PILATUS AIRCRAFT LTD. CH-6371 STANS, SWITZERLAND

SERVICE LETTER

SUBJECT: GOODRICH POWER SYSTEMS DC STARTER/GENERATOR SERVICE BULLETINS 23085-025-24-1 AND 23085-024-24-01

To all Customers, Operators and Service Centers: Date: Sep 08/08

Electrical Power - DC Starter/Generator Drive Shaft Isolation Model 23085-025 - SB 23085-025-24-01

Electrical Power - DC Starter/Generator Drive Shaft Isolation Model 23085-024 - SB 23085-024-24-01

This Service Letter is issued to draw attention to the Goodrich Power Systems Service Bulletins above.

The Vendor Service Bulletins give instructions for the modification of Starter/Generator Model Numbers 23085-024 (Pilatus P/N 978.91.23.422) and 23085-025 (Pilatus P/N 978.91.23.433) to give an isolated drive shaft, which eliminates Electrical Discharge Damage (EDD). In addition, new bearings are installed as part of the modification to enhance bearing performance. Embodiment of Goodrich Service Bulletins 23085-025-24-01 and 23085-024-24-01 is available from the following Goodrich approved facilities:

- Goodrich Monroe, NC 28110-1313
- Ametek B&S Aircraft Parts and Accessories Ltd.
- API Technologies
- Canadian Aero Accessories Ltd.
- Consolidated Aircraft Supply Co.
- Embraer Aircraft Maintenance Service
- Future Aviation Inc.
- NIACC-AVITECH Technology Inc.
- Muirhead Avionics and Accessories

After embodiment of these Service Bulletins, the Starter/Generator Model numbers change as follows:

- Model -024 becomes -030 (Pilatus P/N 978.91.23.436), as installed on MSN 849 and 864 on delivery.
- Model -025 becomes -029 (Pilatus P/N 978.91.23.435), installed as standard on MSN 791 thru 888.

This Service Letter does not affect Starter/Generator Model 23085-031 (PIL P/N 978.91.23.437) installed on PC-12NG aircraft (MSN 545 and 1001 up). This model Starter/Generator has an isolated drive shaft to eliminate EDD to the engine.

Pilatus recommends the incorporation of these Service Bulletins at the next removal/overhaul of the Starter/Generator as the modification eliminates the potential of Electrical Discharge Damage to the engine. After an aircraft has EDD modified Starter/Generators installed, Pilatus recommends that unmodified Starter/Generators are not used as a replacement.

Operators requiring further information on this subject, please contact one of the addresses given below:

PILATUS AIRCRAFT LTD.,
CUSTOMER SUPPORT MANAGER,
CH-6371 STANS,
SWITZERLAND.

General Aviation
Tel : + 41 41 619 6208
Fax: + 41 41 619 7311
eMail: SupportPC12@pilatus-aircraft.com

PILATUS BUSINESS AIRCRAFT LTD.,
PRODUCT SUPPORT DEPARTMENT,
11755 AIRPORT WAY,
BROOMFIELD, CO 80021.
USA

Tel : 303 465 9099
Fax: 303 465 6040
eMail: Productsupport@PilBal.com

PILATUS AUSTRALIA (Pty.) LTD.,
17 James Schofield Drive,
Adelaide Airport SA 5950,
AUSTRALIA

Tel : +61 (08) 8234 4433
Fax: +61 (08) 8234 4499
Free Call: 1800 445 007
eMail: info@pilatus.com.au

Attachments: Goodrich Power Systems Service Bulletins 23085-025-24-01 and 23085-024-24-01

GOODRICH

SERVICE BULLETIN

Number 23085-024-24-01

ELECTRICAL POWER - DC STARTER-GENERATOR DRIVE SHAFT ISOLATION - CONVERSION OF MODEL 23085-024 TO MODEL 23085-030

1. PLANNING INFORMATION

A. Effectivity

This Service Bulletin (SB) applies to all Goodrich Corporation Model 23085-024 DC Starter-Generators.

NOTE: Model 23085-014 Starter-Generators can be converted to model 23085-030, but they must first be converted to model 23085-024 by following SB 23085-0XX-24-05.

B. Concurrent Requirements

None.

C. Reason

This conversion is required to electrically insulate the starter-generator drive shaft from the armature and stator housing. Bearing shields and ceramic hybrid ball bearings have also been added for enhanced bearing performance.

D. Description

This SB provides instructions for the conversion of starter-generator model 23085-024 to starter-generator model 23085-030. The conversion consists of updating the ADE end bell (if required), new bearings, bearing shields, new isolated drive shaft, armature, fan, dampener back plate, fan cap plug, dampener hub, washer assembly, isolator and identification plate. See Table 3 for all parts used. The starter-generator model 23085-024 is to be re-identified as a model 23085-030.

NOTE: Use this SB and the referenced Component Maintenance Manual (CMM) for repair and overhaul of model 23085-030 until a CMM with Illustrated Parts List (IPL) is issued.

The anti-drive end (ADE) end bell (P/N 23085-1810) must have four holes drilled, spot faced and tapped with heli-coils put in to relocate ground leads for the filter board assembly. Also, the four bearing retainer holes must have heli-coils installed. If heli-coils are not installed in the ribs of the anti-drive end (ADE) end bell (P/N 23085-1810) and in the bearing retainer holes, disassemble the bearing and brush support assembly following the instructions in the DISASSEMBLY section of the referenced CMM. Refer to Figure 1 for the location of required heli-coils. The following options are available for the modification of the ADE end bell:

(1) For ADE end bells (P/N 23085-1810) that already include heli-coils in the holes on the ribs and bearing retainer screw holes, no modification is necessary.

(2) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the ribs, proceed with modification steps in paragraph 3.F.(2).

(3) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the bearing retainer holes, proceed with modification steps in paragraph 3.F.(3).

E. Compliance

RECOMMENDED

Goodrich Corporation recommends that this conversion be considered during the next removal or repair.

F. Approval

This SB has the approval of Goodrich Corporation and Pilatus Aircraft Ltd. Repairs and conversions specified in this SB are in compliance with the approved data and applicable Federal Aviation Regulations and EASA regulations.

This document provides approval for conversion of model 23085-024 to the model 23085-030 configuration by Authorized Repair Centers that have been approved and audited by Goodrich Corporation. The use of any parts, materials, or processes not authorized by Goodrich Corporation invalidates the conversion of the units.

G. Manpower

An estimated 1.0 man-hour is required to complete the modification in this SB when done at overhaul or repair.

If modification to the ADE end bell (P/N 23085-1810) is required in paragraph 3.F., an estimated additional 1.0 man-hour is required to complete the modification in this SB when done at overhaul or repair.

H. Weight and Balance

Effect on weight: None.

Effect on overhung moment: None.

I. Electrical Load Data

Not Changed.

J. References

Refer to the 23085 Series Component Maintenance Manual (CMM) with Illustrated Parts List (IPL), ATA 24-30-19.

Refer to SB 23085-0XX-24-05 for model 23085-014 conversion to model 23085-024.

K. Other Publications Affected

A Component Maintenance Manual (CMM) with Illustrated Parts List (IPL) will be created to include the model 23085-030 introduced in this SB.

2. MATERIAL INFORMATION

A. Material - Price and Availability

Required parts and pricing information are available from the following Goodrich Corporation Exclusive Distributors:

REGION	ADDRESS	COMMUNICATIONS
AMERICAS:	Goodrich Corporation Customer Service Desk 4115 Corporate Center Drive Monroe, NC 28110-1313 USA	PHONE: (1) 704 282 2500 AOG: (1) 800 735 7899 FAX: (1) 704 282 2560
EUROPE/ MIDEAST/ AFRICA:	Goodrich Corporation Customer Service Desk Stratford Road Solihull B90 4LA UK	PHONE: (44) 121 451 5755 AOG: (44) 121 451 5904 FAX: (44) 121 451 5949 AOG: aog.helpdesk@goodrich.com
ASIA PACIFIC:	Goodrich Control Systems Pte. Ltd. Customer Service Desk 35 & 37 Loyang Way Republic of Singapore 508733	PHONE: (65) 6545 9975 AOG: (1) 800 735 7899 FAX: (65) 6545 9965

B. Technical Support Information

Technical questions should be directed to the location listed below:

ADDRESS	COMMUNICATIONS
Goodrich Corporation Technical Services 8380 Darrow Road Twinsburg, OH 44087 USA	PHONE (1) 330 487 2000 FAX (1) 330 487 1902
Goodrich Corporation Power Systems Division Westfield Road Pitstone Green Buckinghamshire LU7 9GT UK	PHONE (44) 1296 663000 FAX (44) 1296 663300

C. Material Requirements

The following materials and tools are required for modification:

Item	Description/Specification	Source (CAGE Code)
Acrylic Coating	HumiSeal Type 1B31 MIL-I-46058	Chase Corporation Woodside, NY 11377 Ph: (718) 932-0800 Fax: (718) 932-4345 www.humiseal.com (V0SR97)
Chemical Film Solution	Chemical Film Solution MIL-C-5541, Class 3 Alodine 1200	Henkel Surface Technologies 32100 Stephenson Hwy Madison, Heights, MI 48071 USA Ph: 800-521-6895 Ph: 248-583-9300 Fax: 248-583-2976 www.hstna.com (V1N6B3)
Lockwire	NASM20995C32	Aircraft Tool Supply Company P.O. Box 370 Oscoda, MI 48750 Ph: 1-800-248-0638 Ph: 1-989-739-1447 www.aircraft-tool.com (V11138)
Lubricating and Assembly Paste	Altemp QNB 50	Klueber Lubrication Londonderry, NH Ph: (603) 434-7704 Ph: (800) 447-2238 Fax: (603) 434-8046 www.klueber.com (V3EZL6)
Tape	Electrical	Commercially Available
Threaded Inserts (4) for Ribs	NAS1130-06-15 or equivalent	Emhart Teknologies Industrial Division 50 Shelton Technology Center P.O. Box 859 Shelton, CT 06484 USA Ph: 203-924-9341 Fax: 203-925-3109 (V1D1Q0)
Threaded Inserts (4) for Bearing Retainer	NAS1130-08L15D Alt: MS21209C0815 or equivalent	
Thread Sealing Compound	Gasoila, Soft Set, Lead Free	GSA Supply on-line Ph: 1-800-846-7325 www.gsasupplyco.com
Zinc Chromate Primer	TT-P-1757, Composition G, Color Y	Commercially Available

Table 1 - Assembly Materials

D. Tooling Requirements

Tools	Vendor
Spanner Socket Torque Adapter TG-1277-1011	Goodrich Corporation

Table 2 - Special Tools

E. Parts Requirements

Use the parts listed for the starter-generator model 23085-024 in the ILLUSTRATED PARTS LIST section of the CMM, but replace with the following new P/N listed in Table 3 and Table 4 for conversion to starter-generator model 23085-030:

New P/N	Qty.	Nomenclature	Old P/N	Instruction
52-230094	1	KIT, Starter-Generator Conversion	N/A	Install See Table 4
23085-1743 Alt:23085-1740	1	INLET, Air	23085-1743	Alternate can be used
MS35338-42	8	WASHER, Lock Spring	MS35338-42	Updated Quantity Used. Deleted four lock washer's used with bearing retainer
23085-1810	1	End Bell, Anti-Drive End (ADE)	23085-1810	If required, modify with machined holes as specified in paragraph 3.F. See Figure 1
NOTE: Quantities listed are for one (1) starter-generator.				

Table 3 - Model Conversion/Required Parts

New P/N	Qty.	Nomenclature	Old P/N	Instruction
06-209285	1	PLATE, Identification (Replacement)	-----	Remove/Install new
23078-1844	1	SHAFT, Drive	23085-1358	Remove/Install new
23078-1802	1	ISOLATOR	N/A	Install new
02-5600-17	1	RING, Friction	02-5600-13	Remove/Install new
23032-1916	1	HUB, Dampener	23032-1901	Remove/Install new
23032-2716	1	BACK PLATE, Dampener	23032-2711	Remove/Install new

Table 4 - Isolated Drive Shaft Conversion Kit 52-230094 Contents

New P/N	Qty.	Nomenclature	Old P/N	Instruction
23088-1340	1	SHIELD, Drive End, Bearing	23032-1143	Remove/Install new
23085-1507	1	ARMATURE	23085-1503	Remove/Install new
03-6009-25	2	BEARING, Ball, Ceramic Hybrid	03-6009-23	Remove/Install new
MS35265-45	4	SCREW, Slotted Fillister Head	MS35206-246	Install new
23078-1860	1	PLUG, Fan Cap	N/A	Install new
23078-1873	1	ASSEMBLY, Washer	AN960-416	Remove/Install new
MS172239	1	NUT, Spanner	N/A	Install new
MS172204	1	WASHER, Key, Bearing Retainer	N/A	Install new
23078-1851	1	FAN, Axial	23065-1873	Remove/Install new
23088-1342	1	SHIELD, Anti-Drive End, Bearing	N/A	Install new
MS16555-301	1	PIN, Straight, Headless	N/A	Install new
MS35206-227	4	SCREW, Pan Head	N/A	Install new
MS35338-41	4	WASHER, Lock	N/A	Install new
02-4022-02	4	SCREW	MS35265-45	Remove/Install new
NOTE: Quantities listed are for one (1) starter-generator.				

Table 4 - Isolated Drive Shaft Conversion Kit 52-230094 Contents

3. ACCOMPLISHMENT INSTRUCTIONS

This SB provides instructions for the conversion of starter-generator model 23085-024 to starter-generator model 23085-030. The conversion consists of updating the ADE end bell (if required), new bearings, bearing shields, new isolated drive shaft, armature, fan, dampener back plate, fan cap plug, dampener hub, washer assembly, isolator and identification plate. See Table 3 for all parts used. The starter-generator model 23085-024 is to be re-identified as a model 23085-030.

NOTE: Use this SB and the referenced Component Maintenance Manual (CMM) for repair of model 23085-030 until a CMM with Illustrated Parts List (IPL) is issued.

The anti-drive end (ADE) end bell (P/N 23085-1810) must have four holes drilled, spot faced and tapped with heli-coils put in to relocate ground leads for the filter board assembly. Also, the four bearing retainer holes must have heli-coils installed. If heli-coils are not installed in the ribs of the anti-drive end (ADE) end bell (P/N 23085-1810) and in the bearing retainer holes, disassemble the bearing and brush support assembly following the instructions in the DISASSEMBLY section of the referenced CMM. Refer to Figure 1 for the location of required heli-coils. The following options are available for the modification of the ADE end bell:

(1) For ADE end bells (P/N 23085-1810) that already include heli-coils in the holes on the ribs and bearing retainer screw holes, no modification is necessary.

(2) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the ribs, proceed with modification steps in paragraph 3.F.(2).

(3) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the bearing retainer holes, proceed with modification steps in paragraph 3.F.(3).

A. Preparation

All work performed on the DC starter-generator must be performed in a clean, dry area free of oil, dirt, moisture and other contamination. The DC starter-generator must be kept clean to ensure the operating effectiveness of the unit.

B. Disassembly

Disassemble the DC starter-generator as required, according to the DISASSEMBLY section of the referenced CMM, to the extent necessary to remove the armature.

(1) Disassemble the bearing and brush support assembly to the extent necessary to permit machining of the ADE end bell (P/N 23085-1810) as detailed in paragraph 3.F.

(2) Remove the identification plate from the starter-generator as follows:

NOTE: Record the information from the identification plate before it is removed to make sure the information is not lost by damage during removal.

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

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

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

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

NOTE: Use a dull pair of small side cutters so that you do not cut the head of the drive screw off.

C. Cleaning

Clean unit and disassembled parts according to the CLEANING section instructions of the referenced CMM.

D. Check

Inspect the unit according to the CHECK section instructions of the referenced CMM.

E. Repair

Repair parts as specified in the REPAIR section of the referenced CMM. Replace parts as specified in the CHECK section that cannot be repaired.

F. Modification of the Anti-Drive End (ADE) End Bell

(1) Refer to the REPAIR section of the referenced CMM and SPD (Standard Practice Document) 1003 for removal of surface coatings.

(2) If required, install threaded inserts (heli-coils), (P/N NAS1130-06-15) into ribs, as shown in Figure 1 and as follows:

(a) Elongated spotface, if not already included, a 0.31 inch (7,8 mm) diameter located 38° counter-clockwise from the rivnuts to a depth of 3.15 inch (80,0 mm) from the opposite end of the ADE end bell located on a 2.87 inch (72,9 mm) diameter.

NOTE: 100% cleanup of the ADE end bell is not required.

(b) Drill through on a bolt circle diameter of 2.87 inch (72,9 mm) with #26 0.147 inch (0,37 mm) drill bit.

(c) Tap through for 0.138-32 UNC-3B using 06CPB heli-coil tap, four places equally spaced on a bolt circle diameter of 2.87 inch (72,9 mm).

(d) Clean each hole for threaded inserts by removing burrs or raised metal.

WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

WARNING: DO NOT GET ZINC CHROMATE PRIMER ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ZINC CHROMATE PRIMER IS A POISONOUS MATERIAL.

(e) Coat four new (P/N NAS1130-06-15) heli-coil inserts with zinc chromate primer and install them while wet into the rib screw holes.

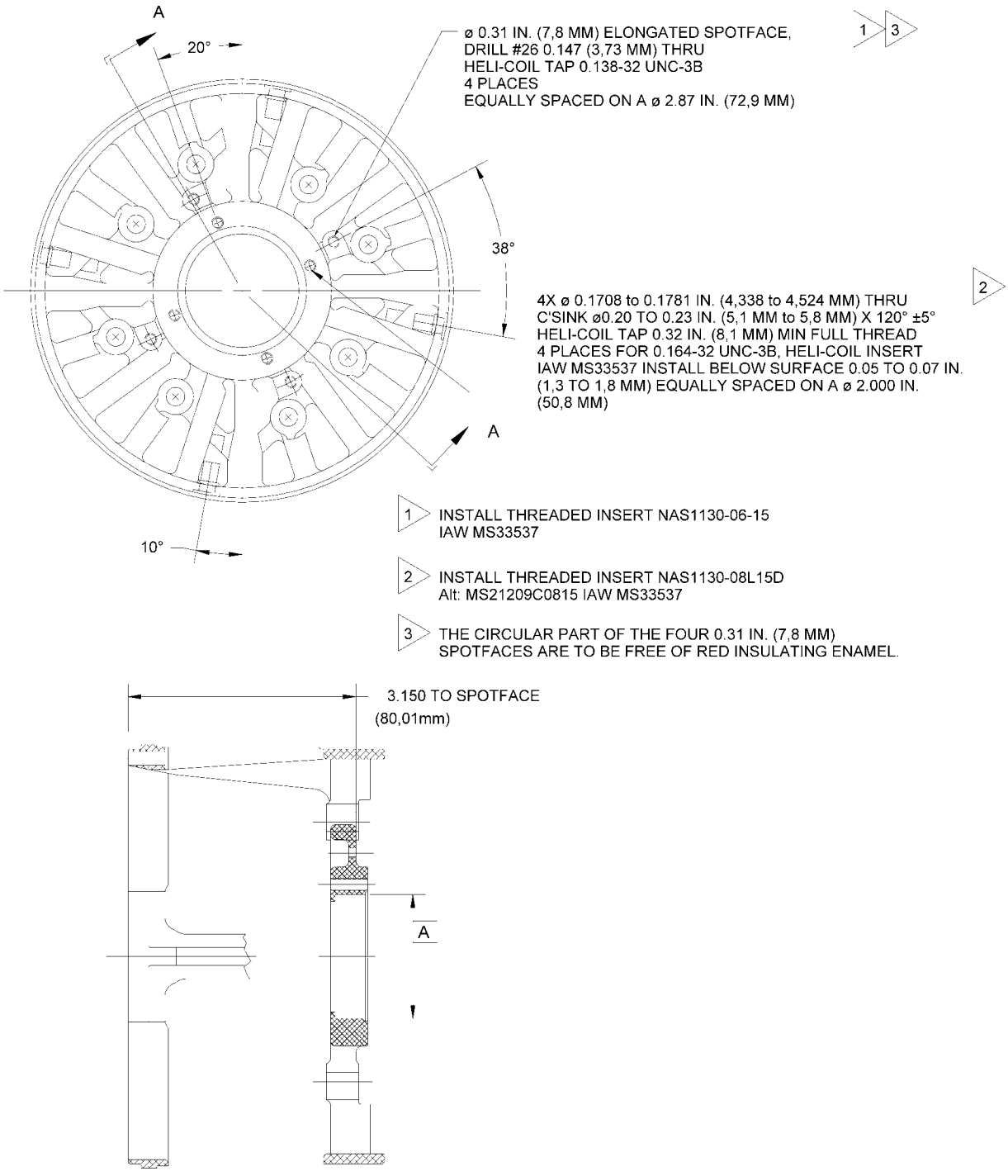


Figure 1 - Location of Heli-Coils in the Anti-Drive End (ADE) End Bell

(3) If required, install threaded inserts (heli-coils), (P/N NAS1130-08L15D, Alt: MS21209C0815) into bearing retainer screw holes, as shown in Figure 1 and as follows:

(a) Drill through with a 0.1708 to 0.1781 inch (4,338 to 4,524 mm) drill bit. The four holes are located on a 2.000 inch (50,8 mm) basic diameter. See Figure 1.

(b) Countersink the bearing retainer screw holes 115° to 125° to a 0.20 to 0.23 inch (5,1 to 5,8 mm) diameter.

(c) Tap 0.164-32 UNC-3B using a 2CPB heli-coil tap.

(d) Clean each hole for threaded inserts by removing burrs or raised metal.

WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

WARNING: DO NOT GET ZINC CHROMATE PRIMER ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ZINC CHROMATE PRIMER IS A POISONOUS MATERIAL.

(e) Coat four new P/N NAS1130-08L15D (Alt. MS21209C0815) heli-coil inserts with zinc chromate and install them into the bearing retainer screw holes to a depth of 0.05 to 0.07 inch (1,3 to 1,8 mm) below the counterbore surface. This measurement is to the start of the heli-coil wire. Break off the tang if required.

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.

(4) If required, touch up with chemfilm in the area that was reworked.

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

(5) If required, REPAIR the surface coating of the ADE end bell using red insulating enamel. Refer to the REPAIR section of the referenced CMM and SPD (Standard Practice Document) 1002.

NOTE: There is to be no red insulating enamel on the 0.31 inch (7,9 mm) spot face surfaces on the ribs.

G. Assembly

Assemble the DC Starter-Generator as specified in the ASSEMBLY section of the referenced CMM and as follows:

NOTE: Assembly must be done using a modified or original ADE end bell (P/N 23085-1810) that has heli-coils installed into the ribs and bearing retainer holes of the ADE end bell as shown in Figure 1.

NOTE: If necessary, attach brush holders to ADE end bell as specified in the ASSEMBLY section of the referenced CMM. Reference SPD 1004 for brush alignment tooling.

(1) Press ball bearing (P/N 03-6009-25) into bearing and brush support assembly. See Figure 2.

(a) Put ADE hub support on arbor press table.

(b) Set bearing and brush support assembly (brush holder side down) on anti-drive end 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.

(c) Apply a light coating of lubricating and assembly paste to the inside diameter of the bearing liner of bearing and brush support assembly.

(d) Set a ball bearing (P/N 03-6009-25) onto bearing liner of ADE end bell assembly.

NOTE: The Goodrich Corporation part marking on the bearing (P/N 03-6009-25) must be facing towards the inside of the Starter-Generator.

(e) Set an outer race bearing driver onto ball bearing (P/N 03-6009-25).

(f) Press ball bearing (P/N 03-6009-25) into bearing liner of ADE end bell assembly until bearing is fully seated against inner lip of bearing liner.

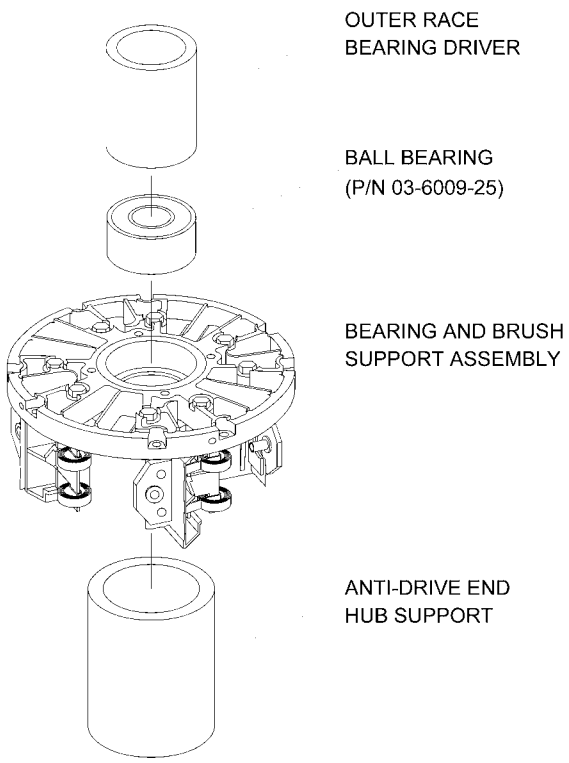


Figure 2 - Ball Bearing Installation

(2) Attach bearing retainer to the bearing and brush support assembly as follows:

NOTE: The ADE end bell must have heli-coil inserts for attachment of the slotted leads of filter assemblies as specified in modification procedures in Paragraph 3.F.

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.

(a) Apply thread sealing compound to the threads of four attaching screws (P/N 02-4022-02).

CAUTION: DO NOT PUT SPRING LOCK WASHERS ON SCREWS FOR BEARING RETAINER. SPRING LOCK WASHERS ARE NOT USED ON THE SCREWS THAT ATTACH THE BEARING RETAINER. THIS CAN CAUSE INTERFERENCE WITH THE BEARING SHIELD.

(b) Attach bearing retainer to bearing and brush support assembly with attaching screws (P/N 02-4022-02).

(3) Insulate slotted lead terminals of filter board assemblies with electrical insulating tape or equivalent.

NOTE: Filter board lead wires are not to be attached until after acceptance testing.

(4) Install the DE bearing shield (P/N 23088-1340) and ball bearing (P/N 03-6009-25) onto drive end of armature (P/N 23085-1507) as follows: See Figure 3.

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

(a) Put armature support on arbor press table.

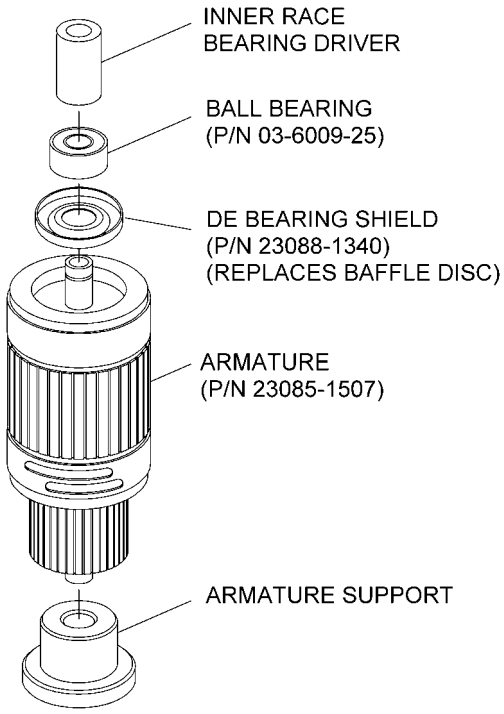


Figure 3 - Bearing Shield and Ball Bearing Installation

(b) Set armature (P/N 23085-1507) (commutator end down) onto armature support.

CAUTION: ORIENT THE DRIVE END BEARING SHIELD WITH THE PART IDENTIFICATION STAMPING FACING INBOARD.

(c) Install the DE bearing shield (P/N 23088-1340) to drive end of armature shaft with the part marking facing toward the armature.

(d) Set ball bearing (P/N 03-6009-25) onto armature shaft.

NOTE: The Goodrich Corporation part marking on the bearing (P/N 03-6009-25) must be facing towards the inside of the starter-generator.

(e) Set inner race bearing driver on ball bearing (P/N 03-6009-25).

(f) Press ball bearing (P/N 03-6009-25) down onto armature shaft making sure bearing is fully seated against bearing shield (P/N 23088-1340).

(g) Install spacer and retaining ring as specified in the ASSEMBLY section of the referenced CMM.

NOTE: Sharp edges of the retaining ring should be facing away from the DC starter-generator.

(5) Prepare armature (P/N 23085-1507) for coarse brush seating according to the referenced CMM and IAW SPD (Special Practice Document 1006).

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

(6) Attach bearing and brush support assembly to armature (P/N 23085-1507) according to the ASSEMBLY section of the CMM.

(7) Calculate and install the shim pack and spring wave washer into the drive end bearing support assembly, and install the bearing and brush support assembly with attached armature into the stator and housing assembly as specified in the ASSEMBLY section of the referenced CMM. Reference Figure 4.

(8) Install dampener back plate (P/N 23032-2716) on the armature shaft with the recessed side facing away from the starter-generator.

(9) Install dampener hub (P/N 23032-1916) on drive shaft (P/N 23078-1844).

NOTE: Make sure that the dampener hub is fully seated on the taper of the drive shaft.

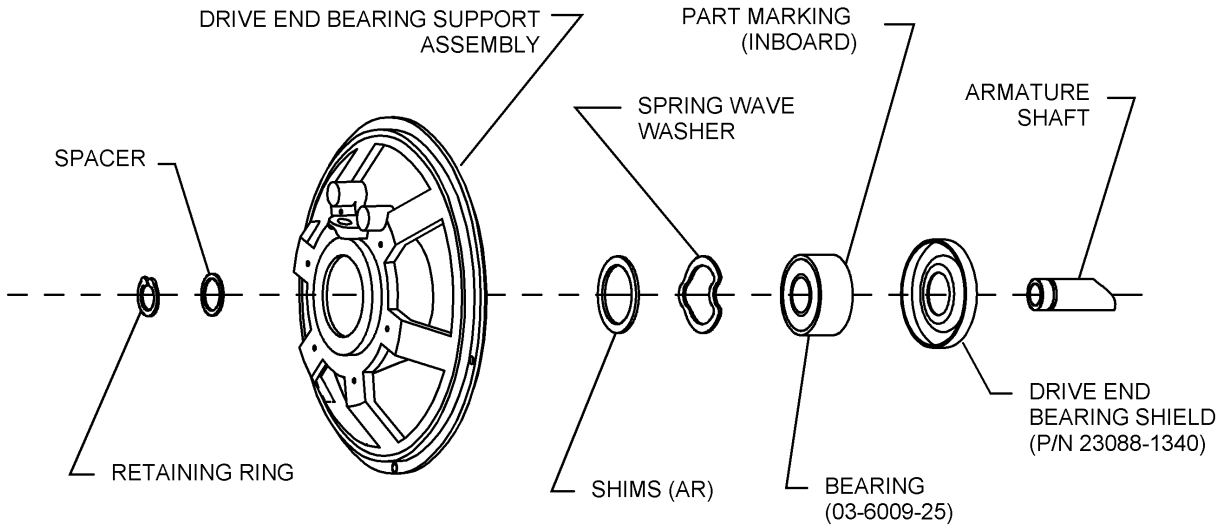


Figure 4 - Drive End Bearing Support Assembly with Preload Stack and Bearing Shield

(10) Install dampener plate on splined dampener hub (P/N 23032-1916). Make sure that dampener plate is installed flush to shoulder of dampener hub (P/N 23032-1916).

(11) Install friction ring (P/N 02-5600-17) to turned recess of dampener back plate.

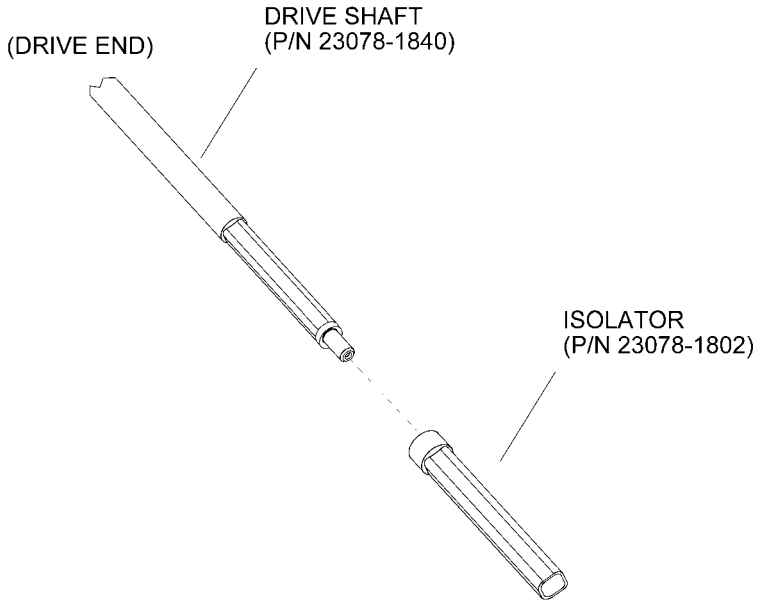


Figure 5 - Installation of Isolator on the Drive Shaft

(12) Install drive shaft (P/N 23078-1844) with isolator (P/N 23078-1802), ADE bearing shield (P/N 23088-1342) and axial fan (P/N 23078-1851) as follows. See Figure 5 and Figure 6.

(a) Slide isolator (P/N 23078-1802) onto the drive shaft square spline until the isolator (P/N 23078-1802) is flush against the drive shaft square spline shoulder. See Figure 5.

(b) Insert drive shaft (P/N 23078-1844) through the armature shaft. Make sure that drive shaft square spline engages armature shaft spline and that friction ring (P/N 02-5600-17) is correctly positioned on dampener back plate.

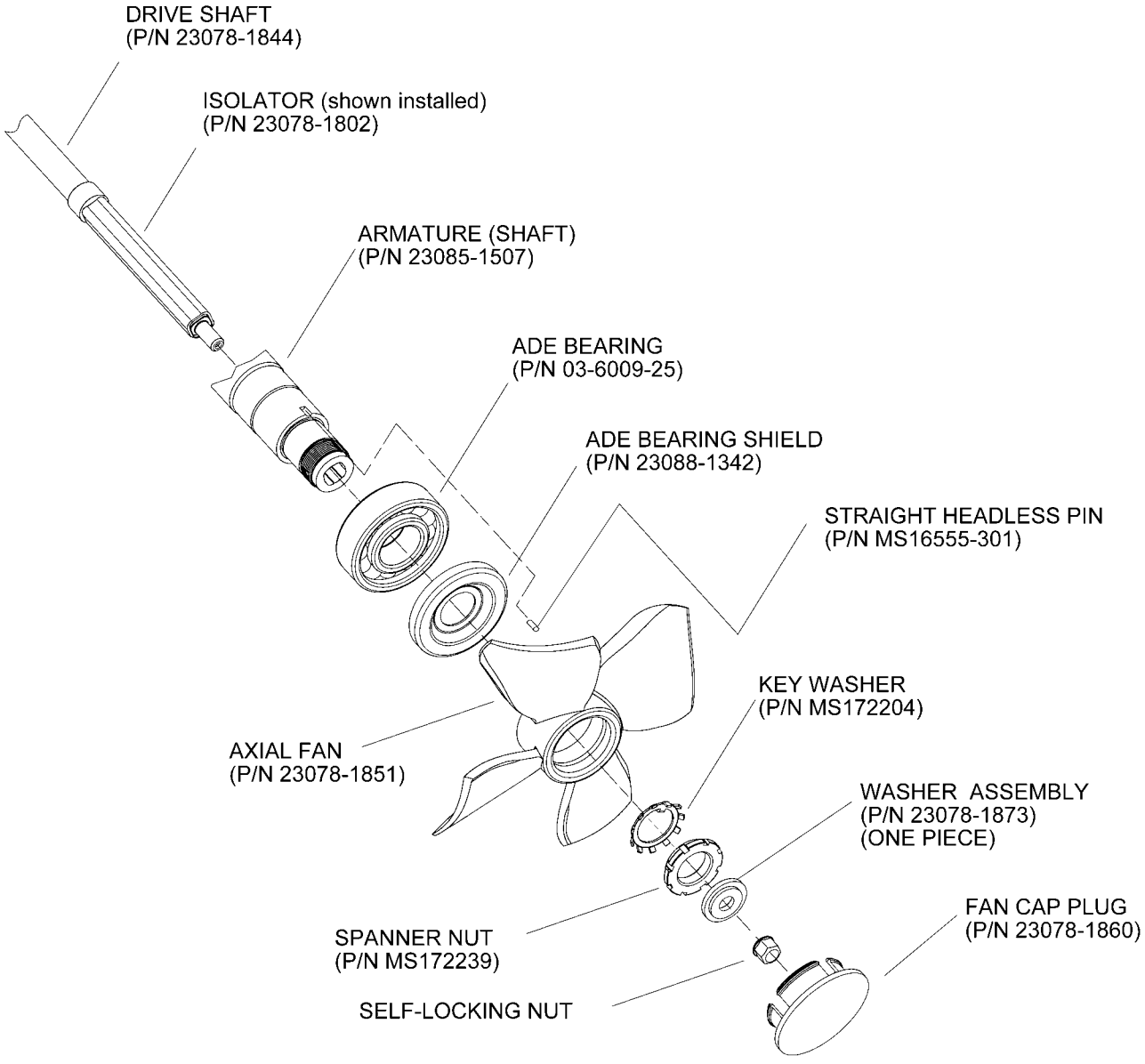


Figure 6 - Assembly of ADE Drive Shaft Isolation

(c) Slide anti-drive end bearing shield (P/N 23088-1342) followed by the axial fan (P/N 23078-1851) on the armature shaft and locate by installing the straight headless pin (P/N MS16555-301) onto the armature shaft keyway.

NOTE: Make sure the part marking of the ADE bearing shield (P/N 23088-1342) is facing towards the outside of the unit.

(d) Attach key washer (P/N MS172204) on armature shaft as shown in Figure 6, locate key washer (P/N MS172204) on armature shaft by aligning the key washer inner tab with the armature keyway.

NOTE: The key washer (P/N MS172204) should have the rounded surface seated against the axial fan (P/N 23078-1851).

(e) Secure the fan (P/N 23078-1851) and key washer (P/N MS172204) with spanner nut (P/N MS172239).

NOTE: The spanner nut (P/N MS172239) should have the rounded surface seated against the key washer (P/N MS172204).

(f) Put the spline wrench on drive end of drive shaft spline and torque the spanner nut (P/N MS172239) to 150 to 200 in.-lb (16,9 to 22,6 N·m) with a spanner wrench (Table 2).

(g) Loosen the spanner nut to zero in.-lb and tighten to a final torque of 80 to 100 in.-lb (9,0 to 11,3 N·m).

(h) Lock one tab of the key washer (P/N MS172204) into a slot of the spanner nut (P/N MS172239).

(i) Put washer assembly (P/N 23078-1873) onto the drive shaft (P/N 23078-1844) with the largest washer facing the spanner nut and secure with self-locking nut.

(j) Use the spline wrench on drive end of drive shaft spline and torque nut to 80 to 100 in.-lb (9,0 to 11,3 N·m).

(k) Press the fan cap plug (P/N 23078-1860) onto the fan. See Figure 6 for proper orientation.

NOTE: Verify that key washer (P/N MS172204) tab is locked into a slot of the spanner nut (P/N MS172239) before installing the fan cap plug (P/N 23078-1860).

(13) Install brushes as specified in the ASSEMBLY section of the referenced CMM and IAW SPD (Special Practice Document 1006).

(14) Attach air inlet (P/N 23085-1743, Alt: P/N 23085-1740). See Figure 7.

(a) Put air inlet (P/N 23085-1743, Alt: P/N 23085-1740) on the bearing and brush support assembly. Align the four screw holes on the air inlet with the screw holes on the bearing and brush support assembly.

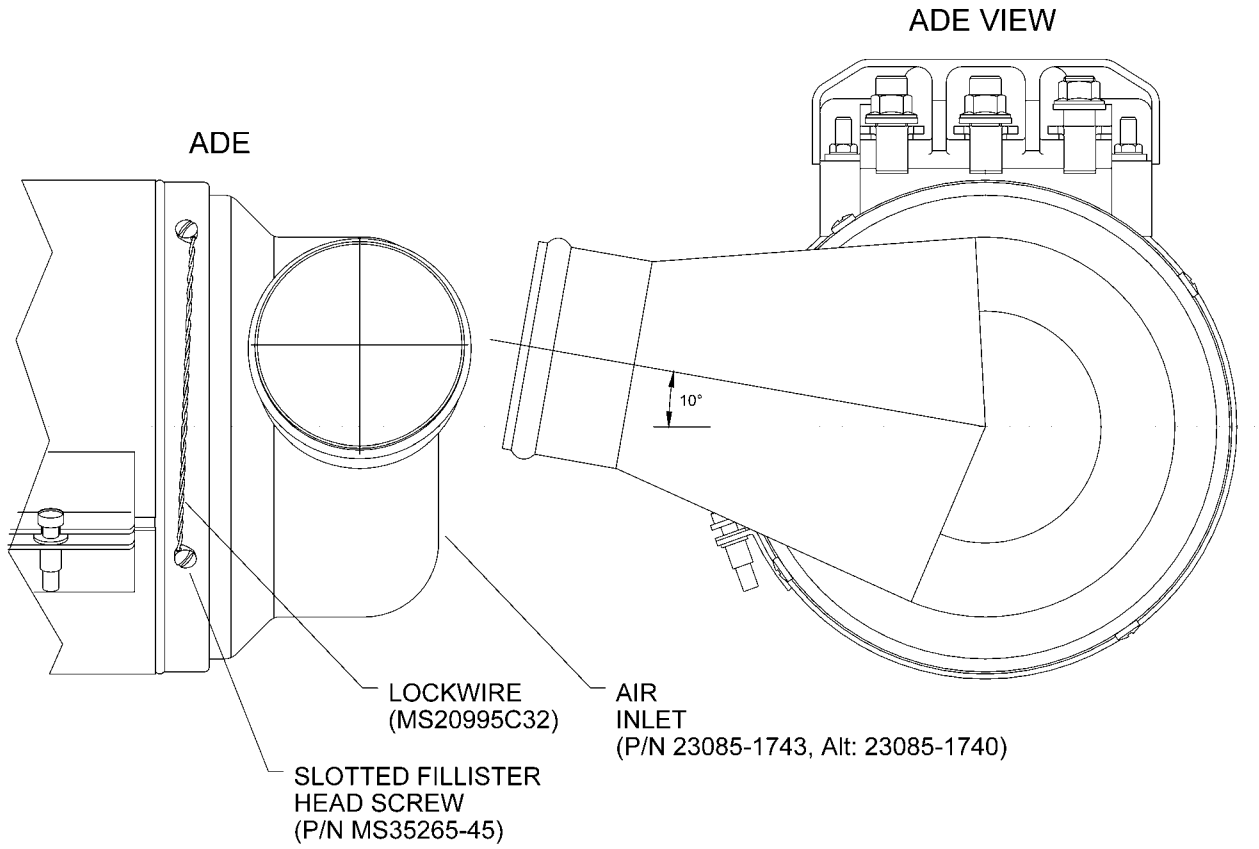


Figure 7 - Attaching Air Inlet

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.**

(b) Apply thread sealing compound to threads of four screws (P/N MS35265-45).

(c) Install air inlet (P/N 23085-1743, Alt: P/N 23085-1740) with four attaching screws (P/N MS35265-45) to a torque of 13.5 to 18.0 in.-lb (1,5 to 2,0 N·m) as shown.

NOTE: Do not attach lockwire to screws until after acceptance testing.

(d) After acceptance testing, lockwire (MS20995C32) four attaching screws (P/N MS35265-45) IAW MS33540.

H. Testing

Test the DC Starter-Generator according to Goodrich Corporation TEST AND FAULT ISOLATION section as given for starter-generator model 23085-024 and as follows:

NOTE: The filter board assembly leads must remain electrically isolated from both the stator housing, and bearing and brush support assembly until acceptance testing is complete. Wrap terminal ends with electrical tape or equivalent to prevent contact with stator housing.

Acceptance procedures are to be performed in the following sequence:

(1) Continuous Operating Speed, Equalizing Voltage, and Minimum Speed:

(a) Operate starter-generator at 12,000 RPM, 30 VDC, 300 Amps for 15 minutes. Use a thermocouple or suitable equivalent to record frame temperature.

(b) Measure and record voltage between terminals D and E: Voltage must be within limits in Figure 8.

(c) Measure and record inlet air temperature.

(d) Measure and record winding or frame temperature.

(e) Immediately operate generator at minimum speed for regulation at 7,200 RPM, 30 VDC, 300 Amps (stabilization not required).

(f) Record field current and voltage between terminals B and A.

(g) Acceptance Limits:

1 Field Current: Not to be more than 10 Amps.

2 External Field Circuit Resistance (terminals B to A):

a Calculate resistance between terminals B and A by dividing B-A voltage by field current.

b External field circuit resistance must be 0.5 Ω minimum.

3 Open the field circuit and record the residual voltage (B to E):

a Residual voltage must not be less than 0.8 V.

(2) Minimum Speed:

(a) Reduce the starter-generator speed to 6,950 RPM, 28.5 VDC, 300 Amps and operate for 15 minutes.

(b) Measure and record field current and B to A voltage.

(c) Calculate (B to A) resistance by dividing B-A voltage by field current.

(d) Acceptance Limits:

1 Field current: Not to be more than 10 Amps.

2 External field circuit resistance must be 0.5 Ω minimum.

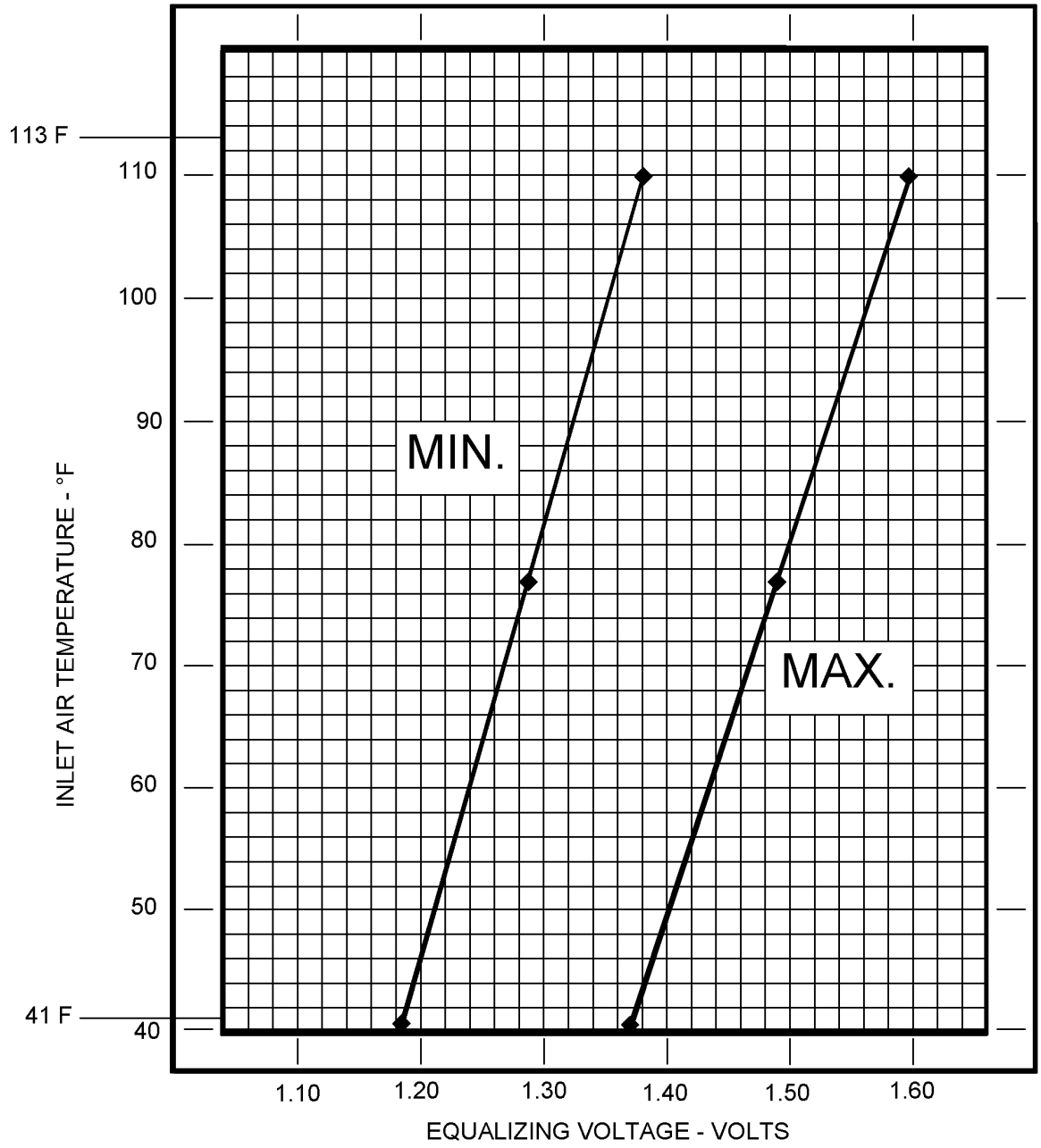


Figure 8 - Equalizing Voltage Diagram

(3) Residual Voltage Test:

(a) Immediately after minimum speed test, operate the starter-generator at 12,000 RPM with an open field circuit. Record the residual voltage between terminals B and E.

(b) Acceptance Limits:

1 Residual voltage must not be more than 3.6 V at 12,000 RPM.

(4) Overspeed:

(a) With the starter-generator hot from the previous test, increase speed to 14,000 RPM with an open field circuit for 5 minutes.

(b) Acceptance Limits:

1 There must be no indication of failure (noise, vibration, loosening of parts, etc.).

(5) Commutation:

(a) Operate the starter-generator at 12,000 RPM, 300 Amps. See Figure 9.

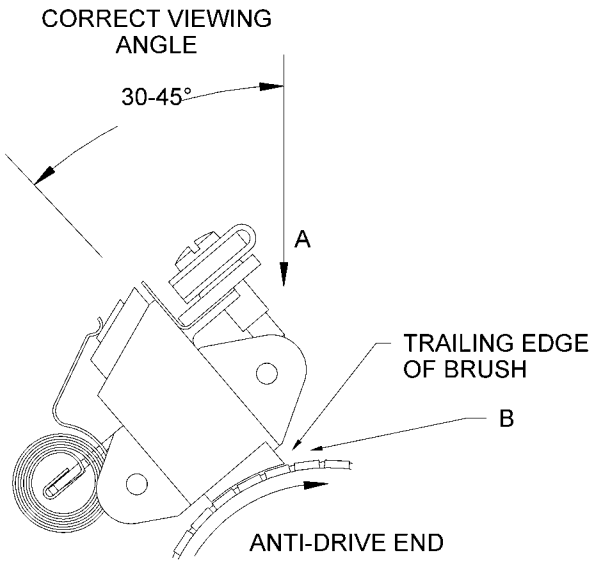


Figure 9 - Correct Viewing Angle

(b) Acceptance Limits:

1 Continuous pinpoint sparking is not to be more than approximately 0.12 inch (3,0 mm) beyond the trailing edge of each brush with no more than 10 single sparks extending up to 0.25 inch (6,0 mm) in any one minute period. Sparks beyond 0.25 inch (6,0 mm) must be considered arcing.

2 Arrow “A” shows the correct viewing angle for finding any sparking. Arrow “B” shows the correct viewing angle, when viewed from the anti-drive end for seeing if commutation is black or pin point.

(6) Dielectric Test:

NOTE: With the starter-generator still hot from testing.

WARNING: BEFORE USING HIGH VOLTAGE TESTER, MAKE CERTAIN TESTER HAS BEEN TURNED “OFF” AND THAT NO ONE IS TOUCHING ANY PORTION OF CONNECTION POINTS OR PROBE LEAD WIRES. FAILURE TO COMPLY WITH THIS WARNING CAN RESULT IN SEVERE ELECTRICAL SHOCK.

CAUTION: THIS TEST IS ACCOMPLISHED ONLY DURING ACCEPTANCE TESTING AND ONLY FOR STARTER-GENERATORS THAT HAVE BEEN CLEANED AND OVERHAULED. USE A DUMMY TERMINAL BLOCK OR DISCONNECT STATOR TERMINAL LEADS FROM TERMINAL BLOCK.

(a) Operating Instructions:

1 Turn all power off at generator drive stand.

2 Disconnect starter-generator from test circuit.

3 Disconnect stator leads from terminal block.

4 Remove terminal block from stator.

5 Remove 4 filter leads from bearing retainer holding screws making certain filter lead terminals do not contact frame and insulate lead ends by applying tape or plastic caps.

6 Remove commutator viewing adapter.

7 Connect all stator terminal leads (A+, B+, C+ where applicable, D and E-) of dummy terminal block together.

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

9 Attach negative (black) lead of high pot tester to an unfinished surface of the starter-generator frame.

CAUTION: APPLY AND REMOVE TEST VOLTAGE AT A UNIFORM RATE NOT TO BE MORE THAN 100 VOLTS PER SECOND.

10 Apply dielectric test voltage of 250 V rms, commercial frequency, for one minute or 300 V rms, commercial frequency, for one second.

(b) Acceptance Limits:

Any arcing as evidenced by flashover (surface discharge), spark-over (air discharge) breakdown (puncture discharge) or leakage current no more than 5 mA will be evidence of damp, dirty, weak or defective components.

(7) Insulation Resistance Test of Isolated Drive Shaft:

CAUTION: MAKE SURE THE DRIVE SHAFT IS NOT TOUCHING THE INSIDE OF THE ARMATURE SHAFT. THIS CAN BE FIXED BY CENTERING THE DRIVE SHAFT IN THE ARMATURE SHAFT.

(a) Apply 30 VDC with a commercial megohm meter as follows:

1 Between the drive spline and the starter-generator stator housing.

2 Between the drive spline and the fan.

3 Measure and record the insulation resistance values.

(b) Acceptance Limits:

1 Insulation resistance must be greater than 1 MΩ.

(8) Locked Rotor Test for Series Start DC Starter-Generators:

(a) Mount the starter-generator to the test mounting flange.

(b) With the voltage output of the DC power supply set to zero turn the power supply to the ON position.

CAUTION: DO NOT ENERGIZE UNIT FOR MORE THAN 5 SECONDS.

(c) With 0.2 Ω connected between terminals A and C, quickly increase voltage between terminals C and E until the output torque of 20 ft-lbs (27,1 N·m) is reached. Measure and record current.

(d) Acceptance Limits:

1 Current is not to be more than 630 Amps and voltage must not be more than 9.5 V.

NOTE: If current is too high, rotate armature to a different position and repeat test.

(9) Residual Voltage Test:

(a) Operate the starter-generator at 7,200 RPM with an open field circuit. Record the residual voltage between terminals B and E.

(b) Acceptance Limits:

1 Residual voltage must not be less than 0.5 V.

(10) Commutator Runout

NOTE: This test is to be accomplished only during acceptance testing after completion of overhaul and the armature's commutator has been resurfaced.

(a) Operating Instructions:

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

CAUTION: ONLY ROTATE COMMUTATOR IN CLOCKWISE DIRECTION AS VIEWED FROM THE ADE.

1 Rotate armature and measure the commutator total runout and bar-to-bar runout between adjacent commutator bars with a dial indicator or suitable equivalent.

2 Measure and record commutator total indicated run-out. Maximum total indicated run-out not to be more than 0.0008 inch (0,02 mm).

3 Measure and record adjacent bar-to-bar run-out. Maximum bar-to-bar run-out not to be more than 0.0002 inch (0,005 mm).

(11) After successful completion of acceptance testing, install the filter board assembly leads to the bearing and brush support assembly as follows:

(a) Put a lockwasher (P/N MS35338-41) on each of the four screws (P/N MS35206-227).

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.

(b) Apply sealing compound to threads of four screws (P/N MS35206-227).

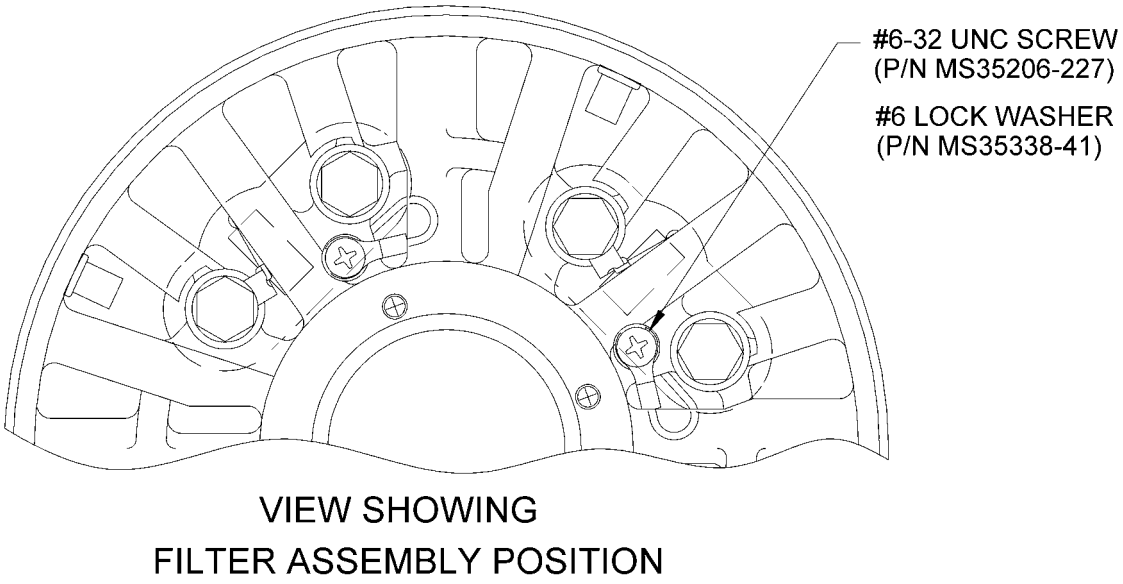


Figure 10 - Fastening Ground Wires to the ADE end bell

(c) Put the slotted terminal end of the lead from the filter board assembly on the screw and install the screw (P/N MS35206-227) into the holes in finned bearing support as shown in Figure to ground the filter board assembly lead. Torque screws (P/N MS35206-227) from 7.7 to 10.3 in.-lb (0,9 to 1,2 N·m).

I. Re-identification

(1) Re-identify the DC Starter-Generator as follows:

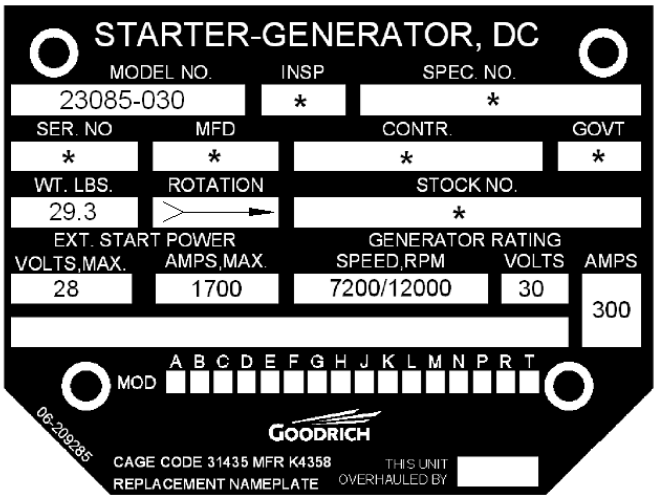
(a) Remove the old identification plate as given in paragraph 3.B.(2).

(b) Put the replacement identification plate (P/N 06-209285) on a wood backing surface and metal stamp or vibra etch the MODEL NO., WT. LB., ROTATION, VOLTS MAX, AMPS MAX, SPEED RPM, VOLTS and AMPS as shown in Figure 11.

NOTE: Identify this unit as a 23085-030.

(c) Metal stamp or vibra etch the data from the old identification plate to the blocks identified with the asterisk (*) of the replacement identification plate (P/N 06-209285).

NOTE: Do not transfer modification status stamping from the 23085-024 identification plate.



NOTE: AFTER THE SERIAL NUMBER HAS BEEN TRANSFERRED, METAL STAMP OR VIBRA ETCH THE SUFFIX "/CA" AFTER IT. THIS ONLY APPLIES TO UNITS WITH "P1###" SERIAL NUMBERS.

Figure 11 - Replacement Identification Plate

(d) After the serial number has been transferred, for serial numbers that start with “P1” metal stamp or vibra etch the suffix “/CA” after the serial number.

NOTE: This only applies to units with “P1###” serial numbers.

(e) Install the replacement identification plate with four drive screws (P/N MS21318-13) as described in the referenced CMM.

NOTE: If the drive screw holes have become elongated, or if the drive screw head breaks off or damages the screw hole, the stator housing cannot be field repaired.

WARNING: KEEP ACRYLIC COATING AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. CONFORMAL COATING IS FLAMMABLE.

WARNING: DO NOT GET ACRYLIC COATING ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ACRYLIC COATING IS A POISONOUS MATERIAL.

(f) Coat the replacement identification plate with acrylic coating (or equivalent) and let the coating air dry.

GOODRICH

SERVICE BULLETIN

Number 23085-025-24-01

ELECTRICAL POWER - DC STARTER-GENERATOR DRIVE SHAFT ISOLATION - CONVERSION OF MODEL 23085-025 TO MODEL 23085-029

1. PLANNING INFORMATION

A. Effectivity

This Service Bulletin (SB) applies to all Goodrich Corporation Model 23085-025 DC Starter-Generators.

NOTE: Model 23085-015 Starter-Generators can be converted to model 23085-029, but they must first be converted to model 23085-025 by following SB 23085-0XX-24-05.

B. Concurrent Requirements

None.

C. Reason

This conversion is required to electrically insulate the starter-generator drive shaft from the armature and stator housing. Bearing shields and ceramic hybrid ball bearings have also been added for enhanced bearing performance.

D. Description

This SB provides instructions for the conversion of starter-generator model 23085-025 to starter-generator model 23085-029. The conversion consists of updating the ADE end bell (if required), new bearings, bearing shields, new isolated drive shaft, armature, fan, dampener back plate, fan cap plug, dampener hub, washer assembly, isolator and identification plate. See Table 3 for all parts used. The starter-generator model 23085-025 is to be re-identified as a model 23085-029.

NOTE: Use this SB and the referenced Component Maintenance Manual (CMM) for repair and overhaul of model 23085-029 until a CMM with Illustrated Parts List (IPL) is issued.

The anti-drive end (ADE) end bell (P/N 23085-1810) must have four holes drilled, spot faced and tapped with heli-coils put in to relocate ground leads for the filter board assembly. Also, the four bearing retainer holes must have heli-coils installed. If heli-coils are not installed in the ribs of the anti-drive end (ADE) end bell (P/N 23085-1810) and in the bearing retainer holes, disassemble the bearing and brush support assembly following the instructions in the DISASSEMBLY section of the referenced CMM. Refer to Figure 1 for the location of required heli-coils. The following options are available for the modification of the ADE end bell:

(1) For ADE end bells (P/N 23085-1810) that already include heli-coils in the holes on the ribs and bearing retainer screw holes, no modification is necessary.

(2) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the ribs, proceed with modification steps in paragraph 3.F.(2).

(3) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the bearing retainer holes, proceed with modification steps in paragraph 3.F.(3).

E. Compliance

RECOMMENDED

Goodrich Corporation recommends that this conversion be considered during the next removal or repair.

F. Approval

This SB has the approval of Goodrich Corporation and Pilatus Aircraft Ltd. Repairs and conversions specified in this SB are in compliance with the approved data and applicable Federal Aviation Regulations.

This document provides approval for conversion of model 23085-025 to the model 23085-029 configuration by Authorized Repair Centers that have been approved and audited by Goodrich Corporation. The use of any parts, materials, or processes not authorized by Goodrich Corporation invalidates the conversion of the units.

G. Manpower

An estimated 1.0 man-hour is required to complete the modification in this SB when done at overhaul or repair.

If modification to the ADE end bell (P/N 23085-1810) is required in paragraph 3.F., an estimated additional 1.0 man-hour is required to complete the modification in this SB when done at overhaul or repair.

H. Weight and Balance

Effect on weight: None.

Effect on overhung moment: None.

I. Electrical Load Data

Not Changed.

J. References

Refer to the 23085 Series Component Maintenance Manual (CMM) with Illustrated Parts List (IPL), ATA 24-30-19.

Refer to SB 23085-0XX-24-05 for model 23085-015 conversion to model 23085-025.

K. Other Publications Affected

A Component Maintenance Manual (CMM) with Illustrated Parts List (IPL) will be created to include the model 23085-029 introduced in this SB.

2. MATERIAL INFORMATION

A. Material - Price and Availability

Required parts and pricing information are available from the following Goodrich Corporation Exclusive Distributors:

REGION	ADDRESS	COMMUNICATIONS
AMERICAS:	Goodrich Corporation Customer Service Desk 4115 Corporate Center Drive Monroe, NC 28110-1313 USA	PHONE: (1) 704 282 2500 AOG: (1) 800 735 7899 FAX: (1) 704 282 2560
EUROPE/ MIDEAST/ AFRICA:	Goodrich Corporation Customer Service Desk Stratford Road Solihull B90 4LA UK	PHONE: (44) 121 451 5755 AOG: (44) 121 451 5904 FAX: (44) 121 451 5949 AOG: aog.helpdesk@goodrich.com
ASIA PACIFIC:	Goodrich Control Systems Pte. Ltd. Customer Service Desk 35 & 37 Loyang Way Republic of Singapore 508733	PHONE: (65) 6545 9975 AOG: (1) 800 735 7899 FAX: (65) 6545 9965

B. Technical Support Information

Technical questions should be directed to the location listed below:

ADDRESS	COMMUNICATIONS
Goodrich Corporation Technical Services 8380 Darrow Road Twinsburg, OH 44087 USA	PHONE (1) 330 487 2000 FAX (1) 330 487 1902
Goodrich Corporation Power Systems Division Westfield Road Pitstone Green Buckinghamshire LU7 9GT UK	PHONE (44) 1296 663000 FAX (44) 1296 663300

C. Material Requirements

The following materials and tools are required for modification:

Item	Description/Specification	Source (CAGE Code)
Acrylic Coating	HumiSeal Type 1B31 MIL-I-46058	Chase Corporation Woodside, NY 11377 Ph: (718) 932-0800 Fax: (718) 932-4345 www.humiseal.com (V0SR97)
Chemical Film Solution	Chemical Film Solution MIL-C-5541, Class 3 Alodine 1200	Henkel Surface Technologies 32100 Stephenson Hwy Madison, Heights, MI 48071 USA Ph: 800-521-6895 Ph: 248-583-9300 Fax: 248-583-2976 www.hstna.com (V1N6B3)
Lockwire	NASM20995C32	Aircraft Tool Supply Company P.O. Box 370 Oscoda, MI 48750 Ph: 1-800-248-0638 Ph: 1-989-739-1447 www.aircraft-tool.com (V11138)
Lubricating and Assembly Paste	Altemp QNB 50	Klueber Lubrication Londonderry, NH Ph: (603) 434-7704 Ph: (800) 447-2238 Fax: (603) 434-8046 www.klueber.com (V3EZL6)
Tape	Electrical	Commercially Available
Threaded Inserts (4) for Ribs	NAS1130-06-15 or equivalent	Emhart Teknologies Industrial Division 50 Shelton Technology Center P.O. Box 859 Shelton, CT 06484 USA Ph: 203-924-9341 Fax: 203-925-3109 (V1D1Q0)
Threaded Inserts (4) for Bearing Retainer	NAS1130-08L15D Alt: MS21209C0815 or equivalent	
Thread Sealing Compound	Gasoila, Soft Set, Lead Free	GSA Supply on-line Ph: 1-800-846-7325 www.gsasupplyco.com
Zinc Chromate Primer	TT-P-1757, Composition G, Color Y	Commercially Available

Table 1 - Assembly Materials

D. Tooling Requirements

Tools	Vendor
Spanner Socket Torque Adapter TG-1277-1011	Goodrich Corporation

Table 2 - Special Tools

E. Parts Requirements

Use the parts listed for the starter-generator model 23085-025 in the ILLUSTRATED PARTS LIST section of the CMM, but replace with the following new P/N listed in Table 3 and Table 4 for conversion to starter-generator model 23085-029:

New P/N	Qty.	Nomenclature	Old P/N	Instruction
52-230080	1	KIT, Starter-Generator Conversion	N/A	Install See Table 4
23085-1743 ALT:23085-1740	1	INLET, Air	23085-1743	Alternate can be used
MS35338-42	8	WASHER, Lock Spring	MS35338-42	Updated Quantity Used. Deleted four lock washer's used with bearing retainer
23085-1810	1	End Bell, Anti-Drive End (ADE)	23085-1810	If required, modify with machined holes as specified in paragraph 3.F. See Figure 1
NOTE: Quantities listed are for one (1) starter-generator.				

Table 3 - Model Conversion/Required Parts

New P/N	Qty.	Nomenclature	Old P/N	Instruction
06-209285	1	PLATE, Identification, Replacement	-----	Remove/Install new
23078-1840	1	SHAFT, Drive	23085-1355	Remove/Install new
23078-1802	1	ISOLATOR	N/A	Install new
02-5600-17	1	RING, Friction	02-5600-13	Remove/Install new
23032-1916	1	HUB, Dampener	23032-1901	Remove/Install new
23032-2716	1	BACK PLATE, Dampener	23032-2711	Remove/Install new

Table 4 - Isolated Drive Shaft Conversion Kit 52-230080 Contents

New P/N	Qty.	Nomenclature	Old P/N	Instruction
23088-1340	1	SHIELD, Drive End, Bearing	23032-1143	Remove/Install new
23085-1507	1	ARMATURE	23085-1503	Remove/Install new
03-6009-25	2	BEARING, Ball, Ceramic Hybrid	03-6009-23	Remove/Install new
MS35265-45	4	SCREW, Slotted Fillister Head	MS35206-246	Install new
23078-1860	1	PLUG, Fan Cap	N/A	Install new
23078-1873	1	ASSEMBLY, Washer	AN960-416	Remove/Install new
MS172239	1	NUT, Spanner	N/A	Install new
MS172204	1	WASHER, Key, Bearing Retainer	N/A	Install new
23078-1851	1	FAN, Axial	23065-1873	Remove/Install new
23088-1342	1	SHIELD, Anti-Drive End, Bearing	N/A	Install new
MS16555-301	1	PIN, Straight, Headless	N/A	Install new
MS35206-227	4	SCREW, Pan Head	N/A	Install new
MS35338-41	4	WASHER, Lock	N/A	Install new
02-4022-02	4	SCREW	MS35265-45	Remove/Install new
NOTE: Quantities listed are for one (1) starter-generator.				

Table 4 - Isolated Drive Shaft Conversion Kit 52-230080 Contents

3. ACCOMPLISHMENT INSTRUCTIONS

This SB provides instructions for the conversion of starter-generator model 23085-025 to starter-generator model 23085-029. The conversion consists of updating the ADE end bell (if required), new bearings, bearing shields, new isolated drive shaft, armature, fan, dampener back plate, fan cap plug, dampener hub, washer assembly, isolator and identification plate. See Table 3 for all parts used. The starter-generator model 23085-025 is to be re-identified as a model 23085-029.

NOTE: Use this SB and the referenced Component Maintenance Manual (CMM) for repair of model 23085-029 until a CMM with Illustrated Parts List (IPL) is issued.

The anti-drive end (ADE) end bell (P/N 23085-1810) must have four holes drilled, spot faced and tapped with heli-coils put in to relocate ground leads for the filter board assembly. Also, the four bearing retainer holes must have heli-coils installed. If heli-coils are not installed in the ribs of the anti-drive end (ADE) end bell (P/N 23085-1810) and in the bearing retainer holes, disassemble the bearing and brush support assembly following the instructions in the DISASSEMBLY section of the referenced CMM. Refer to Figure 1 for the location of required heli-coils. The following options are available for the modification of the ADE end bell:

(1) For ADE end bells (P/N 23085-1810) that already include heli-coils in the holes on the ribs and bearing retainer screw holes, no modification is necessary.

(2) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the ribs, proceed with modification steps in paragraph 3.F.(2).

(3) If the ADE end bell (P/N 23085-1810) does not include heli-coils in the bearing retainer holes, proceed with modification steps in paragraph 3.F.(3).

A. Preparation

All work performed on the DC starter-generator must be performed in a clean, dry area free of oil, dirt, moisture and other contamination. The DC starter-generator must be kept clean to ensure the operating effectiveness of the unit.

B. Disassembly

Disassemble the DC starter-generator as required, according to the DISASSEMBLY section of the referenced CMM, to the extent necessary to remove the armature.

(1) Disassemble the bearing and brush support assembly to the extent necessary to permit machining of the ADE end bell (P/N 23085-1810) as detailed in paragraph 3.F.

(2) Remove the identification plate from the starter-generator as follows:

NOTE: Record the information from the identification plate before it is removed to make sure the information is not lost by damage during removal.

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

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

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

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

NOTE: Use a dull pair of small sidecutters so that you do not cut the head of the drive screw off.

C. Cleaning

Clean unit and disassembled parts according to the CLEANING section instructions of the referenced CMM.

D. Check

Inspect the unit according to the CHECK section instructions of the referenced CMM.

E. Repair

Repair parts as specified in the REPAIR section of the referenced CMM. Replace parts as specified in the CHECK section that cannot be repaired.

F. Modification of the Anti-Drive End (ADE) End Bell

(1) Refer to the REPAIR section of the referenced CMM and SPD (Standard Practice Document) 1003 for removal of surface coatings.

(2) If required, install threaded inserts (heli-coils), (P/N NAS1130-06-15) into ribs, as shown in Figure 1 and as follows:

(a) Elongated spotface, if not already included, a 0.31 inch (7,8 mm) diameter located 38° counter-clockwise from the rivnuts to a depth of 3.15 inch (80,0 mm) from the opposite end of the ADE end bell located on a 2.87 inch (72,9 mm) diameter.

NOTE: 100% cleanup of the ADE end bell is not required.

(b) Drill through on a bolt circle diameter of 2.87 inch (72,9 mm) with #26 0.147 inch (0,37 mm) drill bit.

(c) Tap through for 0.138-32 UNC-3B using 06CPB heli-coil tap, four places equally spaced on a bolt circle diameter of 2.87 inch (72,9 mm).

(d) Clean each hole for threaded inserts by removing burrs or raised metal.

WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

WARNING: DO NOT GET ZINC CHROMATE PRIMER ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ZINC CHROMATE PRIMER IS A POISONOUS MATERIAL.

(e) Coat four new (P/N NAS1130-06-15) heli-coil inserts with zinc chromate primer and install them while wet into the rib screw holes.

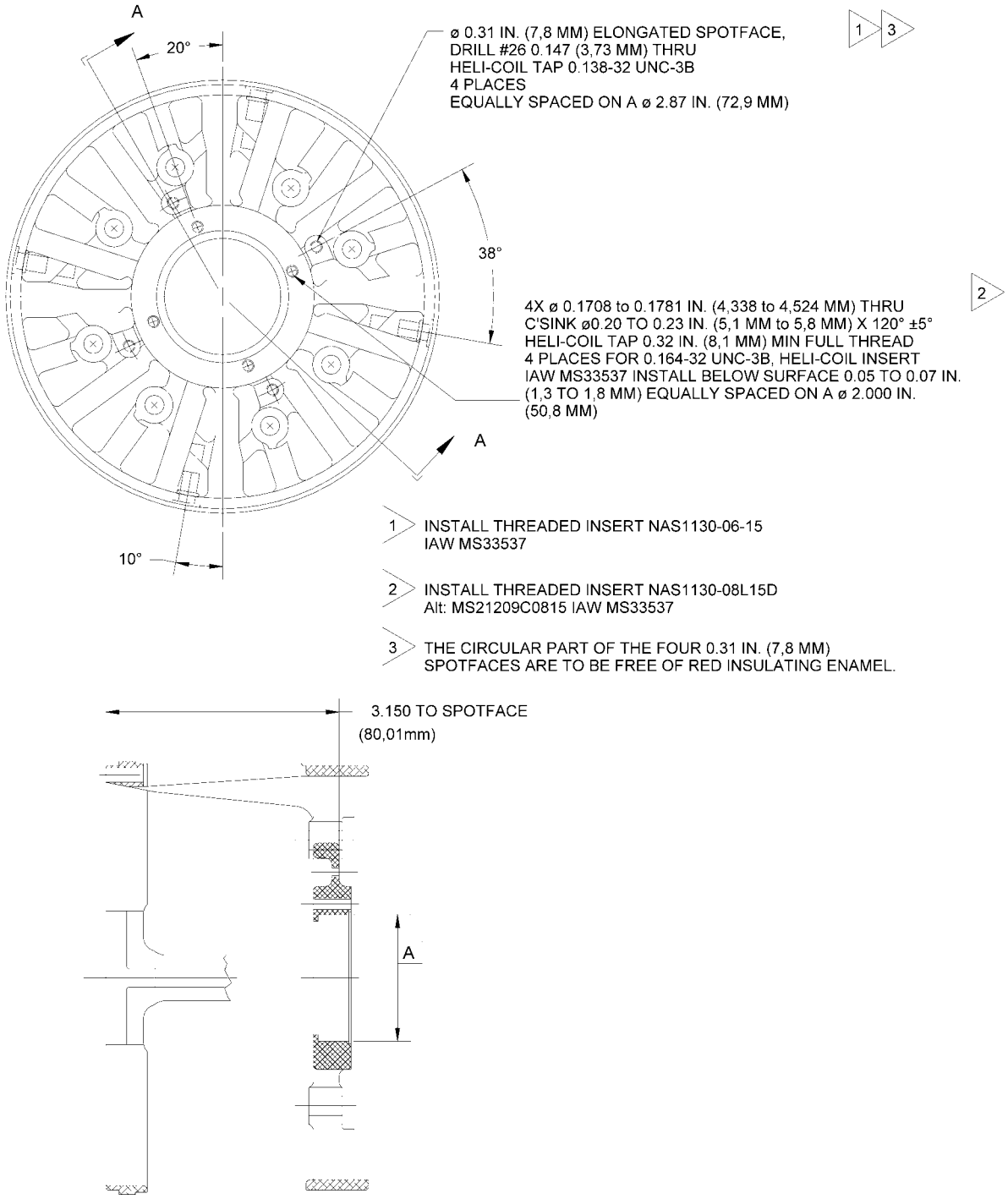


Figure 1 - Location of Heli-Coils in the Anti-Drive End (ADE) End Bell

(3) If required, install threaded inserts (heli-coils), (P/N NAS1130-08L15D, Alt: MS21209C0815) into bearing retainer screw holes, as shown in Figure 1 and as follows:

(a) Drill through with a 0.1708 to 0.1781 inch (4,338 to 4,524 mm) drill bit. The four holes are located on a 2.000 inch (50,8 mm) basic diameter. See Figure 1.

(b) Countersink the bearing retainer screw holes 115° to 125° to a 0.20 to 0.23 inch (5,1 to 5,8 mm) diameter.

(c) Tap 0.164-32 UNC-3B using a 2CPB heli-coil tap.

(d) Clean each hole for threaded inserts by removing burrs or raised metal.

WARNING: KEEP ZINC CHROMATE PRIMER AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. ZINC CHROMATE PRIMER IS FLAMMABLE.

WARNING: DO NOT GET ZINC CHROMATE PRIMER ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ZINC CHROMATE PRIMER IS A POISONOUS MATERIAL.

(e) Coat four new P/N NAS1130-08L15D (Alt. MS21209C0815) heli-coil inserts with zinc chromate and install them into the bearing retainer screw holes to a depth of 0.05 to 0.07 inch (1,3 to 1,8 mm) below the counterbore surface. This measurement is to the start of the heli-coil wire. Break off the tang if required.

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.

(4) If required, touch up with chemfilm in the area that was reworked.

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

(5) If required, REPAIR the surface coating of the ADE end bell using red insulating enamel. Refer to the REPAIR section of the referenced CMM and SPD (Standard Practice Document) 1002.

NOTE: There is to be no red insulating enamel on the 0.31 inch (7,9 mm) spot face surfaces on the ribs.

G. Assembly

Assemble the DC Starter-Generator as specified in the ASSEMBLY section of the referenced CMM and as follows:

NOTE: Assembly must be done using a modified or original ADE end bell (P/N 23085-1810) that has heli-coils installed into the ribs and bearing retainer holes of the ADE end bell as shown in Figure 1.

NOTE: If necessary, attach brush holders to ADE end bell as specified in the ASSEMBLY section of the referenced CMM. Reference SPD 1004 for brush alignment tooling.

(1) Press ball bearing (P/N 03-6009-25) into bearing and brush support assembly. See Figure 2.

(a) Put ADE hub support on arbor press table.

(b) Set bearing and brush support assembly (brush holder side down) on anti-drive end 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.

(c) Apply a light coating of lubricating and assembly paste to the inside diameter of the bearing liner of bearing and brush support assembly.

(d) Set a ball bearing (P/N 03-6009-25) onto bearing liner of ADE end bell assembly.

NOTE: The Goodrich Corporation part marking on the bearing (P/N 03-6009-25) must be facing towards the inside of the Starter-Generator.

(e) Set an outer race bearing driver onto ball bearing (P/N 03-6009-25).

(f) Press ball bearing (P/N 03-6009-25) into bearing liner of ADE end bell assembly until bearing is fully seated against inner lip of bearing liner.

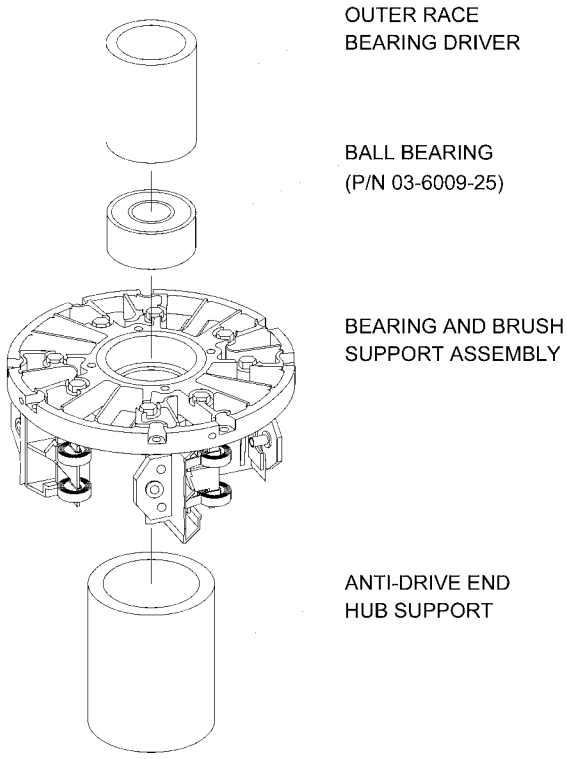


Figure 2 - Ball Bearing Installation

(2) Attach bearing retainer to the bearing and brush support assembly as follows:

NOTE: The ADE end bell must have heli-coil inserts for attachment of the slotted leads of filter assemblies as specified in modification procedures in paragraph 3.F.

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.

(a) Apply thread sealing compound to the threads of four attaching screws (P/N 02-4022-02).

CAUTION: DO NOT PUT SPRING LOCK WASHERS ON SCREWS FOR BEARING RETAINER. SPRING LOCK WASHERS ARE NOT USED ON THE SCREWS THAT ATTACH THE BEARING RETAINER. THIS CAN CAUSE INTERFERENCE WITH THE BEARING SHIELD.

(b) Attach bearing retainer to bearing and brush support assembly with attaching screws (P/N 02-4022-02).

(3) Insulate slotted lead terminals of filter board assemblies with electrical insulating tape or equivalent.

NOTE: Filter board lead wires are not to be attached until after acceptance testing.

(4) Install the DE bearing shield (P/N 23088-1340) and ball bearing (P/N 03-6009-25) onto drive end of armature (P/N 23085-1507) as follows: See Figure 3.

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

(a) Put armature support on arbor press table.

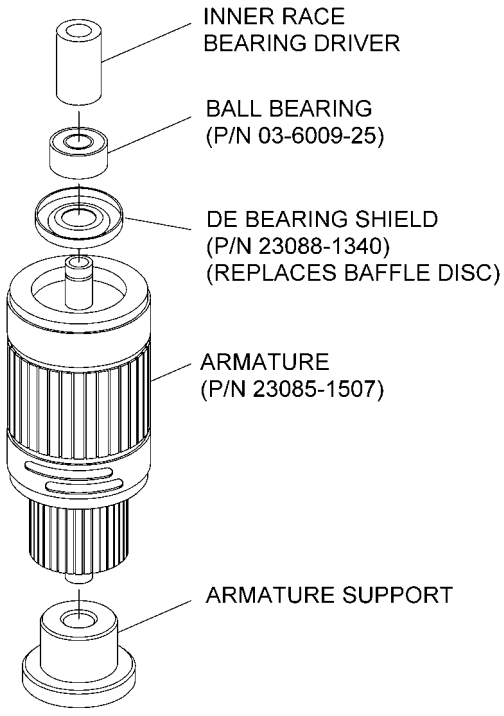


Figure 3 - Bearing Shield and Ball Bearing Installation

(b) Set armature (P/N 23085-1507) (commutator end down) onto armature support.

CAUTION: ORIENT THE DRIVE END BEARING SHIELD WITH THE PART IDENTIFICATION STAMPING FACING INBOARD.

(c) Install the DE bearing shield (P/N 23088-1340) to drive end of armature shaft with the part marking facing toward the armature.

(d) Set ball bearing (P/N 03-6009-25) onto armature shaft.

NOTE: The Goodrich Corporation part marking on the bearing (P/N 03-6009-25) must be facing towards the inside of the starter-generator.

(e) Set inner race bearing driver on ball bearing (P/N 03-6009-25).

(f) Press ball bearing (P/N 03-6009-25) down onto armature shaft making sure bearing is fully seated against bearing shield (P/N 23088-1340).

(g) Install spacer and retaining ring as specified in the ASSEMBLY section of the referenced CMM.

NOTE: Sharp edges of the retaining ring should be facing away from the DC starter-generator.

(5) Prepare armature (P/N 23085-1507) for coarse brush seating according to the referenced CMM and IAW SPD (Special Practice Document 1006).

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

(6) Attach bearing and brush support assembly to armature (P/N 23085-1507) according to the ASSEMBLY section of the CMM.

(7) Calculate and install the shim pack and spring wave washer into the drive end bearing support assembly, and install the bearing and brush support assembly with attached armature into the stator and housing assembly as specified in the ASSEMBLY section of the referenced CMM. Reference Figure 4.

(8) Install dampener back plate (P/N 23032-2716) on the armature shaft with the recessed side facing away from the starter-generator.

(9) Install dampener hub (P/N 23032-1916) on drive shaft (P/N 23078-1840).

NOTE: Make sure that the dampener hub is fully seated on the taper of the drive shaft.

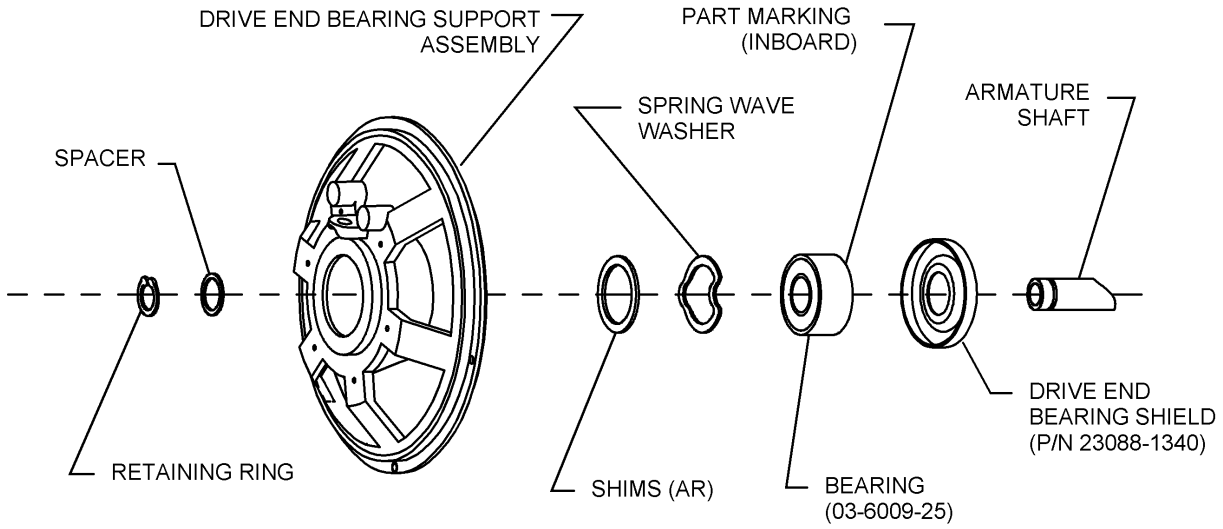


Figure 4 - Drive End Bearing Support Assembly with Preload Stack and Bearing Shield

(10) Install dampener plate on splined dampener hub (P/N 23032-1916). Make sure that dampener plate is installed flush to shoulder of dampener hub (P/N 23032-1916).

(11) Install friction ring (P/N 02-5600-17) to turned recess of dampener back plate.

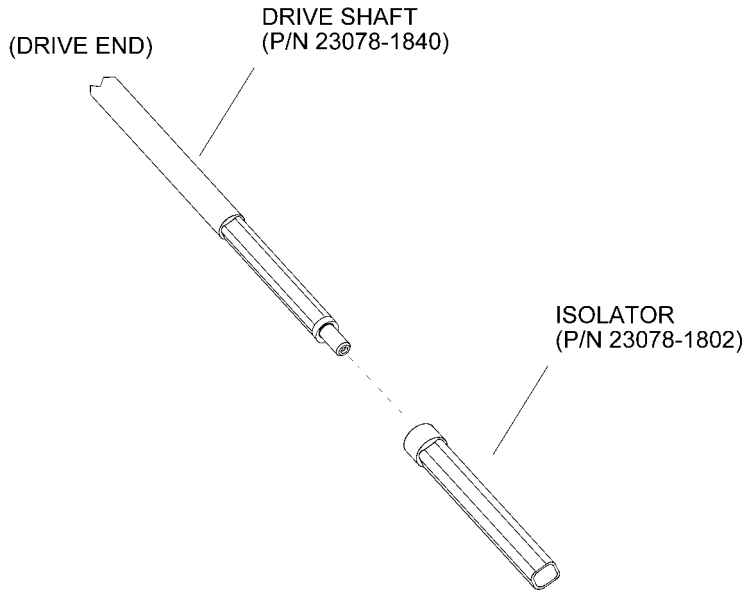


Figure 5 - Installation of Isolator on the Drive Shaft

(12) Install drive shaft (P/N 23078-1840) with isolator (P/N 23078-1802), ADE bearing shield (P/N 23088-1342) and axial fan (P/N 23078-1851) as follows. See Figure 5 and Figure 6.

(a) Slide isolator (P/N 23078-1802) onto the drive shaft square spline until the isolator (P/N 23078-1802) is flush against the drive shaft square spline shoulder. See Figure 5.

(b) Insert drive shaft (P/N 23078-1840) through the armature shaft. Make sure that drive shaft square spline engages armature shaft spline and that friction ring (P/N 02-5600-17) is correctly positioned on dampener back plate.

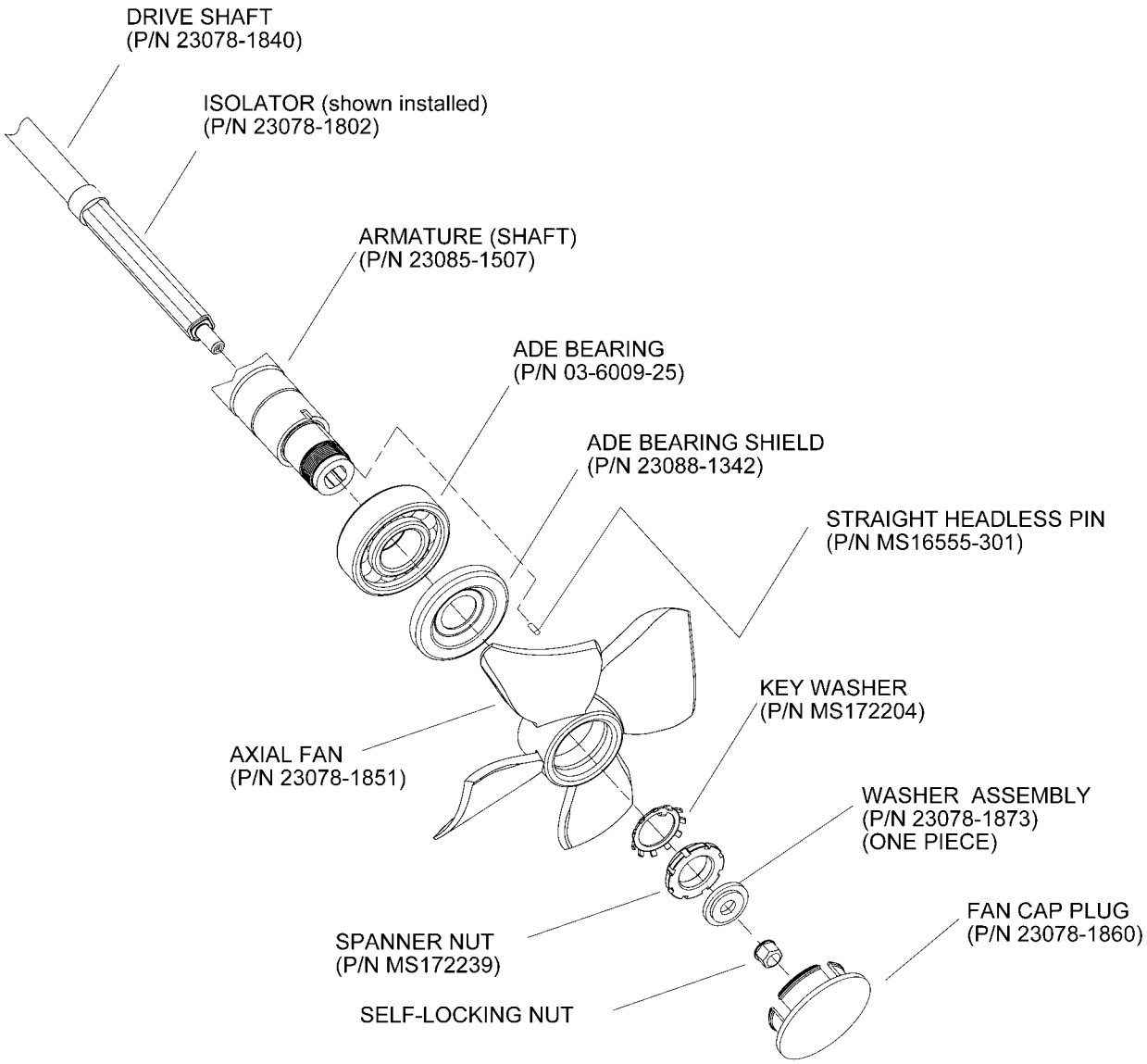


Figure 6 - Assembly of ADE Drive Shaft Isolation

(c) Press the fan cap plug (P/N 23078-1860) onto the fan. See Figure 6 for proper orientation.

NOTE: Verify that key washer (P/N MS172204) tab is locked into a slot of the spanner nut (P/N MS172239) before installing the fan cap plug (P/N 23078-1860).

(d) Slide anti-drive end bearing shield (P/N 23088-1342) followed by the axial fan (P/N 23078-1851) on the armature shaft and locate by installing the straight headless pin (P/N MS16555-301) onto the armature shaft keyway.

NOTE: Make sure the part marking of the ADE bearing shield (P/N 23088-1342) is facing towards the outside of the unit.

(e) Attach key washer (P/N MS172204) on armature shaft as shown in Figure 6, locate key washer (P/N MS172204) on armature shaft by aligning the key washer inner tab with the armature keyway.

NOTE: The key washer (P/N MS172204) should have the rounded surface seated against the axial fan (P/N 23078-1851).

(f) Secure the fan (P/N 23078-1851) and key washer (P/N MS172204) with spanner nut (P/N MS172239).

NOTE: The spanner nut (P/N MS172239) should have the rounded surface seated against the key washer (P/N MS172204).

(g) Put the spline wrench on drive end of drive shaft spline and torque the spanner nut (P/N MS172239) to 150 to 200 in.-lb (16,9 to 22,6 N·m) with a spanner wrench (Table 2).

(h) Loosen the spanner nut to zero in.-lb and finally tighten to a final torque of 80 to 100 in.-lb (9,0 to 11,3 N·m).

(i) Lock one tab of the key washer (P/N MS172204) into a slot of the spanner nut (P/N MS172239).

(j) Put washer assembly (P/N 23078-1873) onto the drive shaft (P/N 23078-1840) with the largest washer facing the spanner nut and secure with self-locking nut.

(k) Use the spline wrench on drive end of drive shaft spline and torque nut to 80 to 100 in.-lb (9,0 to 11,3 N·m).

(13) Install brushes as specified in the ASSEMBLY section of the referenced CMM and IAW SPD (Special Practice Document 1006).

(14) Attach air inlet (P/N 23085-1743, Alt: P/N 23085-1740). See Figure 7.

(a) Put air inlet (P/N 23085-1743, Alt: P/N 23085-1740) on the bearing and brush support assembly. Align the four screw holes on the air inlet with the screw holes on the bearing and brush support assembly.

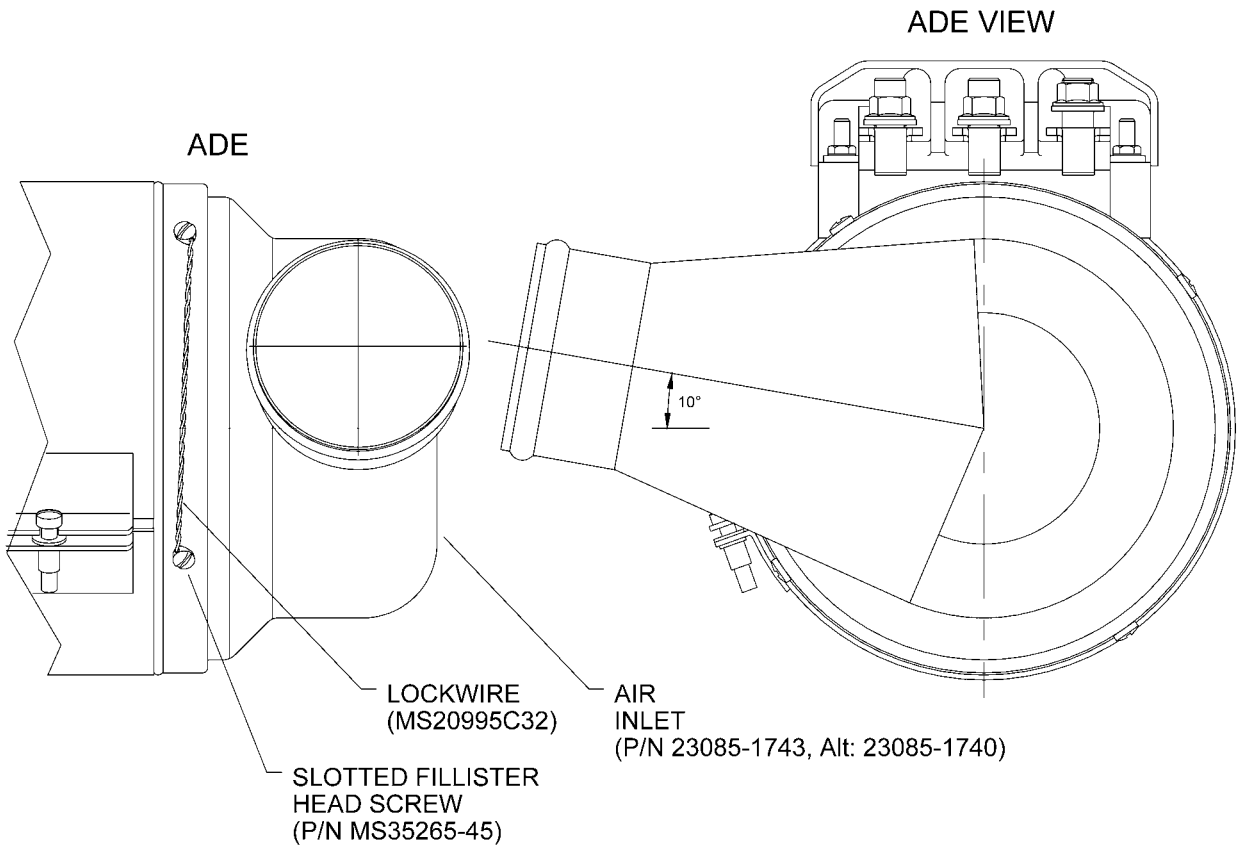


Figure 7 - Attaching Air Inlet

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.**

(b) Apply thread sealing compound to threads of four screws (P/N MS35265-45).

(c) Install air inlet (P/N 23085-1743, Alt: P/N 23085-1740) with four attaching screws (P/N MS35265-45) to a torque of 13.5 to 18.0 in.-lb (1,5 to 2,0 N·m) as shown.

NOTE: Do not attach lockwire to screws until after acceptance testing.

(d) After acceptance testing, lockwire (MS20995C32) four attaching screws (P/N MS35265-45) IAW MS33540.

H. Testing

Test the DC Starter-Generator according to Goodrich Corporation TEST AND FAULT ISOLATION section as given for starter-generator model 23085-025 and as follows:

NOTE: The filter board assembly leads must remain electrically isolated from both the stator housing, and bearing and brush support assembly until acceptance testing is complete. Wrap terminal ends with electrical tape or equivalent to prevent contact with stator housing.

Acceptance procedures are to be performed in the following sequence:

(1) Continuous Operating Speed, Equalizing Voltage, and Minimum Speed:

(a) Operate starter-generator at 12,000 RPM, 30 VDC, 300 A for 15 minutes. Use a thermocouple or suitable equivalent to record frame temperature.

(b) Measure and record voltage between terminals D and E: Voltage must be within limits in Figure 8.

(c) Measure and record inlet air temperature.

(d) Measure and record winding or frame temperature.

(e) Immediately operate generator at minimum speed for regulation at 7,200 RPM, 30 VDC, 300 A (stabilization not required).

(f) Record field current and voltage between terminals B and A.

(g) Acceptance Limits:

1 Field Current: Not to be more than 10 A.

2 External Field Circuit Resistance (terminals B to A):

a Calculate resistance between terminals B and A by dividing B-A voltage by field current.

b External field circuit resistance must be 0.5 Ω minimum.

3 Open the field circuit and record the residual voltage (B to E):

a Residual voltage must not be less than 0.8 V.

(2) Minimum Speed:

(a) Reduce the starter-generator speed to 6,950 RPM, 28.5 VDC, 300 A and operate for 15 minutes.

(b) Measure and record field current and B to A voltage.

(c) Calculate (B to A) resistance by dividing B-A voltage by field current.

(d) Acceptance Limits:

1 Field current: Not to be more than 10 A.

2 External field circuit resistance must be 0.5 Ω minimum.

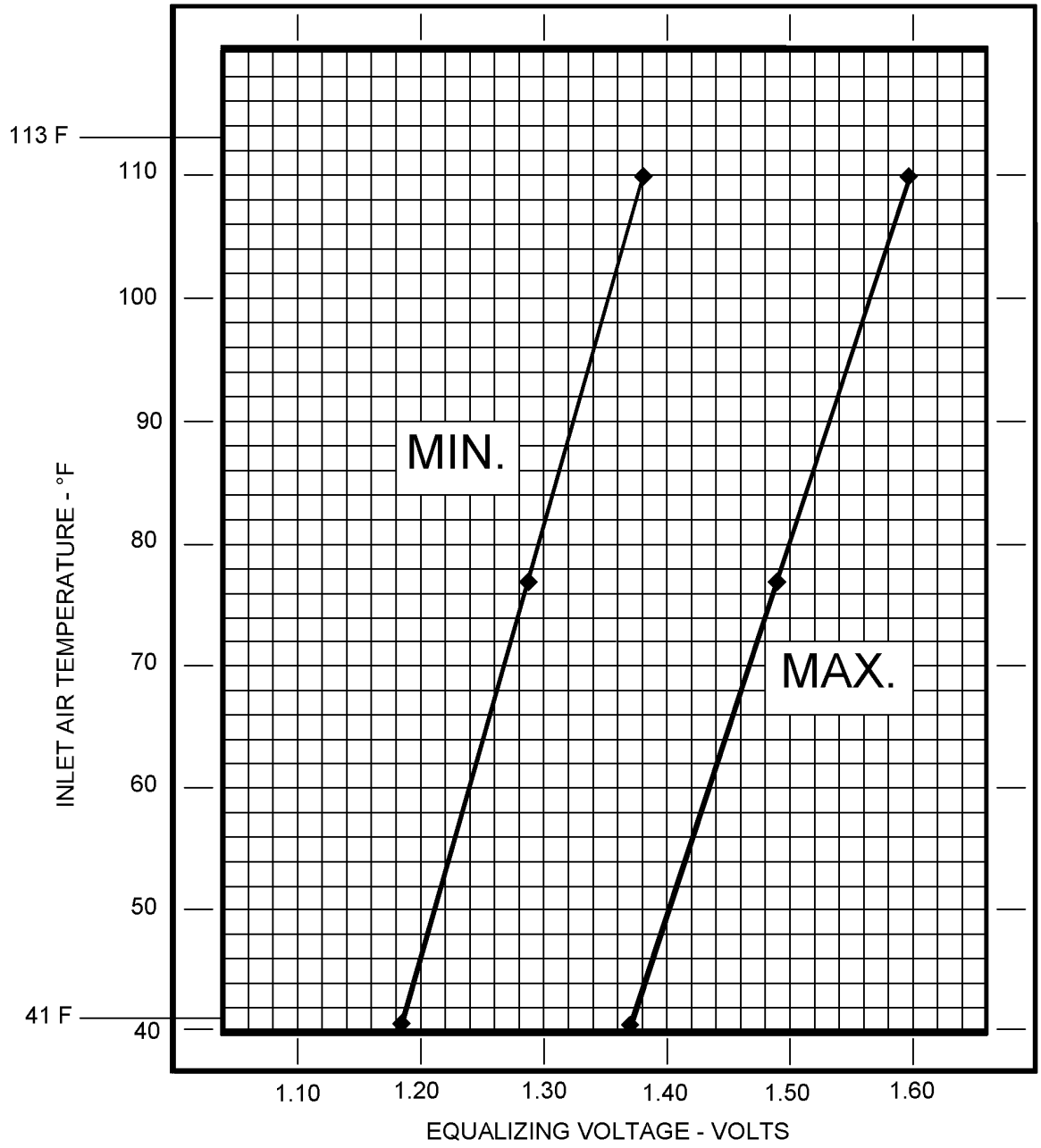


Figure 8 - Equalizing Voltage Diagram

(3) Residual Voltage Test:

(a) Immediately after minimum speed test, operate the starter-generator at 12,000 RPM with an open field circuit. Record the residual voltage between terminals B and E.

(b) Acceptance Limits:

1 Residual voltage must not be more than 3.6 V at 12,000 RPM.

(4) Overspeed:

(a) With the starter-generator hot from the previous test, increase speed to 14,000 RPM with an open field circuit for 5 minutes.

(b) Acceptance Limits:

1 There must be no indication of failure (noise, vibration, loosening of parts, etc.).

(5) Commutation:

(a) Operate the starter-generator at 12,000 RPM, 300 A. See Figure 9.

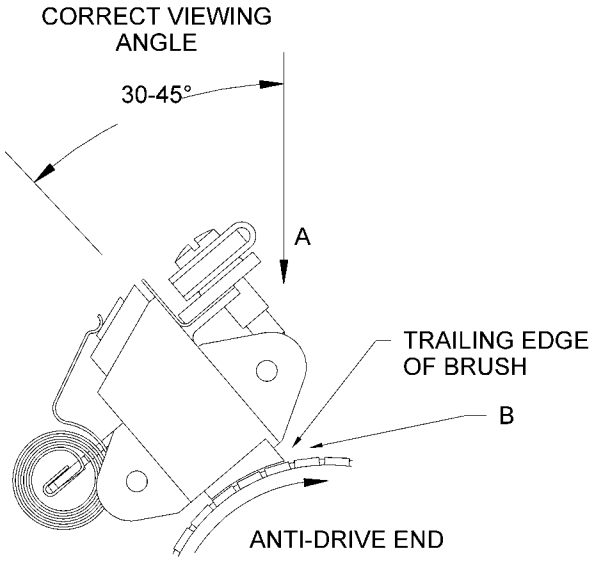


Figure 9 - Correct Viewing Angle

(b) Acceptance Limits:

1 Continuous pinpoint sparking is not to be more than approximately 0.12 inch (3,0 mm) beyond the trailing edge of each brush with no more than 10 single sparks extending up to 0.25 inch (6,0 mm) in any one minute period. Sparks beyond 0.25 inch (6,0 mm) must be considered arcing.

2 Arrow “A” shows the correct viewing angle for finding any sparking. Arrow “B” shows the correct viewing angle, when viewed from the anti-drive end for seeing if commutation is black or pin point.

(6) Dielectric Test:

NOTE: With the starter-generator still hot from testing.

WARNING: BEFORE USING HIGH VOLTAGE TESTER, MAKE CERTAIN TESTER HAS BEEN TURNED “OFF” AND THAT NO ONE IS TOUCHING ANY PORTION OF CONNECTION POINTS OR PROBE LEAD WIRES. FAILURE TO COMPLY WITH THIS WARNING CAN RESULT IN SEVERE ELECTRICAL SHOCK.

CAUTION: THIS TEST IS ACCOMPLISHED ONLY DURING ACCEPTANCE TESTING AND ONLY FOR STARTER-GENERATORS THAT HAVE BEEN CLEANED AND OVERHAULED. USE A DUMMY TERMINAL BLOCK OR DISCONNECT STATOR TERMINAL LEADS FROM TERMINAL BLOCK.

(a) Operating Instructions:

1 Turn all power off at generator drive stand.

2 Disconnect starter-generator from test circuit.

3 Disconnect stator leads from terminal block.

4 Remove terminal block from stator.

5 Remove 4 filter leads from bearing retainer holding screws making certain filter lead terminals do not contact frame and insulate lead ends by applying tape or plastic caps.

6 Remove commutator viewing adapter.

7 Connect all stator terminal leads (A+, B+, C+ where applicable, D and E-) of dummy terminal block together.

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

9 Attach negative (black) lead of high pot tester to an unfinished surface of the starter-generator frame.

CAUTION: APPLY AND REMOVE TEST VOLTAGE AT A UNIFORM RATE NOT TO BE MORE THAN 100 V PER SECOND.

10 Apply dielectric test voltage of 250 V rms, commercial frequency, for one minute or 300 V rms, commercial frequency, for one second.

(b) Acceptance Limits:

Any arcing as evidenced by flashover (surface discharge), spark-over (air discharge) breakdown (puncture discharge) or leakage current no more than 5 mA will be evidence of damp, dirty, weak or defective components.

(7) Insulation Resistance Test of Isolated Drive Shaft:

CAUTION: MAKE SURE THE DRIVE SHAFT IS NOT TOUCHING THE INSIDE OF THE ARMATURE SHAFT. THIS CAN BE FIXED BY CENTERING THE DRIVE SHAFT IN THE ARMATURE SHAFT.

(a) Apply 30 VDC with a commercial meg ohm meter as follows:

1 Between the drive spline and the starter-generator stator housing.

2 Between the drive spline and the fan.

3 Measure and record the insulation resistance values.

(b) Acceptance Limits:

1 Insulation resistance must be greater than 1 MΩ.

(8) Locked Rotor Test for Series Start DC Starter-Generators:

(a) Mount the starter-generator to the test mounting flange.

(b) With the voltage output of the DC power supply set to zero turn the power supply to the ON position.

CAUTION: DO NOT ENERGIZE UNIT FOR MORE THAN 5 SECONDS.

(c) With 0.2 Ω connected between terminals A and C, quickly increase voltage between terminals C and E until the output torque of 20 ft-lbs (27,1 N·m) is reached. Measure and record current.

(d) Acceptance Limits:

1 Current is not to be more than 630 A and voltage must not be more than 9.5 V.

NOTE: If current is too high, rotate armature to a different position and repeat test.

(9) Residual Voltage Test:

(a) Operate the starter-generator at 7,200 RPM with an open field circuit. Record the residual voltage between terminals B and E.

(b) Acceptance Limits:

1 Residual voltage must not be less than 0.5 V.

(10) Commutator Runout

NOTE: This test is to be accomplished only during acceptance testing after completion of overhaul and the armature's commutator has been resurfaced.

(a) Operating Instructions:

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

CAUTION: ONLY ROTATE COMMUTATOR IN CLOCKWISE DIRECTION AS VIEWED FROM THE ADE.

1 Rotate armature and measure the commutator total runout and bar-to-bar runout between adjacent commutator bars with a dial indicator or suitable equivalent.

2 Measure and record commutator total indicated run-out. Maximum total indicated run-out not to be more than 0.0008 inch (0,02 mm).

3 Measure and record adjacent bar-to-bar run-out. Maximum bar-to-bar run-out not to be more than 0.0002 inch (0,005 mm).

(11) After successful completion of acceptance testing, install the filter board assembly leads to the bearing and brush support assembly as follows:

(a) Put a lockwasher (P/N MS35338-41) on each of the four screws (P/N MS35206-227).

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.

(b) Apply sealing compound to threads of four screws (P/N MS35206-227).

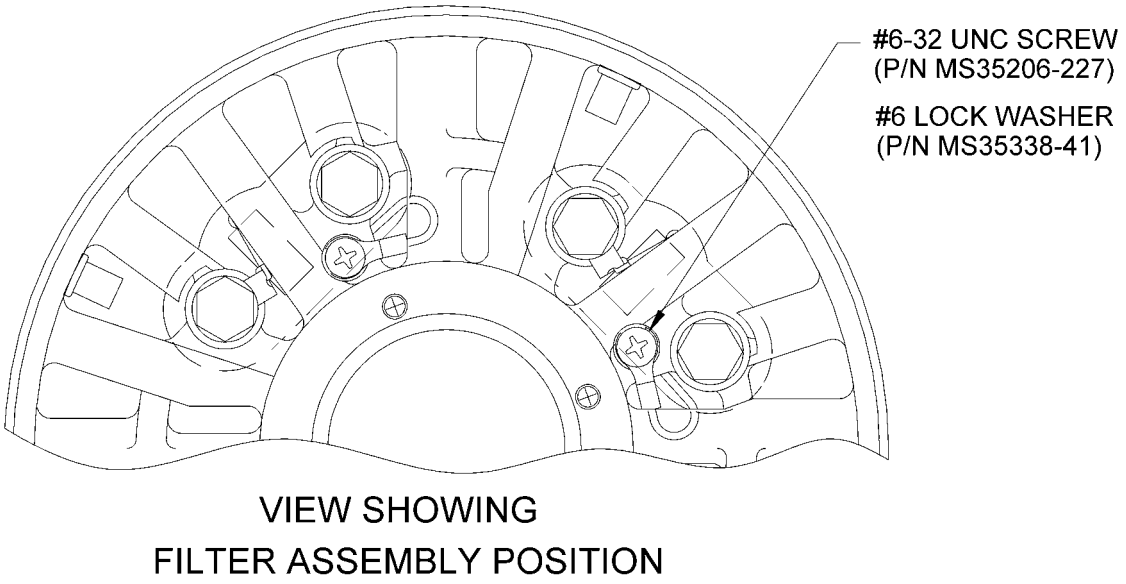


Figure 10 - Fastening Ground Wires to the ADE end bell

(c) Put the slotted terminal end of the lead from the filter board assembly on the screw and install the screw (P/N MS35206-227) into the holes in finned bearing support as shown in Figure 10 to ground the filter board assembly lead. Torque screws (P/N MS35206-227) from 7.7 to 10.3 in.-lb (0,9 to 1,2 N·m).

I. Re-identification

(1) Re-identify the DC Starter-Generator as follows:

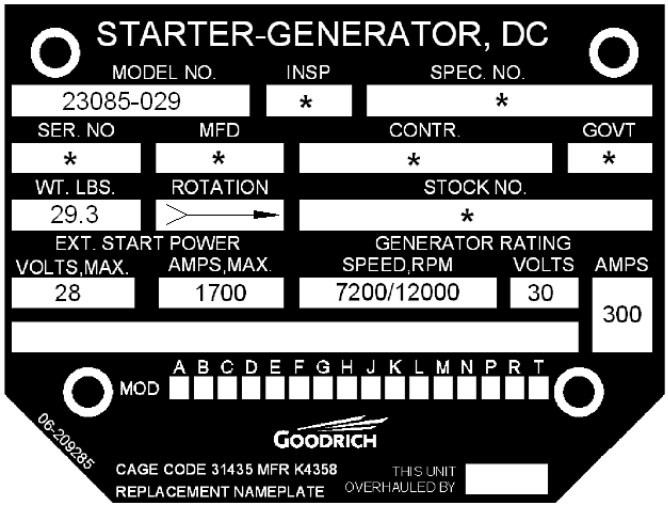
(a) Remove the old identification plate as given in paragraph 3.B.(2).

(b) Put the replacement identification plate (P/N 06-209285) on a wood backing surface and metal stamp or vibra etch the MODEL NO., WT. LB., ROTATION, VOLTS MAX, AMPS MAX, SPEED RPM, VOLTS and AMPS as shown in Figure 11.

NOTE: Identify this unit as a 23085-029.

(c) Metal stamp or vibra etch the data from the old identification plate to the blocks identified with the asterisk (*) of the replacement identification plate (P/N 06-209285).

NOTE: Do not transfer modification status stamping from the 23085-025 identification plate.



NOTE: AFTER THE SERIAL NUMBER HAS BEEN TRANSFERRED, METAL STAMP OR VIBRA ETCH THE SUFFIX "/CA" AFTER IT. THIS ONLY APPLIES TO UNITS WITH "P1###" SERIAL NUMBERS.

Figure 11 - Replacement Identification Plate

(d) After the serial number has been transferred, for serial numbers that start with “P1” metal stamp or vibra etch the suffix “/CA” after the serial number.

NOTE: This only applies to units with “P1###” serial numbers.

(e) Install the replacement identification plate with four drive screws (P/N MS21318-13) as described in the referenced CMM.

NOTE: If the drive screw holes have become elongated, or if the drive screw head breaks off or damages the screw hole, the stator housing cannot be field repaired.

WARNING: KEEP ACRYLIC COATING AWAY FROM SOURCES OF HEAT, SPARKS AND FLAME. CONFORMAL COATING IS FLAMMABLE.

WARNING: DO NOT GET ACRYLIC COATING ON YOUR SKIN AND DO NOT BREATHE THE FUMES. ACRYLIC COATING IS A POISONOUS MATERIAL.

(f) Coat the replacement identification plate with acrylic coating (or equivalent) and let the coating air dry.