P U B L I C A T I O N T R A N S M I T T A L

RR-DERBY

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DATE: Jun. 9/00

V2500-A1/A5/D5 SERIES PROPULSION SYSTEMS SERVICE BULLETIN

This document transmits the Initial Issue of Service Bulletin EV2500-80-0014

Bulletin Initial Issue

Remove	Incorporate	Reason for change
	Pages 1 to 8 of the Service Bulletin	Initial issue

V2500-ENG-80-0014

CHECK THAT ALL PREVIOUS TRANSMITTALS HAVE BEEN INCORPORATED
If any have not been received please advise Publication Services, Rolls-Royce plc, Derby, England

LIST OF EFFECTIVE PAGES

The effective pages to this Service Bulletin are as follows:

Page	Revision Number	Revision Date
Bulletin		
1		Jun.9/00
2		Jun.9/00
3		Jun.9/00
4		Jun.9/00
5		Jun.9/00
6		Jun.9/00
7		Jun.9/00
8		Jun.9/00

STARTING - PNEUMATIC STARTER - INTRODUCTION OF REVISED STARTER WITH MODIFIED TURBINE RETENTION NUT PRE-LOAD

1. Planning Information

A. Effectivity

(1) Airbus A319

V2522-A5, V2524-A5 Engines prior to Serial No. V10825

(2) Airbus A319CJ

V2527M-A5 Engines prior to Serial No. V10825

(3) Airbus A320

(a) V2500-A1 Engines prior to Serial No. V0362

(b) V2527-A5, V2527E-A5, Engines prior to Serial No. V10825

(4) Airbus A321

V2530-A5, V2533-A5 Engines prior to Serial No. V10825

(5) Boeing - Long Beach Division MD-90

V2525-D5, V2528-D5 Engines prior to Serial No. V20286

(6) ATA Location

80-13-41

B. Concurrent Requirements

None.

C. Reason

(1) Problem

Relaxation of the Pneumatic Starter Turbine assembly retention nut pre-load may occur. This can result in wear and movement of this nut, causing cyclic fatigue of the locking pin. In a small number of cases this can result in internal damage to the starter.

The problem is attributed to running friction between the nut and turbine shaft, leading to a low pre-load between components in the turbine assembly.

(2) Background

The problem has been observed on 40 units in-service to date.

(3) Substantiation

The changes introduced by this Service Bulletin have been successfully incorporated in units used on other Rolls-Royce plc and Pratt and Whitney engines with no reported problems.

(4) Incorporation of this Service Bulletin is designed to maintain unit reliability

(5) Effect of Bulletin on Workshop Procedures :

(a) Removal/Installation

Not affected

(b) Disassembly/Assembly

Affected - (See Supplemental Information)

(c) Cleaning

Affected - (See Supplemental Information)

(d) Inspection/Check

Affected - (See Supplemental Information)

(e) Repair

Affected - (See Supplemental Information)

(f) Testing

Affected - (See Supplemental Information)

(6) Supplemental Information

The Topics affected can be found in the Sumitomo Vendor Component Maintenance Manual (80-13-41).

D. Description

(1) This Service Bulletin covers fitment to engines of a pneumatic starter incorporating Sumitomo modification L13. Refer to Sumitomo Service Bulletin 80-2516.

(2) A revised pneumatic starter is introduced similar to the existing component except for :

(a) A more consistant method of torque tightening the turbine retaining nut is introduced called the angle of turn method, resulting in a 30 percent increase in retention nut pre-load.

(b) The thread lubricant is changed from CoMat 10-077 Approved Engine Oil to CoMat 10-087 Ultrachem Assembly Fluid to reduce the running friction during torque tightening operations.

(c) The pinion sleeve is revised to make sure that it is correctly seated and it is flush with the pinion and the contact area is increased.

(d) Existing Pneumatic starters can be reworked. Refer to Sumitomo Service Bulletin 80-2516. Units incorporating this Service Bulletin will be identified by endorsement of the modification plate with L13.

E. Compliance

Category Code 6

Accomplish when the sub-assemblies (i.e. modules, accessories, components, build groups) is disassembled sufficiently to afford access to the affected part and to all affected spare parts.

F. Approval

(1) V2500-A1 and A5 Engines

The technical content of this Service Bulletin has been approved under the authority of the DCAG Design Organisation Approval No. F.JA.02.

(2) V2500-D5 Engines

The part number changes and/or part modifications described in sections 2 and 3 of this Service Bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA-APPROVED for the Engine Model(s) listed.

G. Manpower

Estimated Man-hours to incorporate the full intent of this Service Bulletin :

(1) In service

Not applicable

(2) At overhaul

Not applicable

NOTE: The parts affected by this Service Bulletin are accessible at overhaul.

H. Weight and Balance

(1) Weight change

None

(2) Moment Arm

None

(3) Datum

Engine Front Mount Centerline (Power Plant Station - PPS 100)

I. Electrical Load Data

This Service Bulletin has no effect on the aircraft electrical load.

J. References

(1) IAE Engineering Change Number 99VI007

(2) Refer to Sumitomo Service Bulletin 80-2516.

(3) V2500 Overhaul Processes and Consumable Index (PCI)

(4) Airbus aircraft modification 21820/P6701

K. Other Publications Affected

(1) Illustrated Parts Catalogue (IPC), Chapter/Section 80-13-41

(2) V2500-A1/A5 Engine Manual:

(a) TASK 72-00-60-050-009, 72-00-60 Removal 13 and TASK 72-00-60-450-009, Installation 13.

(b) TASK 72-00-60-020-003-002, 72-00-60 Removal 04 and TASK 72-00-60-420-001-002, Installation 02.

(3) V2500-D5 Engine Manual:

(a) TASK 72-00-60-050-009, 72-00-60 Removal 13 and TASK 72-00-60-450-009, Installation 13.

(b) TASK 72-00-60-020-003-002, 72-00-60 Removal 04 and TASK 72-00-60-420-001-002, Installation 02.

(4) V2500-A1/A5 Engine Maintenence Manual, TASK 80-13-41-000-010, 80-13-41 Removal/Installation

(5) V2500-D5 Engine Maintenence Manual 80-11-01 Removal/Installation

(6) V2500-A1/A5 Series, Sumitomo Component Maintenence Manual 80-13-41.

(7) V2500-D5 Series, Sumitomo Component Maintenence Manual 80-13-41.

L. Interchangeability of Parts

Not affected

2. Material Information

A. Material - Price and availability

Refer to Sumitomo Service Bulletin 80-2516 for parts and availability

B. Vendor units affected by this Service Bulletin.

Applicabilty: for each V2500 engine to incorporate this Service Bulletin.

The type of equipment affected by this Service Bulletin is listed below for information only :

A1 and A5 Models

80-13-41

FIG ITEM NO.	NEW PART NO.	QTY	KEYWORD	OLD PART NO.	INSTR DISP
01200	790425A4	1	Starter, pneumatic (VK0680)	790425A4	(A)(S1)
01200	790425A3	1	Starter, pneumatic (VK0680)(Customer Option)	790425A3	(A)(S1)

A1 and A5 Models (except V2533-A5)

80-13-41

FIG ITEM NO.	NEW PART NO.	QTY	KEYWORD	OLD PART NO.	INSTR DISP
01200	790425-2	1	Starter, pneumatic (VK0680)	790425-2	(A)(S1)

D5 Models

80-13-41

FIG ITEM NO.	NEW PART NO.	QTY	KEYWORD	OLD PART NO.	INSTR DISP
01200	790425A3	1	Starter, pneumatic (VKO680)	790425-A3	(A)(S1)
01200	790425A4	1	Starter, pneumatic (VKO680)(Customer Option)	790425A4	(A)(S1)

C. Instructions disposition codes:

(A) New standard of unit will be available from July 2000.

(S1) Old and new parts are freely and fully interchangeable.

D. Tooling - Price and Availability

Special tools are not required to accomplish this Service Bulletin.

3. Accomplishment Instructions

(1) Rework Instructions

Refer to Sumitomo Service Bulletin 80-2516.

(2) Assembly Instructions

Refer to Vendor Component Maintenence Manual 80-13-41

(3) Recording Instructions

A record of accomplishment is necessary. Refer to Sumitomo Service Bulletin 80-2516.

SUMITOMO PRECISION PRODUCTS CO., LTD.

SERVICE BULLETIN

PNEUMATIC STARTER - REPLACEMENT OF THE TURBINE ROTOR RETENTION NUT AND REWORK OF THE PINION GEAR

1. Planning Information

A. Effectivity

(1) Refer to Table 1.

Table 1. Effectivity

Part Number	Serial Number of First Production Incorporation
All Pneumatic Starters Part Number (PN) 790425 That Do Not Incorporate Stock List Number L13	A11221

NOTE: This Service Bulletin is applicable to MD90, A319, A320 and A321 aircraft that have IAE V2500 Engines.

B. Concurrent Requirements

(1) None

C. Reason

(1) Problem

(a) Some starters have exhibited loose turbine rotor retention nuts and or broken locking pins.

(2) Cause

(a) Friction variation between the rotor retention nut thrust face, threads and the related components has caused the turbine bearing preload to be too low. This can result in the rotor retention nut coming loose and malfunction of the turbine rotor assembly.

(3) Solution

(a) The retention nut may be damaged or worn from operation with a loose bearing stack and must be replaced. Ultrachem Assembly fluid is used on the threads and thrust face of the nut, rotor and pinion gear to reduce friction during installation of the nut.

(b) A better procedure for tightening the retention nut is used. The procedure uses an angle of turn method instead of a torque limit. The procedure will apply a consistent preload to the bearing assembly stack up by eliminating the effect of variations in the running friction between the retention nut threads and the shaft threads, and between the retention nut face and the pinion gear face.

(c) The pinion gear is reworked to replace the sleeve that the retention nut thrust face seats against. The new sleeve has an increased end surface area to provide a better distribution of preload. This will eliminate the possibility for a step that may exist on the surface where the retention nut seats.

(4) Description

(a) The retention nut torquing procedure is changed to an angle of turn method. The rotor pinion and sleeve is also changed or reworked to allow better load distribution between the rotor retention nut and the pinion gear.

(b) Reidentify the starter by adding L13 on the starter identification plate.

D. Compliance

(1) Recommended - Accomplish during the next shop visit when the starter is disassembled for other reasons.

E. Approval

(1) This Service Bulletin No. 80-2516 (IAE SB V2500-ENG-80-0014) was technically agreed to by IAE on May 15/00.

F. Manpower

(1) No additional man hours are necessary when you do this service bulletin procedure at component maintenance or overhaul and the pinion gear is replaced with PN 797631-2.

(2) If the pinion gear 797631-1 is reworked to 797631-2 one man hour is required.

G. Weight and Balance

(1) None

H. Electrical Load Data

(1) No Change

I. Software Accomplishment Summary

(1) Not Applicable

J. References

(1) Component Maintenance Manual (CMM) 80-13-41

K. Other Publications Affected

(1) CMM 80-13-41

L. Interchangeability or Intermixability of Parts

(1) This SB must be accomplished in it's entirety. Parts must be installed as a complete set.

2. Material Information

A. Material - Price and Availability

(1) Refer to Table 2.

B. Industry Support Information

(1) None

C. Material Necessary for Each Component

(1) Material to be Purchased

(a) The parts that are necessary to do this Service Bulletin are shown in Table 2.

(b) Any parts that usually are discarded when you disassemble the Pneumatic Starter are not in Table 2.

(c) In Table 2, "MSQ" is the Minimum Sales Quantity. The parts that have an entry in this area of Table 2 are supplied only in this quantity, or a multiple of this quantity.

(d) In Table 2, "Keyword" is the name of the part.

(e) In Table 2, the "instruction codes" tell you what to do with the parts. A short list under Table 2 tells you about the instruction codes that are used in Table 2.

(f) The prices that are shown are estimates for one part in US dollars. When you buy the parts, the prices may be different. Send requests for parts to:

Mail: Hamilton Sundstrand
A United Technologies Company
Attention: Manager Commercial Spares
Mail Stop: 2MGGHH10
One Hamilton Road
Windsor Locks, CT 06096-1010
USA

Facsimile: (860) 654-6905

(g) Ultrachem Assembly fluid must be purchased to accomplish this service bulletin.

(h) If more data is necessary, ask your Hamilton Sundstrand account representative.

Table 2. Parts To Be Purchased

New PN	Keyword	Old PN	Qty	MSQ	Estimated Unit Price	Instruction Codes
797652-5	Rotor Assembly	797652-4	1	Not applicable		A, B, C
797631-2	Pinion and Sleeve Assy.	797631-1	1	001	1050.00	A, B
797631-21	Sleeve	797631-20	1	-	33.00	E
730565-6	Rotor retention nut	730565-6	1	010	33.60	D

- Instruction Code A. The Service Bulletin change adds the "New PN" to the Pneumatic Starter.
- Instruction Code B. The Service Bulletin change removes the "Old PN" from the Pneumatic Starter. Discard the part.
- Instruction Code C. The "Old PN" has the same fit and function as the "New PN."
- Instruction Code D. The part must be replaced.
- Instruction Code E. The sleeve part number 797631-21 is only used when you rework the pinion and sleeve from 797631-1 to -2.

(2) Material Supplied by the Operator

(a) None

D. Material Necessary for Spare

(1) Material to be Purchased

(a) Refer to Table 2

(2) Material Supplied by the Operator

(a) None

E. Reidentified Parts

(1) See paragraph 3.C.

F. Tooling - Price and Availability

(1) GS23880-1 Angle of Turn Wrench Kit

3. Accomplishment Instructions

NOTE: You can rework the rotor pinion with the instructions in paragraph C. If the rotor pinion is damaged and can not be reworked, omit paragraph C. A reworked PN 797631-1 as modified with the instructions in paragraph C. is equivalent to a New PN 797631-2.

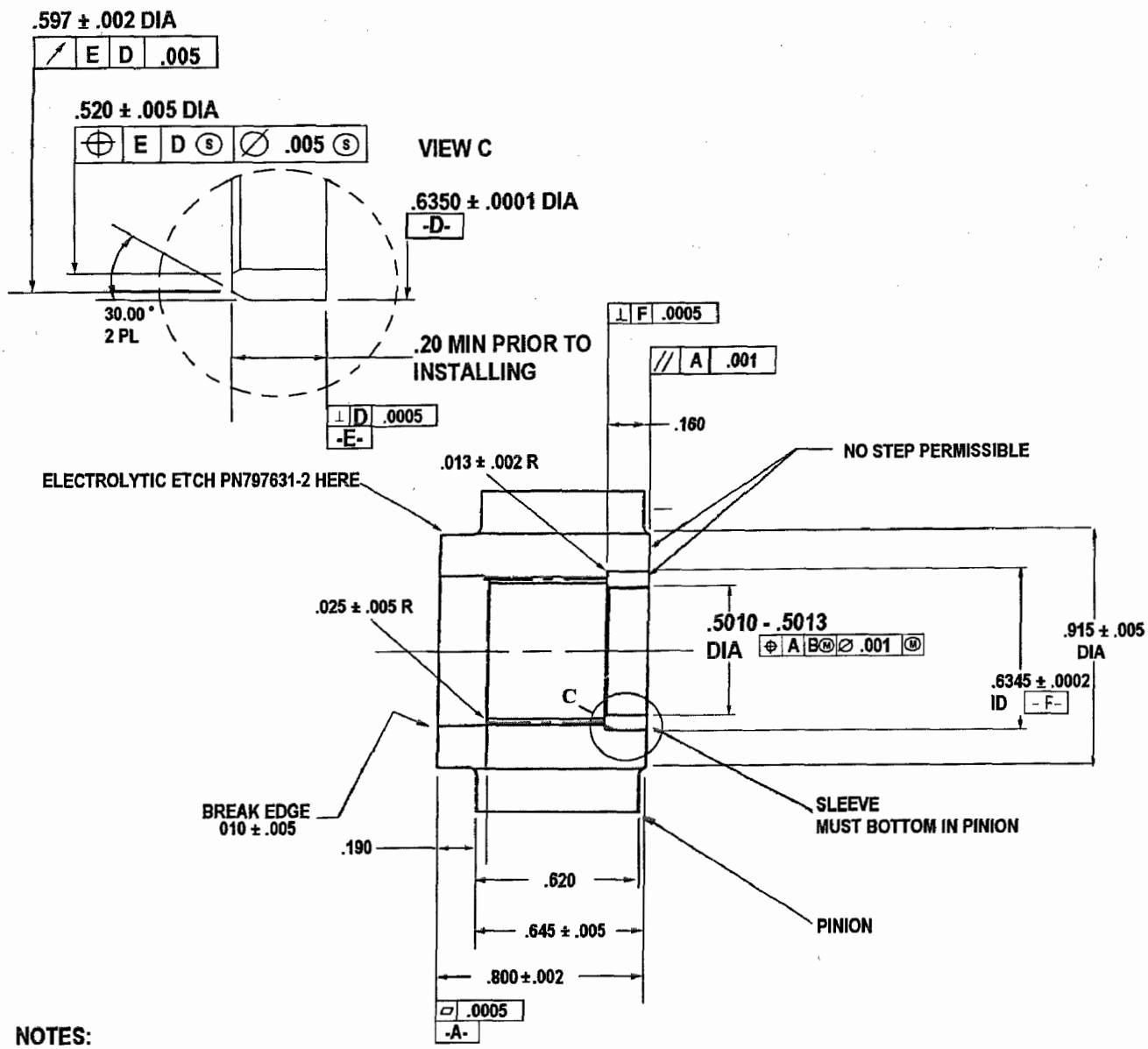
A. Disassemble, clean, and inspect the starter in accordance with the CMM instructions.

B. Use the instructions in DISASSEMBLY of the CMM to remove retention nut part number (PN) 730565-6, and rotor pinion PN 797631-1.

NOTE: Discard the rotor retention nut PN 730565-6 that was removed from the starter. It must be replaced with a new nut to ensure that the running friction of the nut is reduced.

C. The rotor pinion may be reworked from PN 797631-1 to PN 797631-2. To rework the rotor pinion, do these steps:

(1) Machine the pinion to the requirements shown in Figure 1.



NOTES:

1. PN 797631-1 AS MODIFIED IS EQUIVALENT TO PN 797631-2.

2. SLEEVE MAT'L: AMS6415 OR MIL-S-5000; HARDNESS 36-40HRC; HEAT TREAT PER MIL-H-6875

Figure 1. Rework of the Rotor Pinion

(2) Install the sleeve PN 797631-21 in the pinion. Press the sleeve into place using 1000 ± 100 lbs. axial force and make sure that it bottoms in the pinion gear.

(3) Finish machine the pinion and sleeve to the requirements shown in Figure 1. No steps are permissible.

(4) Reidentify the rotor pinion PN 797631-1 to PN 797631-2 as given below:

1 Electrolytic etch the PN "797631-2" onto the surface as shown in Figure 1.

D. Use the instructions in ASSEMBLY of the CMM to assemble the rotor pinion and retention nut with the following changes:

(1) Refer to Figure 2. Assemble the shim PN 732110-264, the rotor pinion and sleeve PN 797631-2, the retention nut PN 730565-6, and the headless straight pin PN 732224-1 with the steps that follow:

(a) Install one 0.021inch (0.53 mm) thick solid shim PN 732110-264 on the turbine rotor PN 792937-5 against the ball bearing PN 797647-1.

WARNING: WEAR GOGGLES AND GLOVES WHEN YOU USE LUBRICATING OIL. USE IT IN AN AREA WITH A GOOD FLOW OF AIR. LUBRICATING OIL CAN IRRITATE THE EYES, SKIN, AND BREATHING PASSAGES.

(b) Apply lubricating oil, MIL-L-23699 or MIL-L-7808 on the internal splines of the rotor pinion and sleeve PN 797631-2, the external splines of the rotor shaft PN 792937-5.

(c) Align the internal splines of the rotor pinion and sleeve PN 797631-2 and the external splines of the rotor shaft.

(d) Use a thin film of Ultrachem assembly fluid #1 (national stock number 9150-00-159-5012) available from UltraChem, Inc. Wilmington DE Cage Code 2H317, as a thread lubricant. Coat the threads of the turbine rotor shaft PN 792937-5, the retention nut PN 730565-6 and the load bearing face of the retention nut and mating face of pinion PN 797631-2 with a thin film of Ultrachem.

NOTE: If you remove or replace the nut to align the locking pin holes you must re-coat the nut threads and nut face with a thin film of Ultrachem each time the nut is removed.

(e) Load pinion spline to rotor spline in a counterclockwise direction when looking at the nut.

(f) Apply initial nut torque of 360 - 375 in-lbs.

(g) Loosen nut to 0 in-lbs

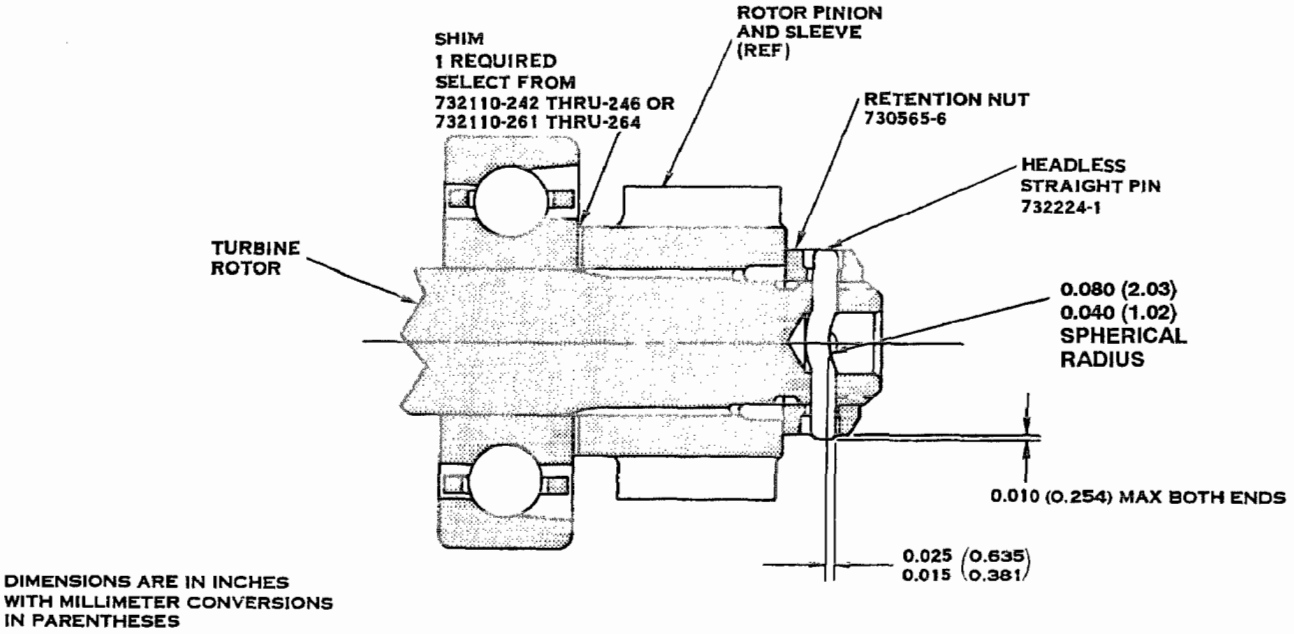


Figure 2. Shim Rotor Balancing Assembly/Install Pin

(h) Re-torque the nut with the pinion spline loaded to rotor spline in a counterclockwise direction, apply initial nut torque of 50 - 60 inch lbs.

NOTE: You can use the Rotor Retention Nut Angle Wrench Kit GS23880-1or a protractor and permanent marker to accomplish the steps that follow.

NOTE: The Rotor Retention Nut Angle Wrench Kit GS23880-1 can be used on several Hamilton Standard starters. You will use only some of the parts in the kit for this starter. The kit consists of the following parts: GS23880-11 Protractor, GS23880-12 Small Pinion Adaptor, GS23880-13 Large Pinion Adaptor, GS23880-14 13/16 inch 12 Point Socket/ Pointer, GS23880-15 15/16 inch 6 Point Socket Adaptor, GS23880-16 5/8 inch 6 Point Socket/Pointer, GS23880-17 Thumb Screw.

(i) After obtaining a torque of 50-60 inch lbs, remove the torque wrench. Install the protractor GS 23880-11 on the Small Pinion Adapter GS23880-12 and secure it with Thumb Screw GS23880-17. Install the pinion adaptor on the pinion gear. Place the GS 23880-14 or -16 socket/pointer on the retention nut PN 730565-6 and with the pinion adaptor loaded in a counterclockwise direction, align the pointer on the socket with the zero degree mark on the GS 23880-11 protractor.

(j) If you are not using the GS tool, use a permanent marker to make a thin reference mark on the nut and pinion gear that line up with one another. Call this reference mark zero degrees.

(k) Use a protractor to determine two points on the pinion, one at **44 degrees** and another at **54 degrees**, clockwise from the zero reference line.

(l) Tighten the nut in a clockwise direction while loading the pinion gear in a counterclockwise direction until the socket pointer lines up with the **44 degree** mark on protractor.

(m) Find the hole in the retention nut PN 730565-6 as related to the hole in the rotor shaft PN 792937-5 (see Figure 3).

NOTE: Do not crimp the headless straight pin PN 732224-1 during the following procedures. The pin is crimped after the rotor assembly is leak checked.

(n) If the hole in the retention nut PN 730565-6 is aligned with the hole in the rotor shaft PN 792937-5, install the headless straight pin PN 732224-1 per Figure 3. If the pin is centered in the hole in the retention nut PN 730565-6 as shown in Figure 3, go to the ASSEMBLY section of the CMM and balance the rotor assembly and deform the headless straight pin PN 732224-1 per the CMM.

(o) If the headless straight pin PN 732224-1 cannot be installed as shown in Figure 3, use the steps that follow to align the hole in the shaft with the hole in the nut.

NOTE: There are four scribe lines on the end of the turbine rotor shaft which agree with the holes in the retention nut.

1 If the hole in the nut and the hole in the rotor shaft do not align, it is permissible to change shims (use single shim only) in accordance with Table 3 or to replace the retention nut. If you replace the retention nut PN 730565-6 with another nut, then repeat steps (1)(d) through (o). If you replace shim PN 732110-264 use the steps that follow.

Table 3. Retention Nut Alignment

Degrees of Misalignment	Replace Shim PN 732110-264 with this Shim PN
0°	N/A (install pin)
1° to 10°	Rotate nut to install pin
11° to 20°	732110-263
21° to 30°	732110-262
31° to 40°	732110-261
41° to 50°	732110-246
51° to 60°	732110-245
61° to 70°	732110-244
71° to 80°	732110-243
81° to 90°	732110-242

2 Locate the hole in the nut which is near to a scribe line going clockwise. Make an estimate of the number of degrees between the hole and the scribe line.

3 If the number of degrees between the hole and scribe line is from 1 to 10, turn the nut clockwise and install the pin.

4 If the number of degrees between the hole and the scribe line is 11 or greater, select a shim from Table 3 that corresponds to the number of degrees. Remove the retention nut, the rotor pinion and sleeve, and the 732110-264 shim. Install the new shim.

5 Install the rotor pinion and sleeve and the retention nut again.

6 Do steps (1)(d) through (o) again.

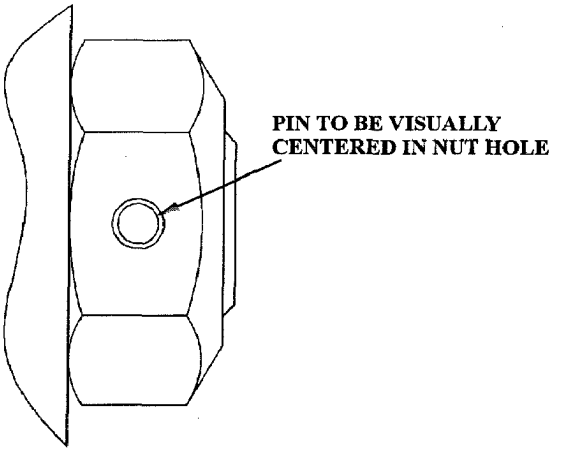


Figure 3.
Pin Alignment

7 The final angle of the nut shall be **44° to 54°** from the zero point which is located when the nut has 50 to 60 inch pounds of torque on it. The headless straight pin PN 732224-1 must be centered in the hole in the retention nut PN 730565-6 as shown in Figure 3.

E. Use electrolytic etch to reidentify the turbine assembly part number from 797652-4 to 797652-5. The part marking is located on the bottom surface of the turbine assembly. Put an X over the -4 and add a -5 after the X.

F. Use the instructions in TESTING AND TROUBLESHOOTING of the CMM to test the Pneumatic Starter.

G. To show that this Service Bulletin was done, add the modification number "L13" to the Pneumatic Starter identification plate. The Hamilton Sundstrand part number is not changed by this Service Bulletin.

H. Hamilton Sundstrand Internal Reference Number 273210.

I. Hamilton Sundstrand Internal Reference Number is 80_2516.

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