URGENT

***TB 1-1520-238-30-19**

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

AUXILIARY POWER UNIT (APU) CLUTCH P/N 3886000-5,125 HOUR BEARING REPLENISH OR REPLACE FOR ALL AH-64 AIRCRAFT

Headquarters, Department of the Army, Washington, D.C.

6 February 2004

NOTE

This publication is effective until rescinded or superseded.

1. PRIORITY CLASSIFICATION. URGENT.

1.1 Aircraft in use. IAW SOF AH-64-04-01.

1.2 Aircraft in AVUM, AVIM, or depot level maintenance. IAW SOF AH-64-04-01.

1.3 Aircraft in Transit. IAW SOF AH-64-04-01.

1.3.1 Surface/Air Shipment. IAW SOF AH-64-04-01.

1.3.2 Ferry Status. IAW SOF AH-64-04-01.

2. SUMMARY OF PROBLEM.

2.1 Summary. Since May 2003 there have been 9 APU clutch failures that have caused extensive aircraft damage. Engineering investigation indicates that the failures may be caused by a lack of grease in the clutch output bearing or contamination of the grease with APU oil in the output bearing. Longer APU operating times may be a factor.

2.2 Purpose.

2.2.1 Require an APU clutch P/N 3886000-5 initial and 125 hour recurring output bearing maintenance/inspection to be performed IAW this TB at the AVIM level.

3. END ITEMS AFFECTED - All AH-64 aircraft.

4. ASSEMBLIES/COMPONENTS/PARTS AFFECTED -

Nomenclature	Part No.	NSN
APU Clutch	3886000-5	2835-01-164-5786

NOTE

When complying with the requirements of this message, complete forms and records entries IAW DA PAM 738-751. ULLS-A units will use appropriate “e” forms.

5. REQUIRED.

5.1 Standard Tools Required.

Tool Number	Nomenclature
SCS 18099B01	Standard Mechanic Tool Set
1H814	Arbor Press
SC518099CLA09	2 to 3 inch depth micrometer
SC518099CLA09	3 to 4 inch depth micrometer
2923	1 inch OD micrometer
QJ117B	Torque Wrench (range 100 in/lbs)
GGG-W-00686	Torque Wrench (range 700 in/lbs)
	Center Punch
	Common Screw Driver
	Bench Vise
1127-001	Brush, Application, Small
4000	Scale (Range, 1000 grams, accuracy +/– 1.0 grams)

5.2 Consumables Required.

Identification Number	*Nomenclature*
369-050-9002	Mobilgrease28 (MIL-G-813322E)
TT-1735	Isopropyl Alcohol
	Cotton Swabs
Stabond C-111	Sealing Compound
Liqui-Moly NV	Anti-seize Compound
Hylomar	Sealing Compound
Sanovac 5 (or equivalent)	Lubricant
	Paint Thinner
	Synthetic Rubber Gloves
	Acetone

REPLACEMENT PARTS						
Part Number	Alternate Part	NSN Number	Nomenclature	Replacement Procedure	Re-Greasing Procedure	Quantity Per Unit
3886018-2		5301-01-180-7706	Nut	X	X	1
3886014-6		5365-01-176-3567	Gasket (0.010 inch thick)	X	N/A	AR
3886014-7		5365-01-176-3568	Gasket (0.016 inch thick)	X	N/A	AR
3886014-9		5365-01-179-7465	Gasket (0.002 inch thick)	X	N/A	AR
MS21043-3		5310-00-844-3302	Nut	X	X	5
S9413-241	M83248/1-241	5331-00-165-1959	Packing	X	X	1
3886051-1		3110-01-166-9106	Bearing, Annular Ball	X	N/A	1
VC-1000-16		No NSN	Cap, Plastic	X	X	1
VC-437-16		No NSN	Cap, Plastic	X	X	1
VC-812-16		No NSN	Cap, Plastic	X	X	1

Table 1. List of 100% Replacement Parts

BENCH STOCK PARTS			
Part Number	Alternate Part	NSN Number	Nomenclature
366550-7		5330-01-168-0629	Seal, plain encased
MS21279-05		5306-00-494-2620	Bolt
3886028-1		2835-01-177-9982	Plug, shaft
NAS1191E02T3LK		5305-01-191-7477	Screw
MS9556-08		5306-00-113-3771	Bolt
NAS620C10	S8157N281-062	5310-00-989-0640	Washer
MS9565-09		5306-00-143-1764	Bolt
MS9556-09		5306-00-116-7790	Bolt

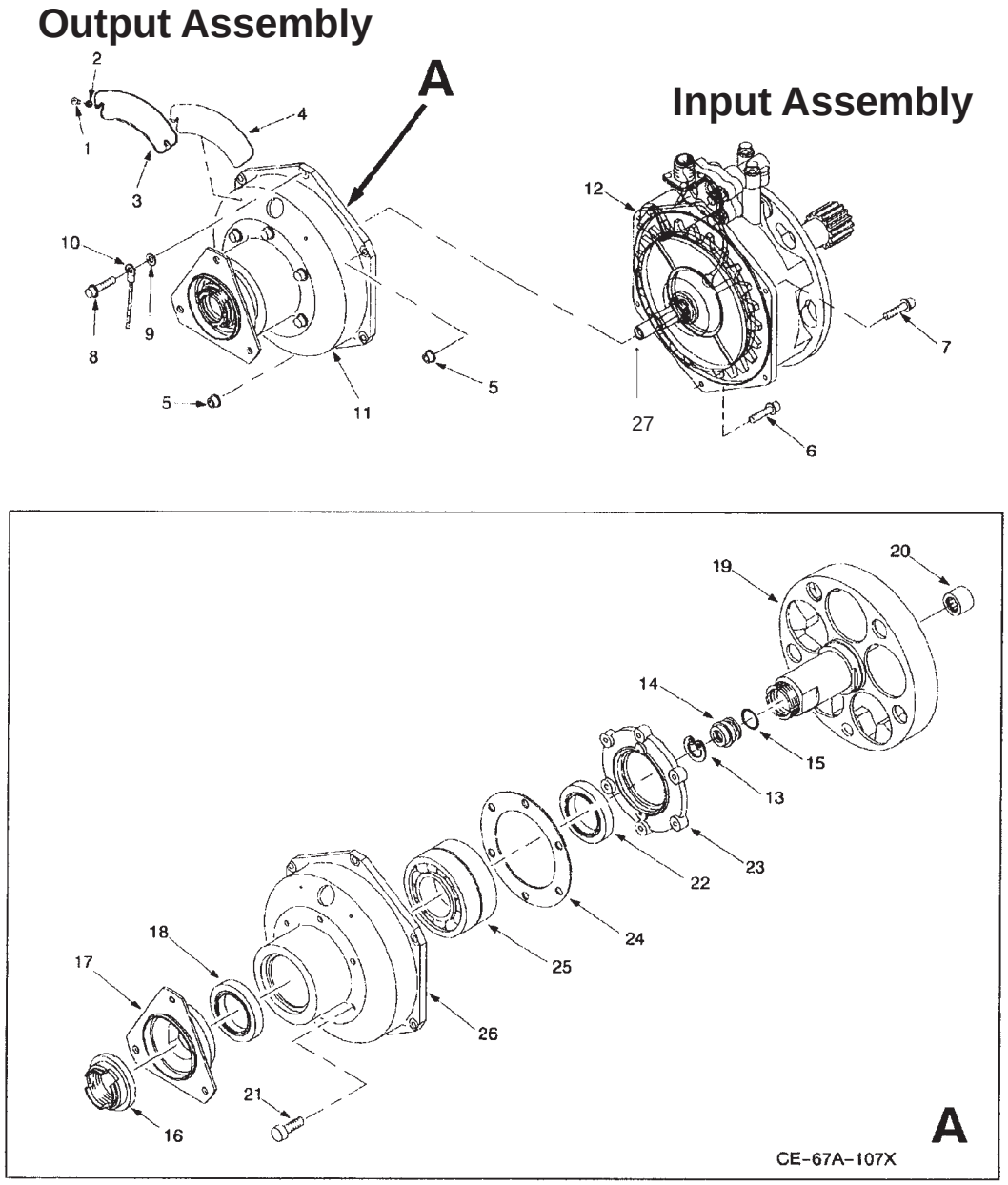
Table 2. List of Bench Stock Parts

5.3 Kits

Number	Kit Name
3618194-1	Bearing Repack Kit
3618196-1	Bench Stock Kit
3618195-1	Bearing Replacement Kit

5.4 Training Required.

6. PARTS TO BE INSPECTED. REFER TO FIGURE 14 FOR THE LOCATION OF ALL CLUTCH COMPONENTS. Part callout number will be listed in parenthesis.



Callout Number	Nomenclature	Callout Number	Nomenclature	Callout Number	Nomenclature
1	Screw	10	Ground Strap	19	Splined output adapter
2	Washer	11	Clutch output section	20	Roller bearing
3	Data Plate	12	Clutch input section	21	Bolt
4	Gasket	13	Retaining ring	22	Plain encased seal
5	Nut	14	Plug, shaft	23	Seal plate assembly
6	Bolt	15	Packing, preformed	24	Gasket
7	Bolt	16	Nut	25	Annular ball bearing
8	Bolt	17	Rotating flange	26	Output housing
9	Washer	18	Plain encased seal	27	Bearing journal

Figure 1. Exploded View APU Clutch Assembly

7. CLUTCH DISASSEMBLY PROCEDURES.

WARNING

Cleaning procedures shall be accomplished in a well-lighted, well ventilated area with adequate safety and fire prevention equipment readily available.

CAUTION

Protect ports, bores and passages of assemblies or components between maintenance procedures.

CAUTION

Use plastic caps or plugs to seal lubrication lines and passages. Do not use cloth, tape or aluminum caps/plugs.

CAUTION

Maintain hardware integrity. Do not interchange clutch detail hardware with other clutch assemblies.

CAUTION

Provide proper coverings or supports to protect shafts, splines and projecting parts from damage. If tapping is required to separate parts, use a cellulose-tipped hammer or a fiber or rawhide mallet. If clamping is necessary, clamp parts in vices that have micrata jaws or equivalent.

CAUTION

Ensure plastic caps remain installed on both sides of the splined output adapter to preclude contamination of roller bearing (20).

CAUTION

Heat discoloration of metal surfaces is acceptable except where noted. Scale that could come loose and damage the clutch shall be removed.

NOTE

Cleaning procedures for individual parts shall be consistent with good shop practices and the following procedures. Correct cleaning for all parts is important to the successful operation of the clutch assembly.

NOTE

Prior to cleaning, record all identifying marks that could be removed by the cleaning and/or repairing process. Examine all parts and assemblies for signs of scoring, burning or other defects. Note physical conditions that will not be apparent after cleaning. Tag involved parts before they are cleaned and laid out for detail inspection.

NOTE

Refer to figure 1 for the location of all clutch components. Refer to the web site www.https//ams14.redstone.army.mil/safety/sof/pic/a6450401.pdf for pictures of critical inspection and assembly steps.

NOTE

Discard all removed self-locking nuts at time of disassembly.

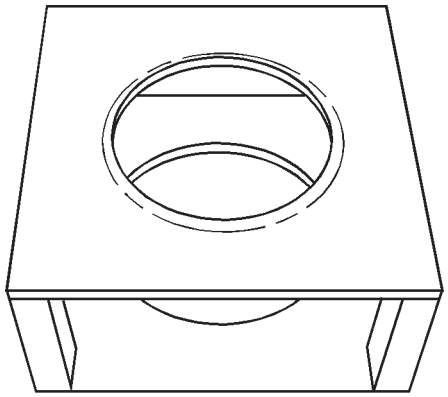
NOTE

Place parts on workbench, in order of disassembly in preparation for cleaning and inspection. Keep hardware and small parts together in trays or baskets.

NOTE

During disassembly, parts may be cleaned of excess oil or grease, and soiled areas may be removed using a clean, lint free cloth. Flange areas and sealing surfaces shall be cleaned of excess oil, gasket material and sealing compounds. Remove adherent gaskets(s) or sealing compound residues using isopropyl alcohol or thinner. Clean out friction disk debris from output housing (26) and splined output adapter (19). Parts should then be set aside for inspection per Section 9.

7.1 Place clutch assembly on holding fixture (P/N 296844-1, Figure 2) with input section down.



MS022376

Figure 2. P/N 296844-1 – Holding Fixture

7.2 Remove screws (1), washers (2), data plate (3), and gasket (4) - retain for reinstallation.

7.3 Remove bolt (8), washer (9) and ground strap terminal (10) - retain for reinstallation.

7.4 Remove nuts (5) and bolts (7). Discard nuts (5). Retain bolts (7) for reinstallation.

7.5 Remove nut (5) and bolt (6) at small identification plate. Discard nut (5). Retain bolt (6) for reinstallation.

NOTE

Friction disk cavity may have a small amount of wetness due to static leakage and operation. Do not reject clutch for this condition.

7.6 Separate outlet housing (Figure 1, Detail A) and attached parts from inlet housing.

7.7 Install plastic cap (P/N VC-437-16) on the end of the clutch (12) output shaft.

7.8 Bag or cover input section of clutch (12) - store in a clean area on work bench with the APU side down.

CAUTION

Immediately wipe off clutch debris/grease film from the aft opening and ID surface of the splined output adapter (19) before the aft protective plastic plug is installed. Ensure the roller bearing (20) is not contaminated when doing this.

7.9 Install plastic cap (P/N VC-812-16) into the inner diameter of the aft opening of the splined output adapter (19) to protect roller bearing (20) from contamination.

7.10 Place splined output adapter holder (P/N 298171-1, Figure 3) in bench vice.

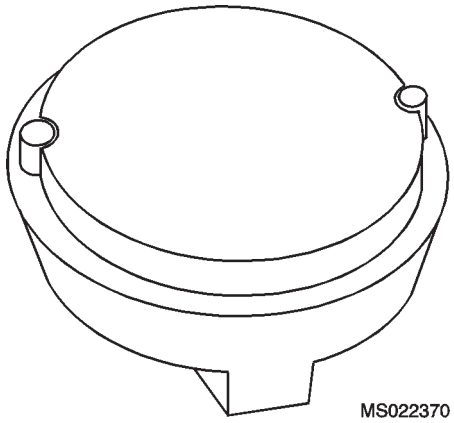


Figure 3. P/N 298171-1 Splined Output Adapter Holder

7.11 Place splined output adapter (19) of outlet housing assembly on splined output adapter holder. Using punch (P/N 3210689-1, Figure 4), unstake nut (16). Apply direct pressure downward while unstaking nut to avoid damaging threads.

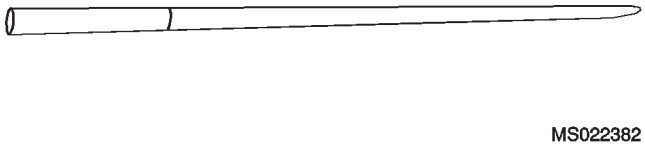


Figure 4. P/N 3210689-1 Alignment Punch

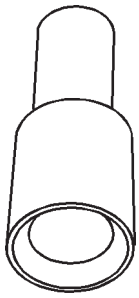
CAUTION

Ensure locking mechanism on nut (16) is fully released prior to removal of nut (16) from splined output adapter (19).

NOTE

Apply direct pressure downward onto spanner wrench during removal of nut (16).

7.12 Using spanner wrench (P/N 298168-1, Figure 5) remove nut (16) from splined output adapter (19) and discard nut.



MS022371

Figure 5. P/N 298168-1 – Spanner Wrench

7.13 Remove six bolts (21) - retain for reinstallation.

NOTE

Using Arbor Press – Position parts, along with proper tooling, onto base of arbor press. Align parts and carefully apply pressure to tooling to start removal process. When alignment is assured, press part to separate.

7.14 Place output housing assembly (11) on holding fixture (P/N 296844-1, Figure 2) with the bolt side against the holding fixture. Make sure output housing assembly is centered in holding fixture. Using arbor press and press tool (P/N 298530-5, Figure 6), press the splined output adapter (19) through the rotating flange (17). Place output housing on work bench. Do not lift output housing (26) by holding the rotating flange (17).

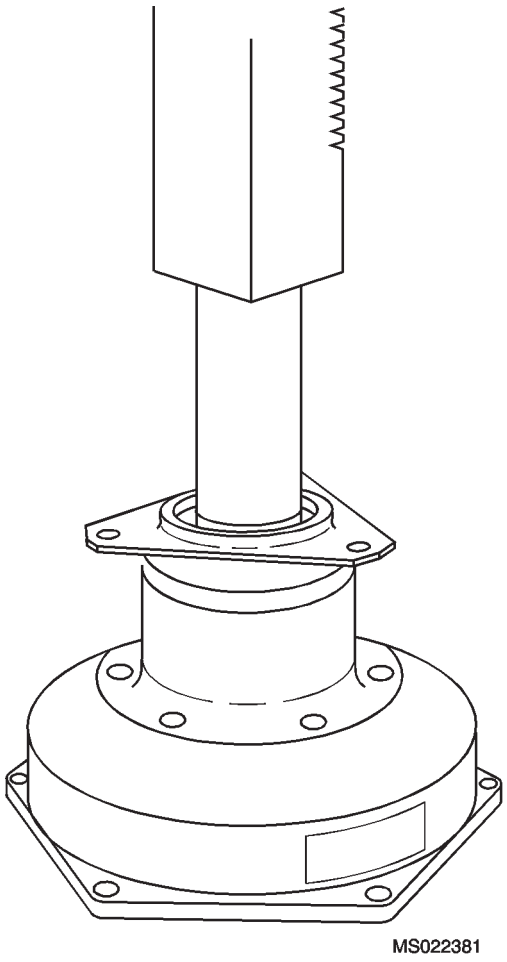


Figure 6. P/N 298530-5 Press Tool

WARNING

Adequate precautions must be taken to insure that the annular ball bearing (25) is not contaminated. If any contamination is suspected reject the bearing and replace with a new bearing.

WARNING

Always exert pressure (press/pull) to the inner race of annular ball bearing (25). Applying pressure to the outer race may cause damage to the race or rolling elements or may cause the bearing to separate.

CAUTION

Handling of bearings should be minimized. When handling bearings it is recommended that personnel wear synthetic rubber gloves. If rubber gloves are not available, clean (non-shedding) cotton gloves may be worn.

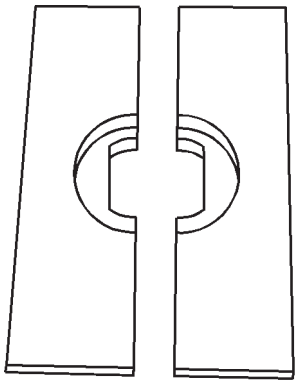
CAUTION

Support the splined output adapter (19) to avoid damaging the adapter as it releases from the output housing assembly (26).

CAUTION

Ensure the press tooling does not contact the rotating flange (17) during the removal process.

7.15 This operation must be accomplished while wearing synthetic rubber gloves. Connect bearing plates (P/N 3210688-1, Figure 7), between the annular ball bearing (25) and seal plate assembly (23) with the concave side of the bearing plate towards the bearing. Insure that the bearing plate is inserted fully between the bearing and the splined output adapter to support the bearing inner race. With the annular ball bearing (25) upward, carefully lower the splined output adapter (19) through the top of the holding fixture (P/N 296844-, Figure 2), until the bearing plate (P/N 3210688-1, Figure 7) rests on the holding fixture.



MS022375

Figure 7. P/N 321–688-1 – Bearing Plate

7.16 Put the press tool (P/N 298530-5) on top of the spline and using the arbor press, remove annular ball bearing (25) from the splined output adapter (19).

7.17 Carefully remove seal plate assembly (23) with plain encased seal (22) from splined output adapter (19), avoiding any sideward movement that could damage the rubber seal.

7.18 Install plastic cap over splined output adapter threads (19) and aluminum vent plug (14) to protect from damage and contamination.

WARNING

If possible, store bearings in a dry area cooled by air conditioning or refrigeration. Do not store in areas cooled by evaporative coolers. Do not store bearings near electrical motors or transport in electrically operated vehicles to preclude the possibility of magnetizing.

WARNING

Do not attempt to clean annular ball bearing (25) internal components.

CAUTION

Do not use cleaning solvents during this cleaning process as they may contaminate bearing grease, causing the grease to lose its lubricating properties.

CAUTION

Extreme care must be taken when handling and cleaning the annular ball bearing (25). Follow the cleaning requirements of Section 8 when cleaning the bearing.

7.19 Perform preliminary inspection of annular ball bearing (25) to look for dried, caked grease on bearing faces; between the bearing cage and inner ring; or between bearing balls. If any dried or caked grease is found, reject the bearing. If the inspection determines that the bearing must be replaced, tag the bearing with an unserviceable tag, place bearing in a plastic bag, and mark the bearing P/N, clutch S/N, and clutch TSO on it. Provide the bearing to a Boeing CFSR, AMCOM LAR, or put the bearing in a shipping container for any clutch being returned.

7.20 If no dried, caked grease is found, clean annular ball bearing (25) by carefully wiping off excess grease from outer portions of raceway. Hold bearing face-down to insure debris does not fall into bearing races. Do not attempt to remove grease from lubrication ports along the bearing's outer diameter. Remove any moist grease found between the bearing cage and inner ring with a clean, dry lint-free cloth, taking care not to push old grease into the bearing.

7.21 Perform detailed inspection of annular ball bearing IAW paragraph 8.12. Seal bearings in a plastic bag while awaiting detailed inspection to minimize contamination. Mark clutch serial number on bag.

8. INSPECTION PROCEDURES.

NOTE

Good shop practices include the compilation of complete and accurate inspection records. It is suggested that a record of inspections and actions accomplished be maintained in the event that such maintenance results are required at a later date.

NOTE

Clutches being dispositioned as unserviceable shall be tagged and a thorough notation of the reason for rejection shall be entered on the applicable documentation.

NOTE

All micrometers, gages, indicators, scales other measuring and test equipment shall be calibrated in accordance with the applicable Military Standard or manufacturer's recommendations.

8.1 Visual Inspection Guidelines: A visual inspection involves viewing the part for general appearance in an effort to locate conditions that cause or indicate abnormal wear.

8.2 Threaded parts: Inspect splined output adapter (19) shaft for stripped, galled or crossed threads - If any of these conditions exist, reject clutch assembly, reassemble as needed to return clutch to supply for disposition.

8.3 Threaded inserts: Inspect seal plate assembly (23) threaded inserts for security and condition of threads (stripped, galled, and cross-threaded). If any of these conditions exist, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.4 Press-fit surfaces: Visually inspect press-fit diameters of the splined output adapter (19) shaft, annular ball bearing (25) bore, and seal plate (23) anti-rotation pins for security, dents and gouges. If any of these conditions exist, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

NOTE

Seal surfaces on the output spline adapter (19) and rotating flange (17) will have a 'seal track' due to operational contact from the plain encased seals (18) and (22). This is a normal operating condition - do not reject clutch for this condition.

8.5 Sealing surfaces and flanges: Visually inspect splined output adapter (19) and output flange (17) sealing surfaces for dents and gouges. If any of these conditions exist, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.6 Spline inspection: Visually inspect splines using a strong light.

8.6.1 Splined output adapter (19) dimensional inspection: Inspect friction disk engagement splines for excessive wear. Spline wear must not exceed 0.100 inch in depth. If this condition exists, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.6.2 Visually inspect spline for evidence of fretting, surface flaking, chipping, splitting, rubbing, cracks, chafing or corrosion. If any of these conditions exist, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.6.3 Visually inspect spline for evidence of overheating discoloration. If overheating discoloration of metal is evident reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.6.4 Visually inspect spline for evidence of abnormal or deep wear patterns. If a visual inspection reveals abnormal or deep wear pattern, reject clutch.

8.7 Remove cover from input housing (12), Remove plastic cap (P/N VC-437-16) and inspect bearing journal (27) of output shaft for damage. None allowed.

NOTE

Minor flaking at the friction disk outer edges is acceptable - do not reject clutch. If bearing journal is found to be acceptable replace plastic cap and cover input housing until reassembly. If found to be unacceptable, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.8 Passageways: Flush weep hole in output housing (26) with alcohol. Visually inspect weep hole for obstructions. Remove obstructions as required.

8.9 Flanges: Inspect rotating flange (17) for cracks, fretting, scoring and heat damage - none allowed. Inspect for deformation at bolt holes and outer edges of flange - none allowed. If any of these conditions exist, reject clutch assembly, and reassemble as needed to return clutch to supply for disposition.

8.10 Roller bearing (20) cavity inspection. If any of the below conditions exists, reject clutch assembly, reassemble and return to supply for disposition.

8.10.1 Inspect roller bearing cavity for burnt, dry, or powdered grease.

8.10.2 Damaged seal packing.

8.10.3 Fractures on roller bearing, rollers, separator or outer race.

8.10.4 Visible wear or deformation on the rollers.

8.10.5 Roller bearing raceway surface on the input shaft is worn or corroded.

8.11 Bearing bore and splined output adapter (19) shaft diameter: Visually inspect annular ball bearing (25) bore and splined output adapter (19) shaft for excessive corrosion or excessive wear and scoring. If any of these conditions exist, reject clutch assembly, reassemble and return to supply for disposition.

NOTE

The bearing bore may show slight wear and scoring from being pressed on and off and should not be rejected for this.

8.12 Annular ball bearing (25) inspection. If annular ball bearing (25) is considered visually acceptable, then the annular ball bearing can be re-greased IAW paragraph 9. Serviceable, well lubricated bearings feel smooth when rotated with no perceptible roughness, catching, or binding. Corrosion should not be evident on the bearing exterior. If any of the below conditions exist, reject the bearing and replace with a new one. If the inspection determines that the bearing must be replaced, tag the bearing with an unserviceable tag, place bearing in a plastic bag, and mark the bearing S/N, clutch S/N, and clutch TSO on it. Provide the bearing to a Boeing CFSR, AMCOM LAR, or put the bearing in a shipping container for any clutch being returned.

8.12.1 Fractured Components. Cracked or broken rings, retainers or rolling elements.

8.12.2 Frozen or seized bearings. Reject bearings that are frozen and cannot be rotated.

8.12.3 Rough Bearings. Reject any bearings that has any obvious catching or binding when turned by hand. Roughness can be caused by caking or deteriorated grease, foreign particles, corrosion, brinelling from improper installation, or spalling of the raceways or rolling elements.

8.12.4 Heat discolored bearings. Discoloration (bluing or a straw color) of the exterior of the bearings usually indicates overheating. If any discoloration is found reject clutch assembly, reassemble and return to supply for disposition.

8.12.5 Corroded bearings. External corrosion frequently indicates that the interior may also be corroded. Reject bearings with corrosion.

8.13 Inspect seal (18) and seal (22) for nicks, dents, and gouges, none allowed. Seal shall be uniform and smooth.

9. PROCEDURES FOR REGREASING THE ANNULAR BALL BEARING (25).

9.1 General Requirements.

9.2 Handling Bearings Prior to Regreasing.

9.2.1 Protection. Bearings received from the clutch disassembly are unprotected and must be given immediate protection. The fact cannot be overemphasized that many bearings are contaminated prior to lubrication or preservation, and must be rejected later. Every precaution shall be taken to keep all bearings surfaces free of foreign material contamination during all phases of the process.

9.3 Handling of Lubricants. It is imperative that lubricants used in rolling bearings are kept clean, and every precaution shall be taken to prevent the contamination of lubricants with foreign materials.

9.4 Lubricating Bearings with Grease.

9.4.1 Under Lubrication. Insufficient amounts of grease will cause premature bearing failure. The oil component of the grease is insufficient and higher operating temperatures and internal wear of the bearing will result.

9.4.2 Over-Lubrication. Excessive quantities of grease causes churning within the bearing with subsequent temperature and volume rise. This is particularly true of the bearings running at high speeds where churning of the lubricant will cause the bearing to run excessively hot.

9.4.3 Excess greases will be thrown out of the bearing causing contamination or malfunction of other components. Early deterioration of the grease, with possible premature bearing failure, is also a result of overlubrication.

9.4.4 Contaminated Grease. Although the amount of grease put into a bearing is of vital importance, the condition of the grease is just as important.

9.5 Clean dust free synthetic gloves shall be used throughout this procedure.

9.6 Calculate replenishment grease weight. Use Regreasing Procedure Worksheet. (Figure 8).

A =_____ Weight of Bearing

T = 481 – A =_____ Total Weight of Grease Required

F = T / 2 =_____ Weight of Grease Required – Each Row

Figure 8. Regreasing Procedure Worksheet.

9.6.1 Weigh annular ball bearing (25) on suitable, clean scale with an accuracy and resolution not greater than +/-1 gram. Record weight as A on worksheet. If the bearing's weight is between 481 and 482 grams then the bearing does not need regreasing.

9.6.2 Subtract A from 481 to obtain total grease requirement. Record weight as T on worksheet. T should not exceed 9 grams. If T exceeds 9 grams replace annular ball bearing (25).

9.6.3 Divide T by 2 to obtain fill per row, F=T/2. Record as F on worksheet. This is the amount of grease that will be added to each row of the bearing in order to attain a replenished bearing weight of 481 grams.

WARNING

Do not attempt to remove grease from the annular ball bearing (25). If excess grease is accidently added to the bearing, do not attempt to remove grease to bring the total weight below 482 grams. If total bearing weight after regreasing is more than 482 grams, replace annular ball bearing (25).

9.7 Add grease to the annular ball bearing (25) as follows:

9.7.1 Place bearing on one of its end faces on clean scale. Using the grease filled syringe, inject the grease into the bearing ball row that is face up into the space between the balls, filling the ball row with F grams of the grease. Access this space by injecting between the inner ring shoulder and the retainer (cage) inner diameter. Monitor the scale reading to insure that the proper amount of grease is being added. Be sure to distribute the grease approximately equally between all ball spaces. Continue to inject grease into the ball row until the bearing weighs A + F. Pick up the bearing, hold the inner ring, and rotate the outer ring slowly several turns to distribute the grease.

9.7.2 Place the bearing on its other end face with the non-regreased ball row face up on the scale. Using a grease filled syringe, inject the grease into the bearing ball row that is face up into the space between the balls, filling the ball row with F grams of the grease. Access this space by injecting between the inner ring shoulder and the retainer (cage) inner diameter. Monitor the scale reading to insure that the proper amount of grease is being added. Be sure to distribute the grease approximately equally between all ball spaces. Continue to inject grease into the ball row until the bearing weighs 481 grams. Pick up the bearing, hold the inner ring, and rotate the outer ring slowly several turns to distribute the grease.

9.8 Place bearing in a clean plastic bag, mark the clutch S/N on the bag, and store in a clean, dry area. Reinstall into the clutch within 24 hours to minimize the possibility of contamination.

10. CLUTCH ASSEMBLY PROCEDURES

CAUTION

Remove plastic caps (P/N VC-1000-16, VC-437-16, and VC-812-16) prior to assembly operations – cover open bores with a clean, lint free cloth to prevent contamination.

CAUTION

Exercise attention to detail during assembly. Maintain fits and clearances as specified. Exercise extreme care to prevent dirt, dust or foreign objects from entering the clutch, with special attention to bearings and bearing cavities. If any foreign objects dropped into the clutch during assembly, stop assembly and find the particle before continuing even if considerable disassembly is involved. If the clutch is to be left for even a short period of time in a partially assembled state, cover all openings.

CAUTION

When special measurements for shimming are made on parts or assemblies prior to their installation in the next higher assembly, these parts shall be tagged as measured components of the higher assembly (clutch serial number) and kept with that assembly. If annular ball bearing (25) is replaced all measurements which included that part shall be repeated using the new bearing.

CAUTION

Do not oversize seal. If seal becomes oversized, remove seal and replace with a new one. Once seal has been properly formed apply a small amount of Mobilgrease28 to seal surfaces and install rotating flange (17) into seal to retain its shape.

CAUTION

Use caution not to damage plain encased seals during disassembly procedure; if damaged refer to paragraph 10.1 to 10.2.

NOTE

Ensure that all clutch parts and assembly tools are cleaned prior to assembly. Wipe all surfaces with a clean lint free cloth.

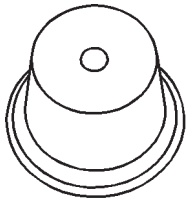
NOTE

Lightly coat all surfaces of shafts that mate with seals and packings, with Mobilgrease28.

10.1 Gently wipe down plain encased seal (18) using a clean, lint free cloth or cotton swab. Encased seals take firm set after being formed. If deformed during the cleaning process replace seal. Once deformed from its original set do not attempt to reform seal.

10.1.1 If plain encased seal (18) is damaged: Using a hammer and common screw driver lightly tap around the circumference of seal housing until it releases from the output housing (26), discard plain encased seal (18). Using paint thinner or acetone ensure excess residual traces of Stabond C-111 compound are removed from output housing.

10.1.2 If replacing the plain encased seal (18), use a small brush to apply a thin, even amount of Stabond C-111 compound to plain encased seal (18) and to bore of output housing (26). Install seal into output housing with a flat side of the seal housing facing inboard towards the output housing. Place output housing (26) onto holding fixture (P/N 296844-1). Place large end of seal installation tool (P/N 298169-1, Figure 9) against seal housing using arbor press and press firmly into output housing (26).



MS022378

Figure 9. P/N 298169-1 – Seal Installation Tool

10.2 Gently wipe down plain encased seals (22) using a clean, lint free cloth or cotton swab. Encased seals take firm set after being formed. If deformed during the cleaning process replace seal. Once deformed from its original set do not attempt to reform seal.

10.2.1 If plain encased seal (22) is damaged, using a hammer and common screw driver lightly tap around the circumference of seal housing until it releases from the seal plate (23), discard plain encased seal (22). Using paint thinner or acetone ensure excess residual traces of Stabond C-111 compound are removed from seal plate.

10.2.2 If replacing the plain encased seal (22), use a small brush to apply a thin, even amount of Stabond C-111 compound to new plain encased seal (22) and to bore of seal plate (23). Place seal into seal plate (23) with a flat side of the housing outboard, away from the seal plate. Place seal plate (23) into bearing plate (P/N 3210688-1, Figure 7), ensuring seal plate is not resting on its anti-rotation pins. Place bearing plate onto the holding fixture. Place large end of seal installation tool (P/N 298169-1, Figure 9) against seal housing and using the arbor press, press seal firmly into the seal plate (23).

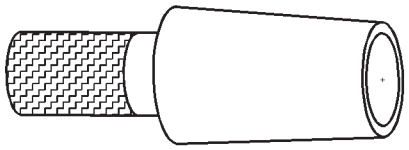
CAUTION

Do not oversize seal. If seal becomes oversized, remove seal and replace with a new one. Once seal has been properly formed apply a small amount of Mobilgrease28 to seal surface and install rotating flange (17) into seal to retain its shape.

CAUTION

Do not deform seal housing during installation. Remove excess compound.

10.2.3 Form seal using plain encased seal (22) forming tool (P/N 298170-1, Figure 10). Press forming tool into flat side of plain encased seal (22). This is the side opposite of the side with the anti-rotation pins. Push forming tool through while rotating tool to form seal. Push forming tool through encased seal (22) until forming tool goes completely through the seal. Do not pull back on the forming tool during seal forming process. The seal diameter should be approximately the size of the flanges (17) seal riding surface.



MS022379

Figure 10. P/N 298170-1 – Seal Forming Tool

10.3 If annular ball bearing (25) has been re-greased proceed to paragraph 10.5. If annular ball bearing (25) has been replaced proceed to paragraph 10.4.

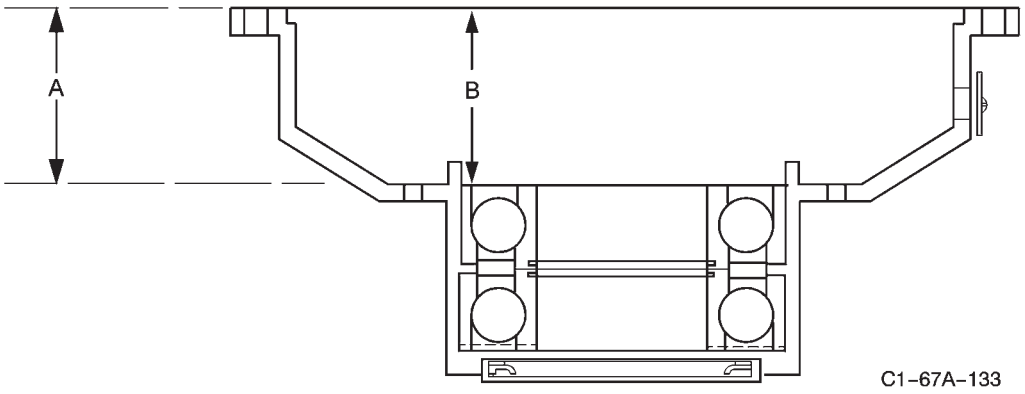
10.4 Measure width of outer race of rejected and replacement annular ball bearing (25) using a 2” – 3” micrometer.

10.4.1 If both annular ball bearing (25) widths are equal within +/– 0.001”, proceed to paragraph 10.5.

10.4.2 If both annular ball bearing (25) widths are not equal within +/– 0.001”, bearing gasket must be replaced. Remove gaskets using an awl being careful not to damage the housing. Clean housing to ensure all gasket material is removed from the output housing.

10.4.2.1 Install new annular ball bearing (25) into output housing (26) with anti-rotation slots facing up. Apply a small amount of Mobilgrease28 to outer diameter of bearing to facilitate installation into housing assembly.

10.4.2.2 Using 3 to 4 inch micrometer and micing bar, measure and record dimensions A and B shown in Figure 15. Dimension A is top of output housing to seal plate assembly mounting surface. Dimension B is top of output housing to bearing outer race. Obtain dimensions at three different locations to ensure reliable calculations.



Dimension A _____ Dimension B _____

Dim A _____

– Dim B _____

= _____

- 0.003

= _____ Clutch Gaskets Required

Total thickness of clutch gaskets required _____ +/– 0.002 inch

Total thickness of clutch gaskets installed _____

MS022384

Figure 11. Gasket Worksheet

CAUTION

Ensure plastic caps are remain installed on both sides of the output adapter shaft to preclude contamination of roller bearing (20).

10.4.2.3 Calculate dimensions for clutch gaskets (24) as follows: (A–B) – 0.003= Gasket +/– 0.002 inch.

10.4.2.4 Using 1 inch OD micrometer, select required amount of gaskets (24) and set aside for later installation (see para 10.9).

10.4.3 Remove annular ball bearing (25) from output housing (26).

10.4.4 Lubricate seal (22) with Mobilgrease28.

10.5 If not previously accomplished, install assembled seal plate assembly (23) onto splined output adapter with (19) anti-rotation pins facing up.

INSPECTION POINT: VERIFY SEAL IS UNDAMAGED AND IS SEATED TIGHTLY AGAINST THE SPLINED OUTPUT ADAPTER (19) SEALING SURFACE.

10.6 Align anti-rotation slot on annular ball bearing (25) with pins on seal plate assembly (23).

INSPECTION POINT: INSURE "V" MARK IS ALIGNED ON ANNULAR BALL BEARING (25) PRIOR TO INSTALLATION ON SPLINED OUTPUT ADAPTER (19).

CAUTION

Remove plastic caps prior to assembly operations.

10.7 Align match marks on bearing inner diameter and press annular ball bearing (25) onto splined output adapter (19).

CAUTION

Ensure output adapter (19) is supported at base of shaft prior to pressing annular ball bearing (25) onto adapter (P/N 298166-2, Figure 12). Failure to support adapter properly may result in damage to the splined output adapter (19).

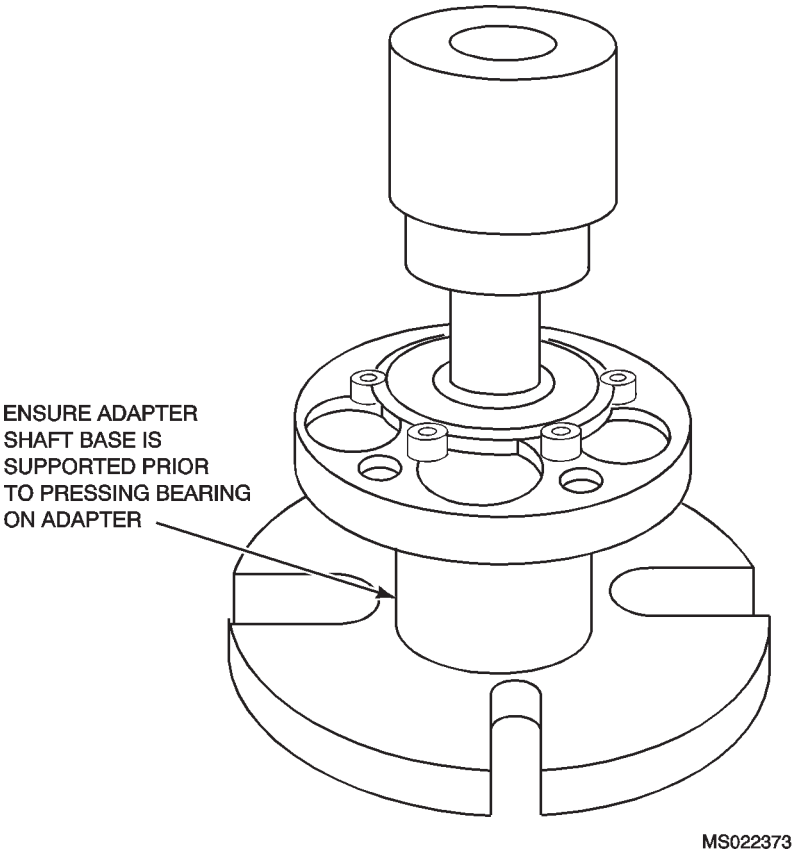


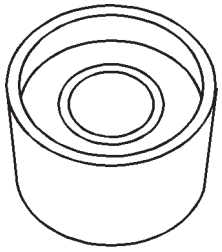
Figure 12. P/N 298166-2 – Bearing Installation Driver

10.8 Using bearing installation tool (P/N 298166-1, Figure 13) and arbor press, install annular ball bearing (25) onto output adapter (19).

CAUTION

Before bearing is fully pressed in check for alignment of bearing slots and alignment pins to ensure full engagement.

10.9 If gaskets (24) are not replaced IAW paragraph 10.4 go to paragraph 10.10. If the gaskets (24) are to be replaced IAW paragraph 10.4 perform the following steps:



MS022372

Figure 13. P/N 298166-1 – Bearing Installation Driver

INSPECTION POINT: VERIFY GASKET THICKNESS PRIOR TO INSTALLATION.

10.9.1 When replacing annular ball bearing (25) gaskets (see para 11.6), apply a thin, even amount of Hylomar compound to both sides of EACH clutch gasket (24) (previously calculated). Apply a thin, even amount of Hylomar compound to the mounting surface of seal plate assembly (23) and the output housing (26).

10.9.2 Install clutch gaskets (24) on output housing (26). Align gasket bolt holes with the output housing (26) bolt holes.

CAUTION

Do not oversize seal. If seal becomes oversized, remove seal and replace with a new one. Once seal has been properly formed apply a small amount of Mobilgrease28 to seal surface and install rotating flange (17) into seal to retain its shape.

CAUTION

Do not deform seal housing during installation. Remove excess compound.

10.10 Form plain encased seal (18) using seal forming tool (P/N 298170-1, Figure 10) by placing tool into the seal inner diameter from the input housing side. Push forming tool through while rotating tool to form seal. Push forming tool through encased seal (18) until forming tool goes completely through the seal. Do not pull back on the forming tool during seal forming process. The seal diameter should be approximately the size of the flange's (17) seal riding surface.

10.11 Apply lubricant Mobilgrease28 to seal (18).

10.12 If not previously accomplished, install rotating flange (17) through plain encased seal (18).

INSPECTION POINT: VERIFY SEAL IS UNDAMAGED DURING INSTALLATION AND IS SEATED TIGHTLY AGAINST THE ROTATING FLANGE (17) SEALING SURFACE.

10.13 Apply Mobilgrease28 to the bearing (25) surface and the housing (21) surface to assist in the installation of the bearing into the housing.

10.14 Hold rotating flange (17) and carefully place output housing (26) over splined adapter (19). Align rotating flange (17) so the flat surfaces on the flange's inner diameter are aligned perpendicular to the output housing's weep hole. The weep hole is located at the clutch 6 O'clock position near the bolt (21).

10.15 Align seal plate assembly (23) anti-rotation pins offset from one “bolt hole” output housing (26) the weep hole. Ensure clutch gaskets (24) remain aligned with seal plate assembly (23).

10.16 Place large end of seal installation tool (P/N 298169-1, figure 9) over the splined output adapter’s (19) roller bearing cavity. Using arbor press, press splined output adapter (19) through the rotating flange (17) until firmly seated – do not apply excessive force.

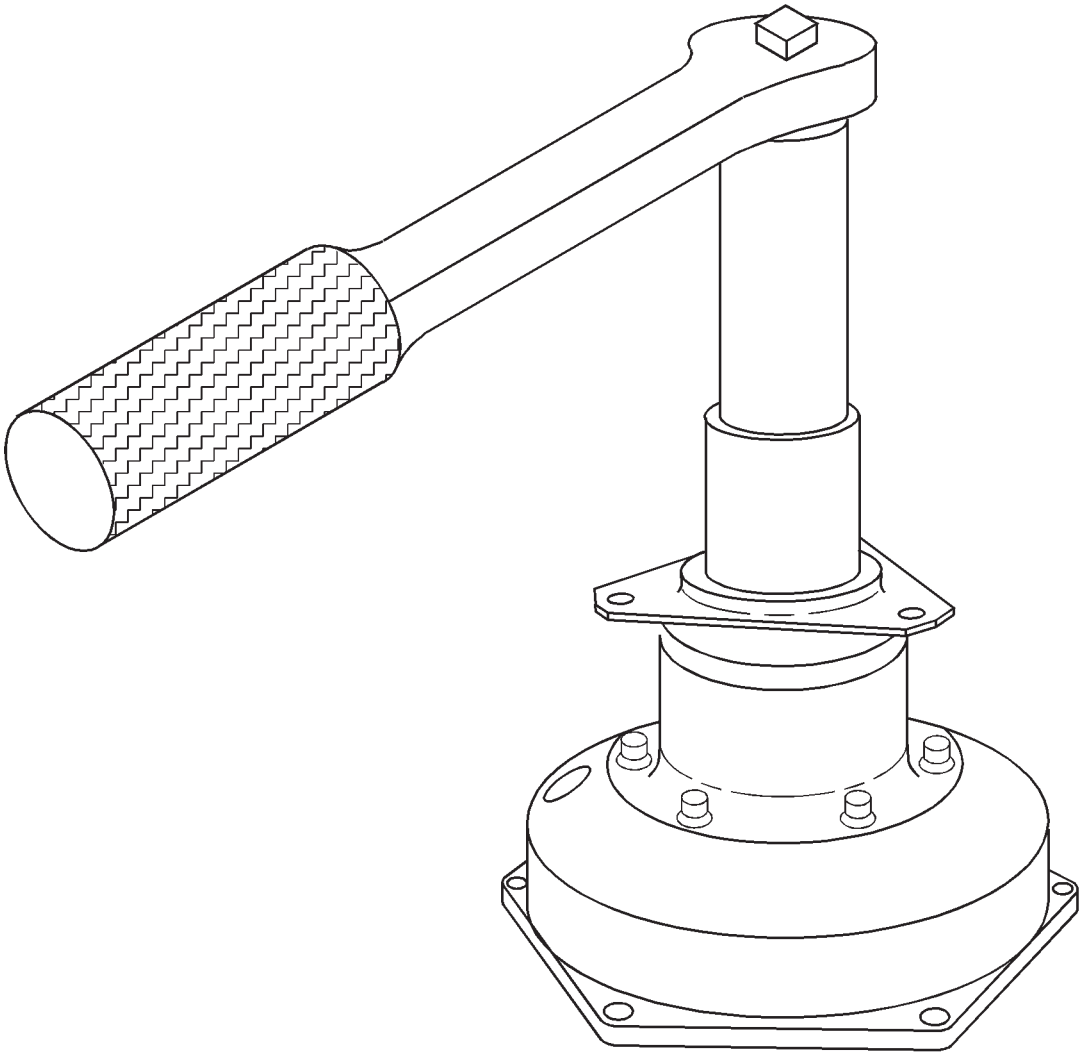
10.17 Install six bolts (21) and run down tight (ensuring bearing and seal assembly anti-rotation devices remain locked in place). Torque bolts (21) to 50 inch-pounds. Torque bolts in a crisscross pattern.

10.18 By hand, install nut (16) onto splined output adapter (19) until tight – ensure threads are not stripped or galled during installation of the nut.

CAUTION

Apply direct pressure downward onto spanner wrench as shown in Figure 14.

10.19 Using spanner wrench (P/N 298168-1, Figure 5), splined adapter holder (P/N 298171-1, Figure 3) and a calibrated torque wrench, torque nut (16) to 550 inch-pounds.



MS022374

Figure 14. Use of Spanner Wrench

10.20 Using modified punch (P/N 3210685-3, Figure 15) stake nut (16) into output adapter shaft (19) in two places, 180 degrees apart.

CAUTION

Ensure splined output adapter (19) threads are not damaged during crimping operation. Rotate assembly to check for binding.

INSPECTION POINT: VERIFY TORQUE OF 550 INCH POUNDS TO NUT (16) AND VERIFY NUT IS CRIMPED IN TWO LOCATIONS 180 DEGREES APART.

MS022377

Figure 15. P/N 3210865-3 – Modified Punch

10.21 Using isopropyl alcohol, clean mating surfaces of output housing (26) and input housing (12).

10.22 Regrease roller bearing (20).

WARNING

All precautions must be taken to insure that the roller bearing (20) is not contaminated. If any contamination is suspected reject the clutch.

10.22.1 A grease quantity not to exceed 1 gram of Mobilgrease28 grease shall be added to the roller bearing and cavity forward of the roller bearing as follows:

10.22.2 Weigh a grease filled syringe. Record weight as W=_____ grams.

10.22.3 Inject Mobilgrease28 grease into the roller bearing cavity (20) from the aft output shaft end, working the grease over the bearing rollers with the syringe tip or end of a small plastic spatula. Use caution to avoid getting grease aft of the roller bearing seal (20) packing.

10.23 Output Section Assembly – Apply a thin, even coat of Hylomar compound to mating surfaces of outlet housing (26) and inlet housing assembly (12). Allow Hylomar to cure for a minimum of five minutes to a maximum of twenty minutes. If housing are not joined within 5 to 20 minutes of applying the Hylomar, remove all Hylomar from both flanges and repeat process step.

10.24 Remove plastic caps (P/N VC-1000-16, VC-437-16, and VC-812-16) prior to assembly operations – cover open bores with a clean, lint free cloth to prevent contamination if assembly action is delayed.

10.25 Locate missing tooth on clutch friction disk on input housing assembly (12) and align with smallest diameter hole (o.44 inch) in splined output adapter (19). Alignment can be viewed through inspection hole. The inspection hole must be lined up with solenoid valve at the clutch 12 o'clock position. The data plate would be at the 12 o'clock position.

INSPECTION POINT: VERIFY MISSING TOOTH ON CLUTCH FRICTION DISK IS ALIGNED WITH SMALLEST DIAMETER HOLE IN SPLINED OUTPUT ADAPTER (19).

10.26 Install assembled output housing (26) onto input housing (12). If a tooth is present when viewing through the output housing inspection hole the assembly is incorrect. Repeat para 10.25 and resume with para 10.27.

10.27 Center punch data plate at location shown in Figure 16 (Below the word “clutch”) after each 125 hour interim maintenance effort.

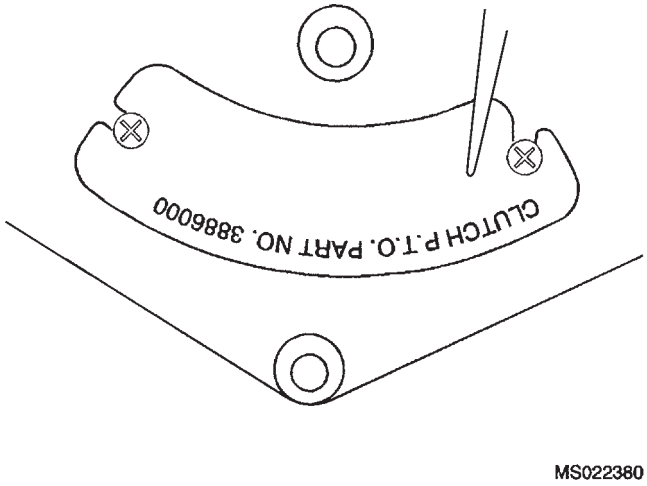


Figure 16. PTO Clutch Data Plate

10.28 Install gasket (4) and dataplate (3) secure with washers (2) and screws (1).

10.29 Lightly coat bolts (6) and (7) with Liqui-Moly NV.

10.30 Install bolt (6) in alignment with the small nameplate and secure with nut (5).

10.31 Install bolts (7) at remaining locations and secure with nuts (5).

10.32 Install washer (9) against the housing, bolt (8) and ground strap terminal.

10.33 Using a calibrated torque wrench torque bolts to 50 inch-pounds.

10.34 Remove excess Hylomar compound from outside diameter of clutch assembly.

10.35 Complete Data Worksheet (Figure 17) and send to the Technical POC.

CLUTCH REPLACEMENT / REGREASING DATA SHEET

Clutch Serial Number: _____ TSO: _____

If Bearing Was Replaced –

. Old Bearing S/N - _____ Width _____ in.

. Reason Old Bearing Was Replaced - _____

_____

. New Bearing S/N - _____ Width _____ in.

If Bearing Was Regreased –

. Initial Weight of Bearing - _____ grams

. Final Weight of Bearing - _____ grams

If Clutch Was Rejected –

. Reason for Rejection - _____

_____

_____

Figure 17. Clutch Replacement / Regreasing Data Sheet

11. SUPPLY/PARTS AND DISPOSITION.

11.1 Parts Required. N/A.

11.2 Requisitioning Instructions. N/A.

11.3 Bulk and Consumable Materials. As required.

12. SPECIAL TOOLS, JIGS AND FIXTURES REQUIRED.

12.1 Special Tools Required.

Tool Number	Nomenclature
3210684-1	Clutch Bearing Tool Kit
298171-1	Splined Output Adapter Holder
298168-1	Spanner Wrench
298166-1	Bearing Installation Driver
298170-1	Seal Forming Tool
298169-1	Seal Installation Tool
3210685-3	Modified Punch
3210688-1	Bearing Plate
296844-1	Holding Fixture
3210689-1	Modified Center Punch
298530-5	Press Tool
2159-3017	Micing Bar

13. APPLICATION.

13.1 Category of Maintenance. AVIM.

13.2 Time Required.

13.2.1 Total of 1 person to inspect, 2 persons to perform disassembly and assembly.

13.2.2 Estimated man-hours to accomplish this task is 4 hours.

13.3 TB/MWO/ECP to be applied prior to or concurrently with this Technical Bulletin: None.

13.4 Publications which require change as a result of this inspection/technical bulletin: Not applicable.

13.5 Deferred Maintenance to be accomplished concurrently with this inspection: As required.

14. REFERENCES.

14.1 TM 1-1520-238-23, Aviation Unit and Intermediate Maintenance Manual, Army Model AH-64A Helicopter.

14.2 TM 1-1500-204-23 General Aircraft Maintenance Manual.

14.3 TM 55-1500-344-23 Aircraft Weapon Systems Cleaning and Corrosion Control.

14.4 TM 1-1520-Longbow/Apache Interactive Electronic Technical Manual (IETM) for Longbow/Apache.

15. RECORDING AND REPORTING REQUIREMENTS.

15.1 Reporting compliance suspense date (aircraft). Upon entering requirements of this Technical Bulletin on DA Form 2408-13, forward compliance message, the report will cite this Technical Bulletin number, date of entry in DA Form 2408-13, aircraft mission design series and serial numbers of aircraft in numerical order.

15.2 Task/Inspection Reporting Suspense Date (aircraft). N/A.

15.3 Reporting Compliance Suspense Date (spares). N/A.

15.4 Task/Inspection Reporting Suspense Date (spares). N/A.

15.5 The following forms are applicable and are to be completed in accordance with DA Pam 738-751, dated 15 March 1999.

15.5.1 DA Form 2408-5 Equipment Modification Record (aircraft).

15.5.2 DA Form 2408-13 Aircraft Inspection and Maintenance Record.

15.5.3 DA Form 2408-18 Equipment Inspection List.

16. WEIGHT AND BALANCE. N/A.

17. POINTS OF CONTACT.

17.1 Technical POC is - Mr. Andy Fabery, AMSRD-AMR-AE-D, DSN 897-2350 ext. 9825 or (256) 705-9825. Fax is (256) 705-9918. E-mail is “andrew.fabery@rdec.redstone.army.mil”.

17.2 Logistical POCS are -

17.2.1 Primary - Mr. Mike Sharp, DSN 897-4044 or (256) 313-4044, Fax is (256) 313-4374. E-mail is “mike.sharp@peoavn.redstone.army.mil”.

17.2.2 Alternate - Mr. Wayne Fusselman, DSN 897-4043 or (256) 313-4043, Fax is (256) 313-4374. E-mail is “wayne.fusselman@peoavn.redstone.army.mil”.

17.3 Wholesale material POC (spares) is TBD .

17.4 Forms and records POC is Ms. Ann Waldeck, AMSAM-MMC-MA-NM, DSN 746-5564 or (256) 876-5564. Fax is DSN 746-4904 or (256) 876-4904. E-mail is “ann.waldeck@redstone.army.mil”.

17.5 Safety POCS are -

17.5.1 Primary - Mr. Harry Trumbull (SAIC), AMSAM-SF-A, DSN 897-2095 or (256) 313-2095. Fax is DSN 897-2111 or (256) 313-2111. E-mail is “harry.trumbull@redstone.army.mil”.

17.5.2 Alternate - Mr. Joseph Creekmore, AMSAM-SF-A, DSN 788-8630-or (256) 842-8630, Fax is DSN 897-2111 or (256) 313-2111. E-mail is “josepg.creekmore@redstone.army.mil”.

17.6 Foreign military sales recipients requiring clarification of this message should contact Mr. Ronnie W. Sammons, AMSAM-SA-AS-UT, DSN 897-0407 or (256) 313-0407. Fax is DSN 897-0411 or (256) 313-0411. E-mail is “ronnie.sammons@redstone.army.mil”.

17.7 After hours contact AMCOM Operations Center (AOC) DSN 897-2066/7 or (256) 313-2066/7.

By Order of the Secretary of the Army:

Official:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0333201

DISTRIBUTION:
To be distributed in accordance with initial distribution number (IDN) 314107, requirements for TB 1-1520-238-30-19.

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@avma27.army.mil>
To: <2028@redstone.army.mil>

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-2840-229-23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04-JUL-85
11. *Change Number:* 7
12. *Submitter Rank:* date time group
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123-123-1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

PIN: 081164-000