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# 6888529HT Starter Generator Spur Gear Shaft

*For Warranty Policy & Model Eligibility, Please visit us at www.hyetechllc.com*

**Subject:** Removal, cleaning, inspection, rework, repair, and installation procedures for 6888529HT-Starter Generator Spur Gearshaft

**Compliance:** Anytime the Starter Generator Spur Gearshaft is removed.

**Notes:** Refer to OEM's published engine operation data.

Technical aspects are FAA approved

Standard shop practices may be substituted for materials and procedures referenced herein provided they have been demonstrated as effective and safe for use with these parts or their OEM and other FAA approved equivalents.

## 1.0 REMOVAL

If installed, remove Accessories Gearbox and disassemble to remove the Accessory Drive Spur Gear Shaft in accordance with the manufacturer's instructions.

Remove Starter Generator Spur Gear Shaft from the gearbox cover by removing internal retaining ring with pliers 6796966 or equivalent.

Remove external retaining ring and bearing retainer. Remove bearings and spacer from the shaft using 6796946 drift or equivalent and 6796950 plate with detail –12 or equivalent. Discard preformed packing.

## 2.1 CLEANING

2.2 Cleaning Precautions. Observe the following precautions when cleaning:

2.2.1 Exercise extreme caution in cleaning parts. Parts with fine finished surfaces, bearings, shafts, or parts with closely machined tolerances must be cleaned with care to avoid damage.

2.2.2 Vapor degrease.

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3.1 INSPECTION

3.2 Inspect and repair or replace the gear shaft in accordance with the following tables.

*NOTE: Anytime the gearbox is opened, review the engine & gearbox records to determine the number of operating hours that have elapsed since the 6888529HT Starter Generator Gear Shaft was new or was last magnafluxed (at overhaul or repair). Gear must not exceed more than 3500 operating hours between magnetic partial inspections. MPI Gear if unable to determine time since last inspection. Record compliance with this inspection in the appropriate section of the engine log book (gearbox section) stating the date & engine/gearbox total operating hours.*

**Table 1**

| Condition/Inspection | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Wear on gear teeth (Visual)** | Slight normal wear with all mating parts in good condition & within PD limits. | Wear pattern which is more than a matte (dull) surface condition. | Remove sharp edges by stoning. Replace if evidence exists of healed prior scuffing. |
| **Measurement over pins.** Measure gear teeth over 0.1080 pins. | Min. measurement: 2.0084 inches. | Min. measurement: 2.0084 inches. | Remove sharp edges by stoning. Hone or grind* to remove irregular tooth wear. The allowable reduction of the distance over pins after honing shall not exceed 0.002 inch. Replace gears which have less than the over pins dimension listed. |
| **Spalling: Use 20X magnification lens.** | Spalling as evidenced by a matte (dull) worn area not exceeding 35% of the tooth width (contact area). | None. | Stone and/or hone or grind* lightly to remove spalling and/or raised metal. |
| **Scuffing. (Visual)** | Scuffing when accompanied by wear off of metal pickup. If gear assembly is still matched with respective mating gears. | Scuffing evidenced by pickup. | Remove scuffing/sharp edges by stoning, honing or grinding. |

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**Table 1**

| Condition/Inspection | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Tooth damage which involves metal displacement to a degree when sub-surface damage is detected by magnetic inspection. (Visual and MPI)** | No sub-surface damage acceptable. | No repair. | Replace gear assembly. |

***NOTES:** Inspect for grinding burns per paragraph 4.0 Grinding Burn Inspection.

**Table 2: Splines**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Wear. (Visual)** | Wear limit on Starter Generator Spur Gearshaft splines is 0.003 inch max on tooth when measured from adjacent unworn area. Wear limit on all other splines is 0.002 inch max on tooth when measured from adjacent unworn area. Passage of 23002205 gage into gear shaft splines indicates excessive wear. | No Repair. | Install new or serviceable Gearshaft. |
| Cracks. Radii root corners of spline teeth (or) **In line or parallel in close proximity on the involute of a gear tooth side (Visual and MPI)** | No cracks. | No repair. | Install new or serviceable Gearshaft. |
| **Tooth damage which involves metal displacement to a degree where subsurface damage is detected by magnetic inspection (Visual and MPI)** | No sub-surface damage acceptable. | No repair. | Install new or serviceable Gearshaft. |

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**Table 3: Seal Journals**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Seal Journal Wear.** | 0.0015 inch max radial wear on journal diameter with respect to adjacent unworn surface. | 0.005 inch max radial wear on journal diameter with respect to adjacent unworn surface. | Grind to clean (0.005 inch max radial). Hard chrome plate seal journals per paragraph 5.0 Journal Repair. |
| **Scoring, grooves, nicks, gouges, scuffing or minute flats on shaft seal journal surfaces. (Visual)** | Evenly polished surface in seal contact without lead or axial marking. | Damage contributing to oil seal leakage shall be cause for repair. | Hard chrome plate seal journals per paragraph 5.0 Journal Repair. |

**Table 4: Bearing Journals and Bores**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Shaft O.D.** | 0.9843 inch | 0.9848/0.9843 inch | Grind to clean (.005 in. max radial). Copper plate dia. **B** per AMS 2418 0.0001 to 0.0002 thick. Optional to plate adjacent shoulder, dia. **G**, dia. **H** and sides of adjacent grooves (see Figure 1). |

**Table 5: Bearing Thrust Shoulders**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Grinding checks on bearing shaft thrust shoulders. (Visual and MPI)** | Checks not breaking an edge or extending into a radius. | No repair permitted. | Replace part exceeding serviceable limits. |

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**Table 5: Bearing Thrust Shoulders**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Roughened surface on thrust face. (Visual)** | No roughened surface. | Max of 20% of the area is affected and condition well dispersed. | Remove by light stoning and polishing. If this does not remove roughness, it is permissible to grind the mounting face to remove damage if no more than 0.005 inch stock is removed. Chrome plate surface per paragraph 5.0 Journal Repair. |

**Table 6: All Areas**

| Condition | Service Limit | Repair Limit | Corrective Action |
|---|---|---|---|
| **Nonmetallic inclusion. (MPI)** | Light scattered non-metallic indications parallel to the material flow lines. | No repair permitted. | Install new or serviceable Gearshaft |
| **Nicks and dents in gear teeth. (Visual)** | Nicks and dents, without sharp corners, not readily detected using a 0.030 inch radius scribe. | Nicks and dents with sharp corners stoned off which are detected using a 0.030 inch radius scribe but which do not exceed 0.060 inch in length, width or diameter. | Remove repairable nicks and dents by stoning, honing or grinding. |

4.1 GRINDING BURN INSPECTION

4.2 After a gear has been reground to remove surface defects, the ground surface must be inspected as follows to determine if grind burns are present

4.3 CAUTION: Contamination (fingerprints, oil, etc.) will give a false indication; therefore, use care in handling the gear to prevent such contamination.

4.4 The surface shall be thoroughly cleaned by vapor degreasing, or other suitable means, to remove grease and assure uniform etching.

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4.5 Nital etch the parts as follows:

4.5.1 Cool the gear to room temperature. The gear may be submerged in a tank of cold water to facilitate cooling.

4.5.2 Submerge the gear in a tank of 3 to 5% (by volume) of nitric acid (Item 99, Appendix C) and water until defective areas are delineated-not to exceed 60 seconds. Remove the part as soon as discoloration is noted.

4.5.3 Rinse the part in cold water.

4.5.4 Thoroughly rinse the part in hot water and blow dry with an air blast.

4.5.5 Submerge the gear in a tank containing a solution of 10% (by weight) of tri-sodium phosphate in de-ionized water or suitable alkaline neutralizers.

4.5.6 Rinse Gearshaft in cold water.

4.5.7 Thoroughly rinse Gearshaft in hot water and blow dry with an air blast.

4.5.8 Examine the part immediately under a diffused light. Apply petroleum solvent to make the tempered areas more pronounced and aid in the inspection.

4.5.9 After nital etch, a gear is acceptable if the surface discoloration is uniform and dull grey to light brown in color.

4.5.10 Grinding burns appear as dark grey to black colored streaks or areas. The darker the color, the greater the burning. Burning causes abnormal tempering and is cause for repair. Gears containing such indications may be reground and re-etched to determine if all indications have been removed.

4.5.11 A gear having white and grey spots surrounded by large dark grey and black areas is not acceptable and shall be replaced. These areas are indicative of extreme overheating resulting in residual stresses and complete local re-hardening.

WARNING: Flight safety parts that have journal repairs have these critical characteristics.

1) Dimension requirements

2) Crack limits.

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5.1 JOURNAL REPAIR

5.2 Journals worn beyond the serviceable limits shall be repaired by plating as specified below.

5.3 NOTE: Unless otherwise specified, plating may be omitted within 0.060 inch of journal shoulders.

5.4 Grind the bearing or seal journal to remove any roughness or previous plating if no other surface preparation is specified in the inspection tables. Maintain concentricity requirements in accordance with Figure 1.

5.5 MPI the ground journal.

5.6 Heat treat at 275 ± 10°F for five hours.

5.7 Mask areas not to be plated with masking wax. Remove wax from surfaces to be plated and clean surfaces.

5.8 Hard chrome plate the journal per AMS-2406 to a thickness sufficient to produce 0.0005 to 0.010 inch thickness after finish grinding. Remove masking wax after plating.

5.9 Finish grind the plated journal in accordance with Figure 1. Concentricity and finish requirements must be met. There must be no spiral lead in the finish on seal journals.

5.10 FPI the finish-ground plated surfaces for cracks.

**Figure 1: Starter Generator Spur Gearshaft**

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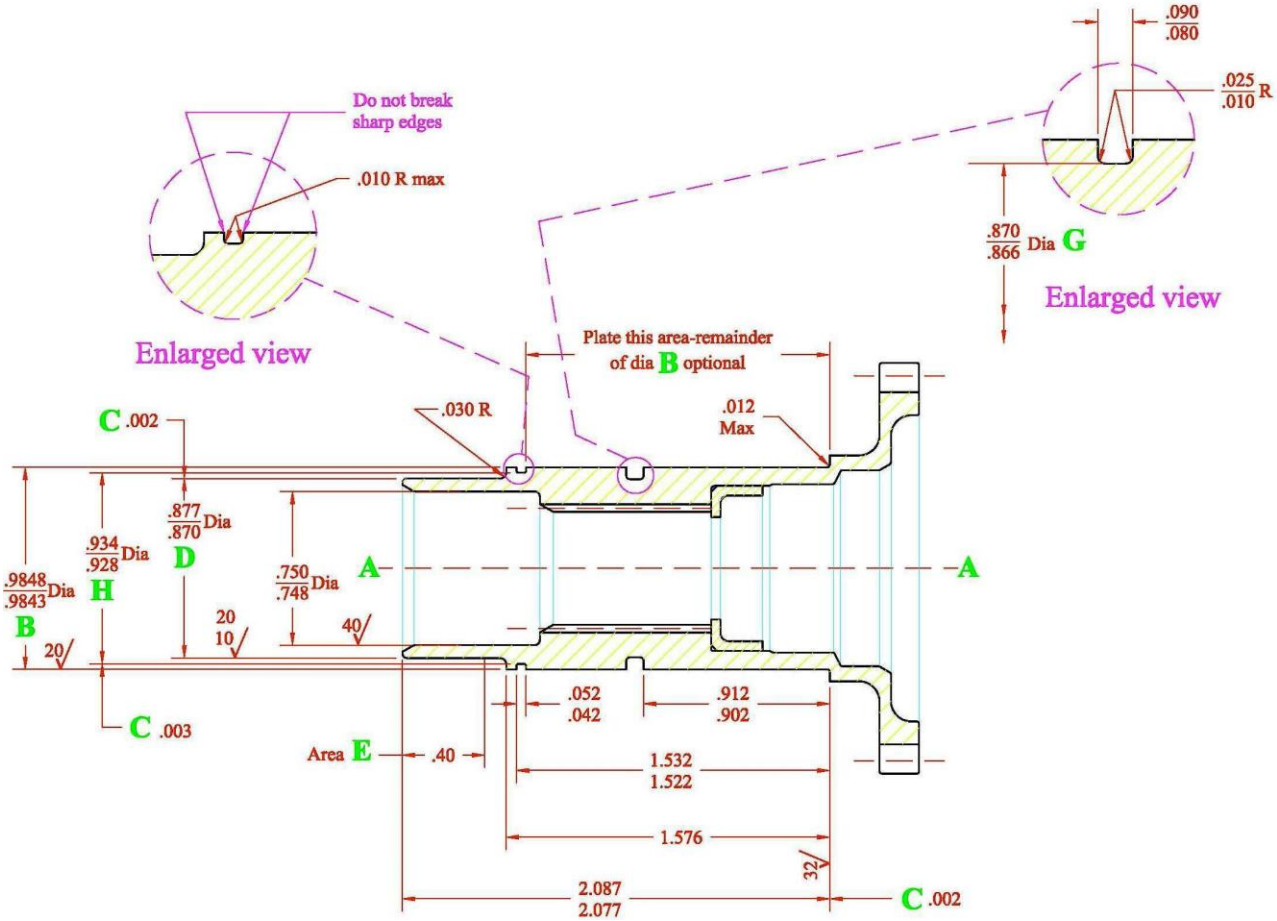


Axis **A-A** established by dia. **B**
Features shall be concentric & square about axis **A-A** within the TIR specified by **C**
Surface lay in area **E** of dia. **D** shall be annular & free from longitudinal & spiral tool marks

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6.1 INSTALLATION

6.2 Install retaining ring then packing lubricated with MIL-L-23699. Install the one of the two ball bearings. Install the bearing sleeve spacer then the second ball bearing on the Starter Generator Spur Gearshaft using 6796949 drift or equivalent and 6976930 plate or equivalent. A 0.000 to 0.0007T fit between the inner race ID and the shaft OD must be maintained. Install bearing retainer and secure it with external retaining ring. Apply lubricant (Lubriplate 130A or equivalent) to the splines of the Gearshaft and using 6796941 seal guide with detail –14 or equivalent, install Gearshaft in the gearbox cover. Secure with internal retaining ring using 6796966 pliers or equivalent.