3	• NUT, Self-Locking . . . . . REPLD BY MS21042L3	EFG	8
	MS21042L3	• NUT, Self-Locking . . . . . REPLS MS21042-3	EFG	8

- ITEM NOT ILLUSTRATED

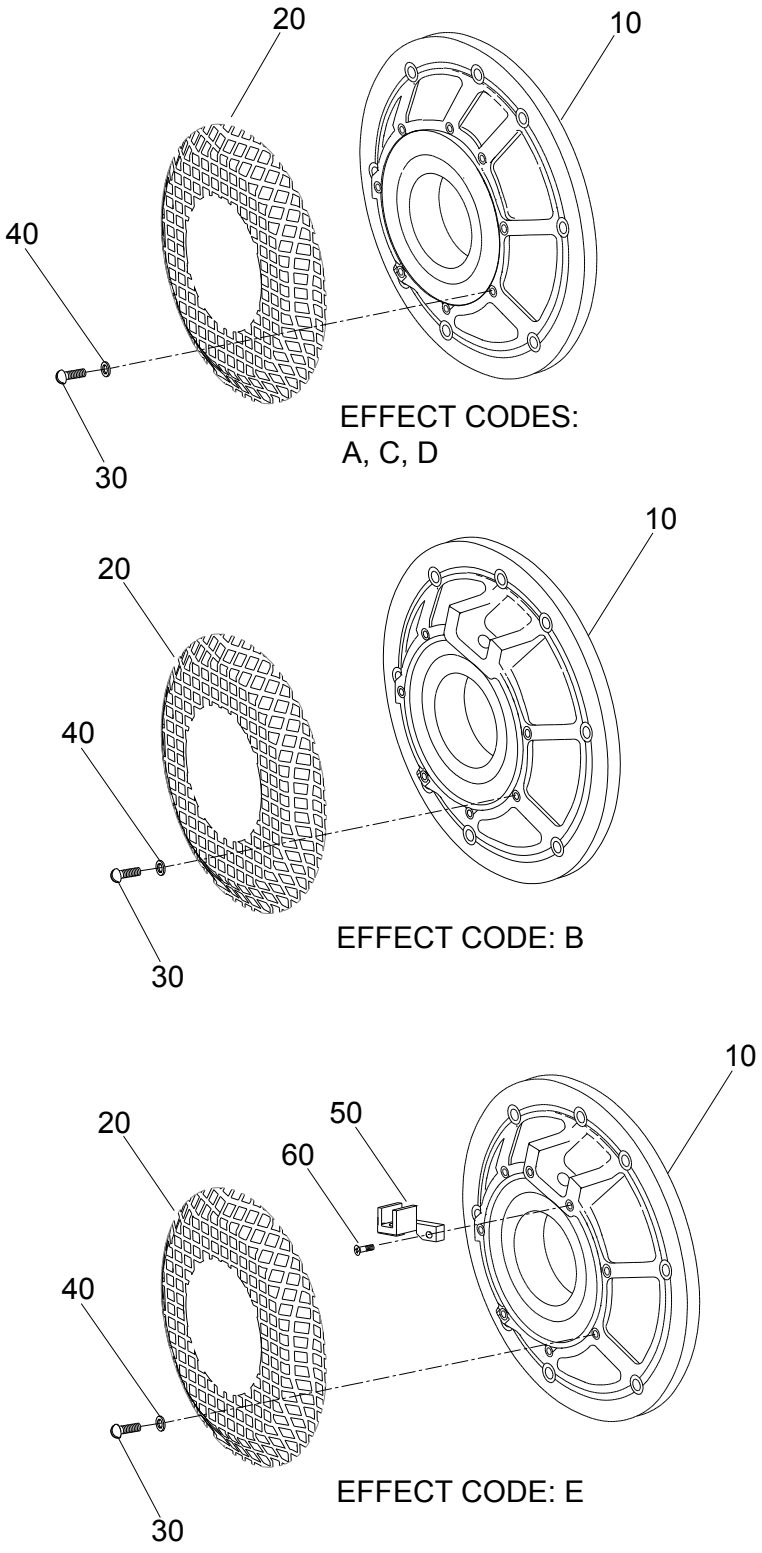

Figure 10003 - Drive End Bearing Support Assembly

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10003-				
	23032-2212	BEARING SUPPORT ASSEMBLY, ... Drive End (See IPL Figure 10001 for NHA)	A	RF
	23081-1500	BEARING SUPPORT ASSEMBLY, ... Drive End (See IPL Figure 10001 for NHA)	B	RF
	23032-2216	BEARING SUPPORT ASSEMBLY, ... Drive End (See IPL Figure 10001 for NHA)	C	RF
	23032-2217	BEARING SUPPORT ASSEMBLY, ... Drive End (See IPL Figure 10001 for NHA)	D	RF
	23081-320	BEARING SUPPORT ASSEMBLY, ... Drive End (See IPL Figure 10001 for NHA)	E	RF
10	23081-1130	• END BELL, Drive End	A	1
	23081-1490	• END BELL, Drive End	B	1
	23081-1131	• END BELL, Drive End	C	1
	23032-3652	• END BELL, Drive End . . . . . REPLD BY 23081-1130	D	1
	23081-1130	• END BELL, Drive End . . . . . REPLS 23081-3652	D	1
	23081-1230	• END BELL, Drive End	E	1
20	23032-2220	• GUARD, Screen	ACD	1
	23081-1510	• GUARD, Screen	B	1
	23081-1250	• GUARD, Screen	E	1
		(ATTACHING PARTS)		
30	MS21318-14	• SCREW, Drive.	BE	4
	MS21318-14	• SCREW, Drive. . . . . Alt: 01-097001	ACD	4
40	05-370169	• WASHER, Flat . . . . . REPLD BY AN960-4L	A	4
	AN960-4L	• WASHER, Flat . . . . . REPLS 05-370169	A	4
	AN960-4L	• WASHER, Flat	BCDE	4

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10003-				
50	23081-1460	• BRACKET, Magnetic Pickup . . . . . . ALT: 23081-1260	E	1
		(ATTACHING PARTS)		
60	MS35190-236	• SCREW.	E	2

- ITEM NOT ILLUSTRATED

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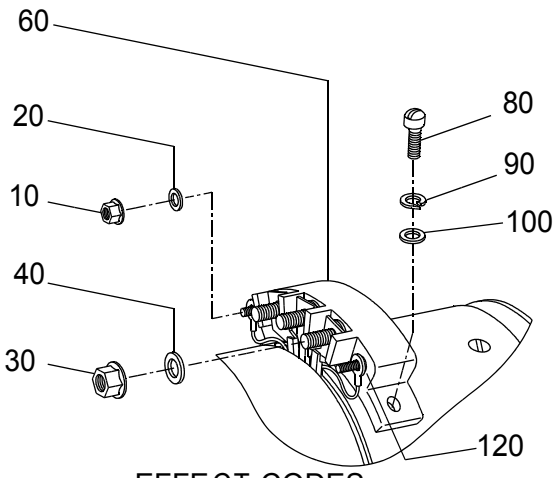
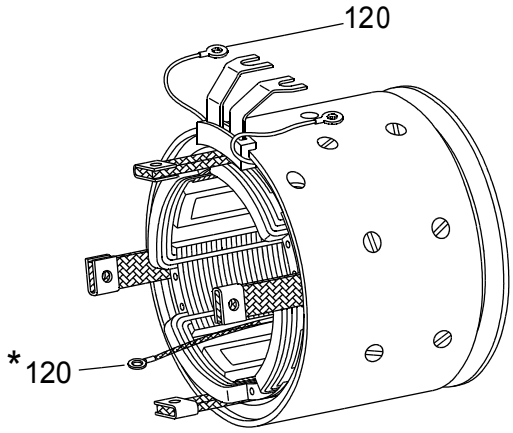
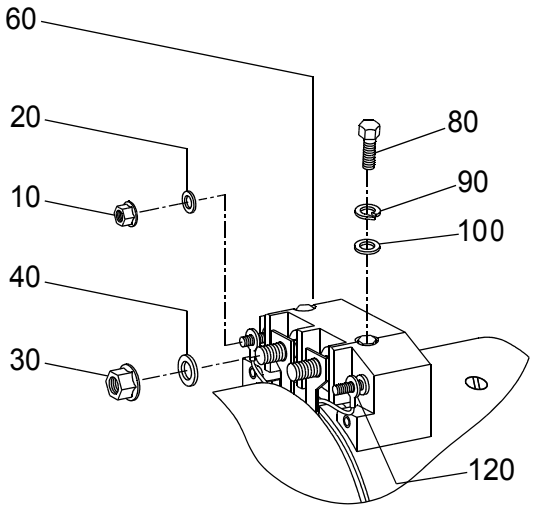


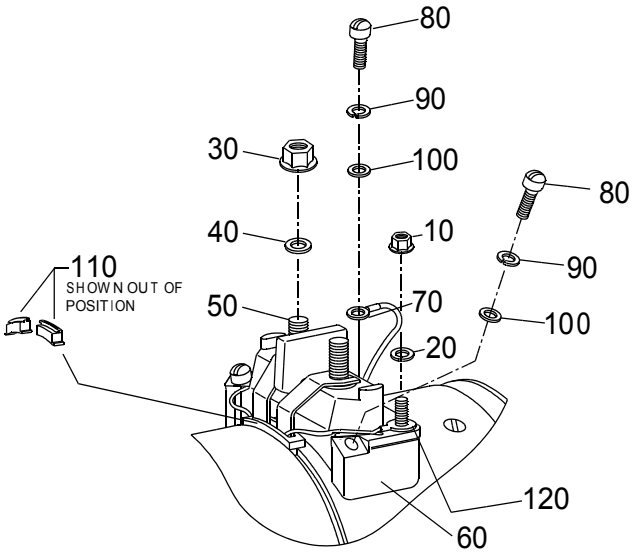
EFFECT CODES:
A, B, F



*PREVIOUS VERSIONS FEATURED A GROUNDING LEAD THAT WAS NOT BUILT INTO THE WINDINGS



EFFECT CODES:
D, E



EFFECT CODE: C

Figure 10004 - Stator and Housing Assembly

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10004-				
	23032-351	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	A	RF
	23032-1827	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	B	RF
	23081-330	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	C	RF
	23081-390	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	D	RF
	23081-391	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	E	RF
	23032-353	STATOR AND HOUSING ASSEMBLY . . . (See IPL Figure 10001 for NHA)	F	RF
10	MS20364B-1032C	• NUT, Self-Locking Reduced Hex. . . . . . REPLD BY MS21042-3	C	2
	MS21043-3	• NUT, Self-Locking Reduced Hex. . . . . . REPLD BY MS21042-3	B	2
	MS21042-3	• NUT, Self-Locking Reduced Hex.	ADEF	2
	MS21042-3	• NUT, Self-Locking Reduced Hex. . . . . . REPLS MS20364B-1032C	C	2
	MS21042-3	• NUT, Self-Locking Reduced Hex. . . . . . REPLS MS21043-3	B	2
20	AN960B10	• WASHER, Flat . . . . . . REPLD BY AN960C10	C	2
	AN961-10T	• WASHER, Flat . . . . . . REPLD BY AN960C10	B	2
	AN960C10	• WASHER, Flat	DE	2
	AN960C10	• WASHER, Flat . . . . . . REPLS AN960B10	C	2
	AN960C10	• WASHER, Flat . . . . . . REPLS AN961-10T	B	2
	NAS1149C0363R	• WASHER, Flat . . . . . . ALT: AN960C10	A	2
	NAS1149C0363R	• WASHER, Flat	F	2
30	MS20364B-624C	• NUT, Self-Locking Reduced Hex. . . . . . REPLD BY MS21042-6	C	2
	MS21043-6	• NUT, Self-Locking Reduced Hex. . . . . . REPLD BY MS21042-6	B	3
	MS21042-6	• NUT, Self-Locking Reduced Hex.	AF	3

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10004-				
30 (Cont'd)	MS21042-6	• NUT, Self-Locking Reduced Hex.	DE	2
	MS21042-6	• NUT, Self-Locking Reduced Hex. . . . . REPLS MS20364B-624C	C	2
	MS21042-6	• NUT, Self-Locking Reduced Hex. . . . . REPLS MS21043-6	B	3
40	AN960B616	• WASHER, Flat . . . . . REPLD BY AN960C616	C	2
	AN961-616T	• WASHER, Flat . . . . . REPLD BY AN960C616	B	3
	AN960C616	• WASHER, Flat	DE	2
	AN960C616	• WASHER, Flat . . . . . REPLS AN961-616T	B	3
	AN960C616	• WASHER, Flat . . . . . REPLS AN960B616	C	2
	NAS1149C0663R	• WASHER, Flat . . . . . ALT: AN960C616	A	3
	NAS1149C0663R	• WASHER, Flat	F	3
50	05-360065	• STUD . . . . . SUPSD BY 02-4082-07	C	RF
	02-4082-07	• STUD . . . . . SUPSDS 05-360065 REPLD BY 02-4089-07	C	2
	02-4089-07	• STUD . . . . . REPLS 02-4082-07 SIL 2015-01	C	2
60	23032-1518	• TERMINAL BLOCK.	AB	1
	23069-1236	• TERMINAL BLOCK.	DE	1
	23081-1310	• TERMINAL BLOCK.	C	1
	23032-1530	• TERMINAL BLOCK.	F	1
70	05-652917	• • LUG, Terminal	C	1
		(ATTACHING PARTS)		
80	AN500A10-12	• SCREW, Fillister Head . . . . . REPLD BY MS35265-65	B	2
	AN500A10-12	• SCREW, Fillister Head . . . . . REPLD BY MS35265-65	C	3
	MS35265-65	• SCREW, Fillister Head	AF	2
	MS35265-65	• SCREW, Fillister Head . . . . . REPLS AN500A10-12	B	2

- ITEM NOT ILLUSTRATED

FIGURE AND ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5	EFFECT CODE	UNITS PER ASS'Y
10004-				
80 (Cont'd)	MS35265-65	• SCREW, Fillister Head . . . . . REPLS AN500A10-12	C	3
	MS16998-33	• SCREW, Socket Head	DE	2
90	AN935-10L	• WASHER, Spring Lock . . . . . SUPSD BY MS35338-43	BC	RF
	MS35338-43	• WASHER, Spring Lock	ADEF	2
	MS35338-43	• WASHER, Spring Lock . . . . . SUPSDS AN935-10L	B	2
	MS35338-43	• WASHER, Spring Lock . . . . . SUPSDS AN935-10L	C	3
100	AN960-10L	• WASHER, Flat . . . . . REPLD BY AN960C10L	B	2
	AN960-10L	• WASHER, Flat . . . . . REPLD BY AN960C10L	C	3
	AN960C10L	• WASHER, Flat . . . . . REPLS AN960-10L	B	2
	AN960C10L	• WASHER, Flat . . . . . REPLS AN960-10L	C	3
	NAS1149C0332R	• WASHER, Flat . . . . . ALT: AN960C10L	A	2
	AN960C10	• WASHER, Flat	DE	2
	NAS1149C0332R	• WASHER, Flat	F	2
110	30059-1029	• GROMMET, Insulator	C	1
120	05-652015	• LUG, Terminal . . . . . Changed Qty from 3 to 2	DE	AR
	05-652015	• LUG, Terminal	AF	2
	05-652028	• LUG, Terminal . . . . . REPLD BY 05-652015	BC	3
	05-652015	• LUG, Terminal . . . . . REPLS 05-652028 Changed Qty from 3 to 2	BC	AR

- ITEM NOT ILLUSTRATED

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