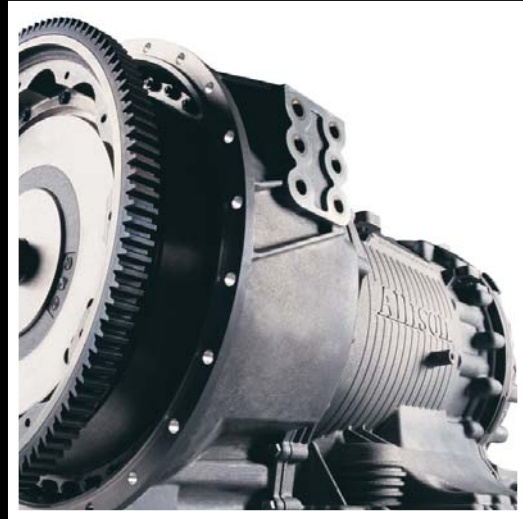


TECHNICIANS' GUIDE



INSPECTION AND ANALYSIS OF THE ALLISON 4000 & B 500 PRODUCT FAMILIES



INSPECTION AND ANALYSIS OF THE ALLISON 4000/B 500 PRODUCT FAMILIES



NOTICE: This guide is intended for use by technicians skilled in diagnosis and repair of automatic transmissions. Contact an authorized Allison Transmission service outlet for further information or clarification if required. All specifications provided in this manual are subject to change without notice.

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ALLISON 4000/B 500 PRODUCT FAMILIES

GLOSSARY OF TERMS

Abrade - Scrape off

Battering - Wear or damage due to hard usage or repeated blows

Brinelling - Permanent deformation of a bearing surface where rollers or balls contact a race; Results from excessive load or impact; Characterized by indentations on a bearing surface

Burr - Sharp metal extending beyond normal surface

Chipped - Having a small piece broken off

Cone - A shape whose base is a circle and whose sides taper up to a point

Crimped - Pinched or pressed together tightly

Crocus cloth - Fine grit cloth

Discoloration - Change in color

Distortion - Change from original shape

Erosion - Gradual uneven removal of material

Fracture - A break or crack

Gall - Wear between parts such that metal transfer occurs

Grooves - Long narrow depressions

Inadequate - Not enough

Light Stoning - Using a medium India oilstone to remove material

Metal Transfer - Metal from one component embedded in a mating component

Nick - Small notch

Pit - Local areas where material has been removed

Porosity - Porous area where air, fluid, or light may pass through

Score - Deep scratch

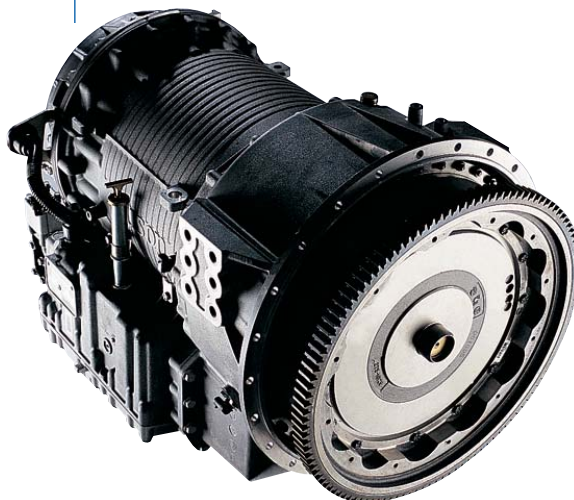
Scuff - Wear due to two moving parts coming together with no lubricant

Spalled - Damage characterized by metal flaking or breaking down on a wear surface; Similar to pitting damage

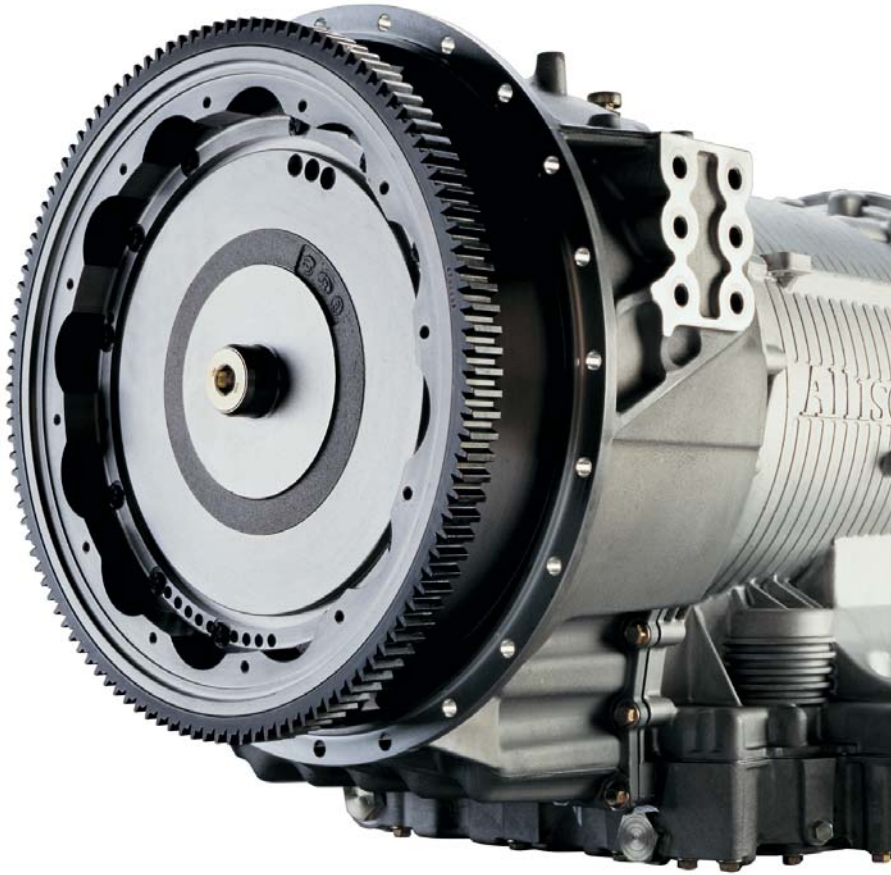
Stripped - Threads broken or damaged so part will not hold torque

TAN - Total Acid Number; Oil acidity should not change by more than 3 from the new fluid TAN when oil sampling is used to determine oil change intervals

Twisted - Bent from original shape



ALLISON 4000 / B 500 PRODUCT FAMILIES INTRODUCTION TO INSPECTION & ANALYSIS



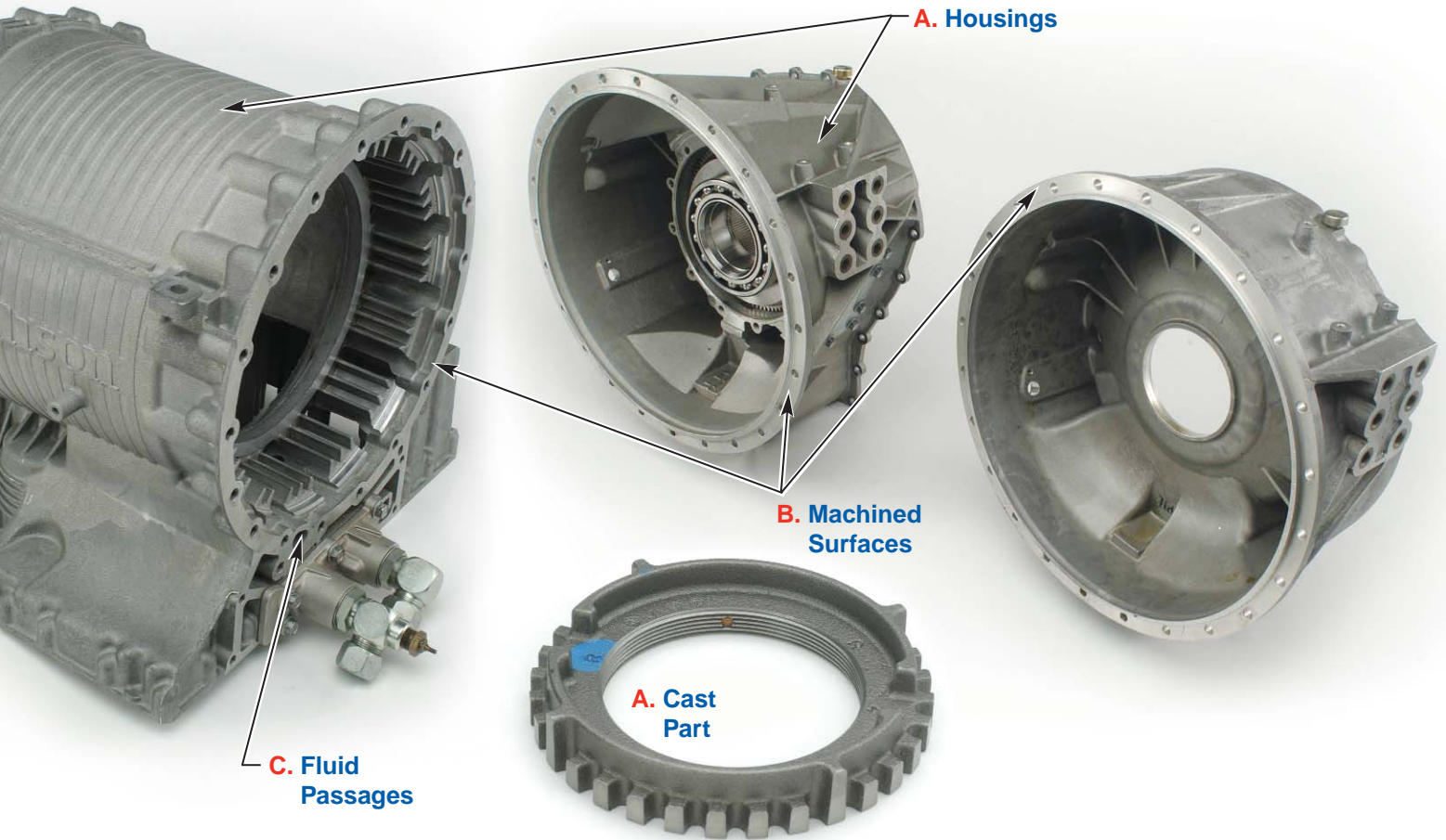
The Technicians' Guide is intended to provide additional guidance with the inspection and analysis of transmission parts. This guide should be used by technicians who overhaul Allison 4000/B 500 automatic transmissions in conjunction with the 4000/B 500 Service Manual (SM2457EN) when inspecting parts to determine their serviceability and reuse.

General Rework Guidelines

Replace parts that cannot be re-worked as outlined in this manual and Service Manual SM2457EN. A soft stone or crocus cloth can be used to attempt removal of "high spots" from transmission parts. After the attempted rework, the part must meet specification if it is going to be reused. Some seal surfaces (*for example the output yoke sealing surface and the converter pump hub sealing surface*) cannot be reworked. Both of these seal surfaces have a controlled finish that can result in a fluid leak if the part is altered by rework.

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR CAST PARTS & MACHINED SURFACES



A. Replace housings or other cast parts that are cracked or broken. Inspect clutch housing sealing surfaces for imperfections that could damage the piston seals or interfere with mating parts. Inspect threaded holes for bad threads. Clean damaged threads with the correct size tap.

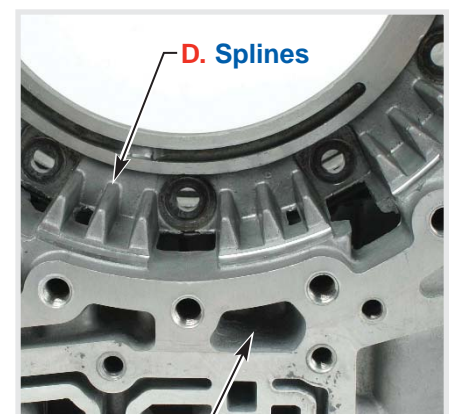
B. Inspect all machined surfaces for damage that could cause fluid leakage. Inspect mounting faces and bores for damage.

C. Inspect all fluid passages for obstructions, porosity, broken lands, cracks and land surface imperfections.

D. Replace housings that have splines worn beyond wear limits. Refer to the Wear Limits Table (7-1) in Service Manual SM2457EN.

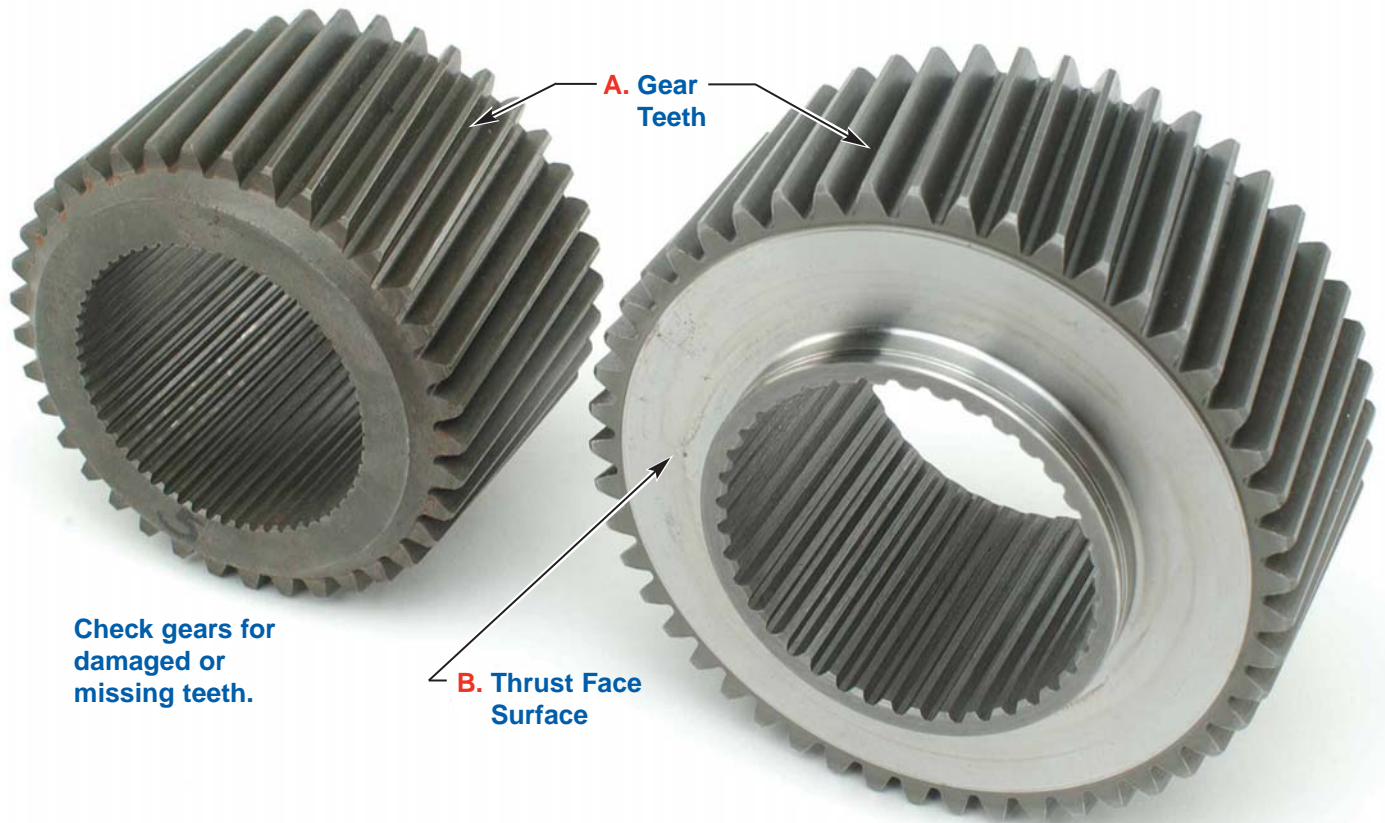
NOTE: Some parts have Spirallock® threaded holes. A standard tap will eliminate the locking feature requiring the reworked part to be replaced. For repair, use a Spirallock® tap to repair Spirallock® threaded holes. As of this printing, the following parts have Spirallock® threaded holes:

- Torque converter front cover flexplate adapter bolt holes and lockup clutch backplate bolt holes.
- Output shafts using a single bolt for flange or yoke retention.



C. Fluid Passages

ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR GEARS



A. Inspect gears for damaged or broken teeth. Inspect gear teeth for wear that has changed the original tooth shape. If this condition is noted, replace the gear. Inspect gears for load pattern and signs of distress. Any signs of distress indicate the gear may fail during operation. Reusing distressed gears is an individual customer decision based on experience. Backlash cannot be used to establish critical gear wear. Pits, scuffs, scores or galling are typically evident long before backlash exceeds specification.

B. Inspect the thrust face of gears for damage. If these defects cannot be removed with a soft stone, replace the gear.

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR SPLINES



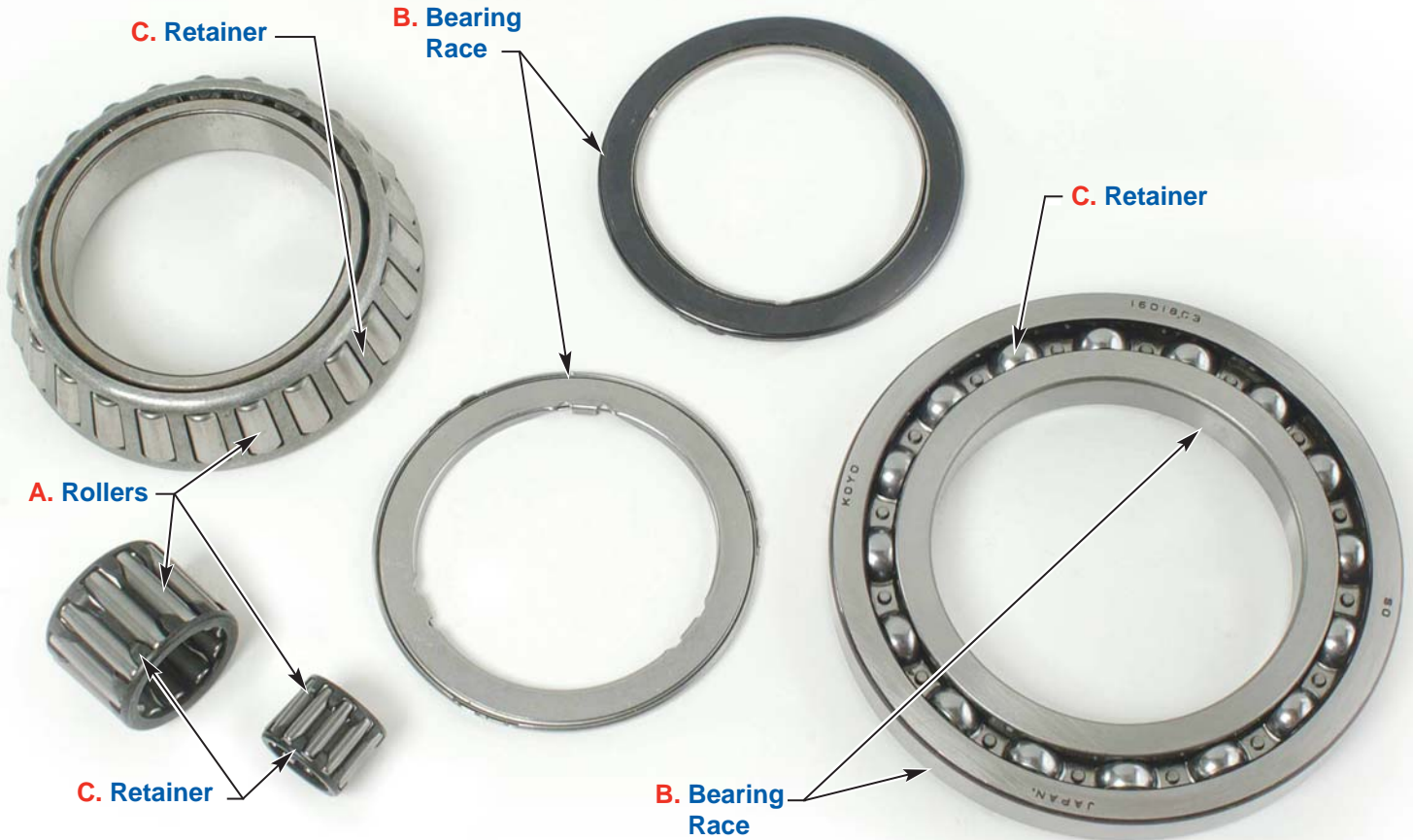
A. Splines

Inspect splined parts for burrs, damage and excessive wear.

A. Inspect splined parts for damage. Remove burrs with a soft stone. Spline wear is not considered harmful except where it affects the fit of the splined parts. Spline wear is determined by comparing feeler gauge thickness with the thickness of the worn area on the spline. Replace parts having excessive spline wear. The maximum movement allowed at the splines is

0.38 mm (0.015 inches) if not otherwise listed in Wear Limits Table 7-1 in Service Manual SM2457EN. Do not reuse a splined part that exceeds the published maximum spline wear. Backlash cannot be used to establish critical spline wear. Accurate backlash measurement requires the mating parts to be concentrically located.

ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR BEARINGS



A. Replace the bearing if any rollers/balls are rusted. Replace the bearing if balls/rollers have a feeling of looseness in the retainer or race compared to a new bearing. Replace the bearing if balls/rollers are discolored from heat, lack of lubrication or debris lapping in the balls/rollers. Replace the bearing if the balls/rollers are worn, galled or abraded. Replace the bearing if it catches or feels rough after being thoroughly cleaned.

B. Replace the bearing if any races are rusted. Replace the bearing if the bearing balls/rollers have a feeling of looseness in the raceway compared to a new

bearing. Replace the bearing if races are discolored from heat, lack of lubrication or debris lapping in the race. Replace the bearing if the races are worn, galled or abraded. Replace the bearing if it catches or feels rough after being thoroughly cleaned.

C. Replace the bearing if any retainer or retainer clip is fractured, bent, dented or missing. Replace the bearing if any retainer is rusted. Replace the bearing if there is a feeling of looseness between the retainer and ball/roller compared to a new bearing. Replace the bearing if it catches or feels rough after being thoroughly cleaned.

(continued)



B. Bearing Race

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR BEARINGS

(continued)

General Bearing Handling & Storage

Dirt is the greatest single enemy of any antifriction bearing. Cleanliness - using clean tools in a clean environment - is at the top of the list of good service techniques. Keep bearings sealed in original containers. Do not allow anyone to open boxes and handle bearings. A new bearing, if not protected, can quickly pick up enough dust even in an apparently clean place to seriously affect its life and operation. Minimize the possibility of rusting or lubricant aging in storage by using the oldest bearings in stock first.

If any part of a bearing assembly has been compromised, replace all detail parts in the assembly (example - races, retainers and the bearing itself). Most bearings fail from preventable causes. Follow a regular system for inspection. Look for bearings with obvious damage first.

General Bearing Inspection

Do not try to judge the condition of a bearing until after cleaning. Do not spin bearings while cleaning them. Rotate them slowly while washing. Do not spin any bearings with air pressure. Put bearings under axial pressure while rotating to bring the balls and races firmly in contact with each other. For single row angular contact bearings, pressure must always be applied on thrust faces.

When immersing in solvent, place bearings in a wire basket so there is plenty of space for cleaner to reach all parts. Tanks should have a screened false bottom to prevent settled debris from being stirred up into the bearings. Agitate the basket frequently until grease, oil or sludge is thoroughly loosened and can be flushed out. Blow solvent out of bearings using dry, filtered air. Be careful not to spin the bearing using air pressure. Lubricate bearings immediately after drying to avoid rust.

NOTE: Wear eye protection and follow the appropriate safety guidelines when using solvents to clean components.

Badly discolored rollers and races are usually a sign of inadequate lubrication. Replace badly discolored bearings. Moderately discolored rollers, cages and races do not necessarily mean that the bearing needs replacement.

Technicians should always try to determine the root cause of failure when inspecting failed components. It's important the root cause be identified and repaired to avoid the same failure in the future. Bearings should be replaced for the following reasons:

Rusted rollers, balls or raceways - rusted rollers, balls or raceways are usually caused by water passing worn or defective seals, or by condensation inside the housing.



Fractured races - a fractured race can be caused by forcing a cocked bearing on or off a shaft. An excessively tight press fit can also cause a race to fracture.

Worn, galled or abraded surfaces - worn, galled or abraded surfaces on a bearing may be the result of a loose fit on a shaft or in a housing. A locked bearing spinning on a shaft or in a housing can also create this type of damage.

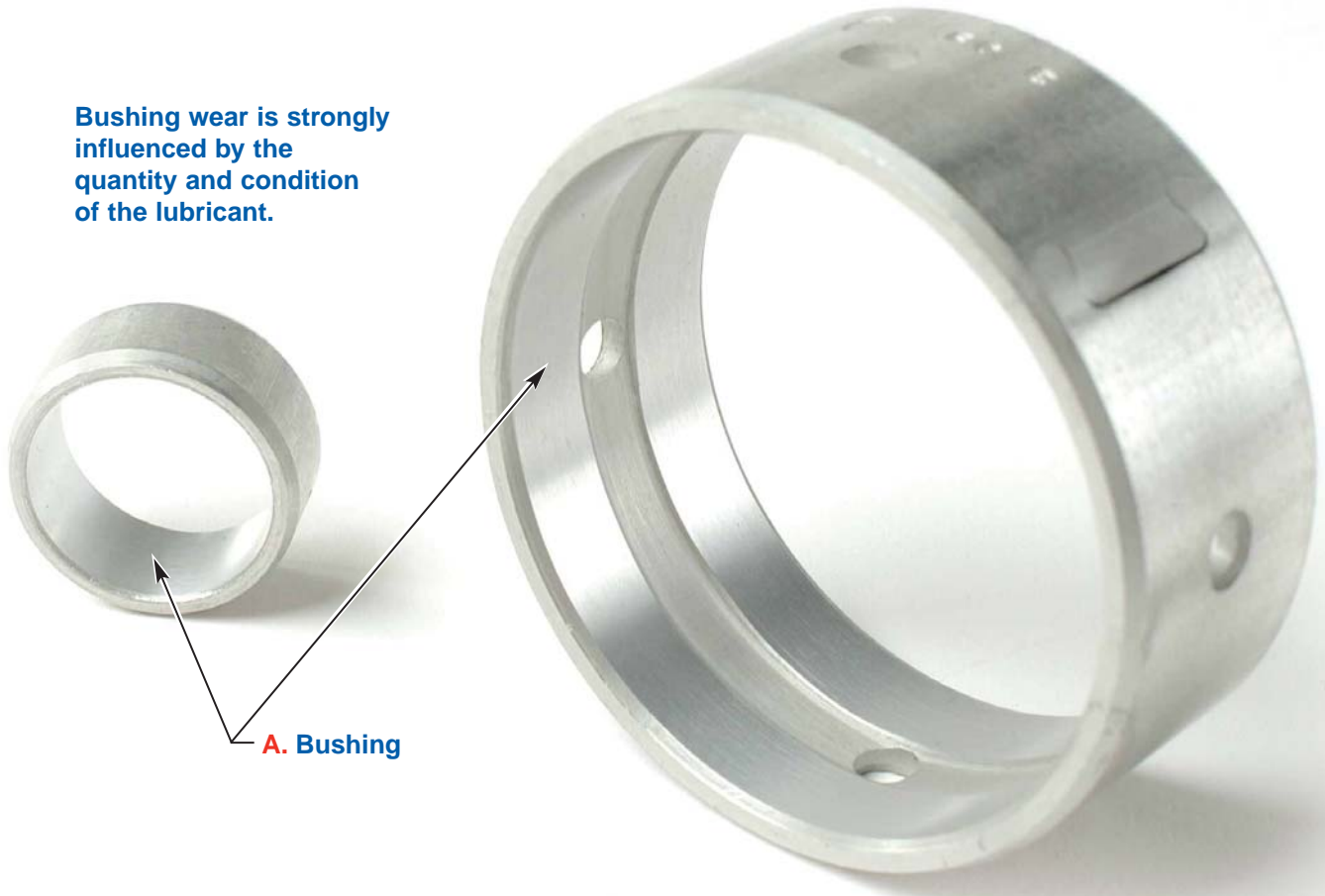
General feeling of roughness - inspect for a general feeling of roughness which remains unchanged by thorough cleaning. This condition generally indicates damage to raceways or rollers caused by dirt, pitting, brinelling or corrosion.

Catchy feeling - inspect for a catchy feeling at one or more points which repeated flushing will not remove. This condition generally indicates a spalled or fatigued spot on the race. Thorough flushing is necessary to be sure the catchy or rough feeling is not caused by foreign debris in the bearing.

Excessive looseness - inspect for excessive looseness which indicates lapping by dirt or an abrasive contaminate in the lubricant. If in doubt, compare the end play against the end play of an identical new bearing. The races, balls and rollers will appear dull gray when lapped by dirt.

ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR BUSHINGS

Bushing wear is strongly influenced by the quantity and condition of the lubricant.



A. Bushing

A. Inspect bushings for wear beyond service limits. Replace any bushing which is excessively worn. Inspect bushings for discoloration and surface damage due to lack of lubrication. Replace any bushing which is damaged.

General Bushing Information

Mechanically, bushings are the simplest type of journal bearing and are often referred to as “plain” bearings. A bushing is simply a sleeve of bearing material, such as bronze or aluminum, in which a component rides. Bushing wear is strongly influenced by the quantity and condition of the lubricant. Bushing bearing surfaces are sometimes grooved to better distribute lubrication across the bearing surface.

Some bushings are susceptible to material leaching. This can be caused by oxidized oil that has turned acidic combined with heat and mechanical loading. The TAN (Total Acid Number) of the transmission oil should not change by more than 3 from the baseline (new fluid) TAN. Changing transmission oil per recommended change intervals or based on a successful oil sampling program will help prevent material leaching.

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR RETAINING RINGS



A. Retaining Rings

A. Inspect retaining rings for damage, distortion and excessive wear. Replace retaining rings if damage cannot be repaired using a soft stone or crocus cloth.

Examine retaining rings for damage, distortion or excessive wear.

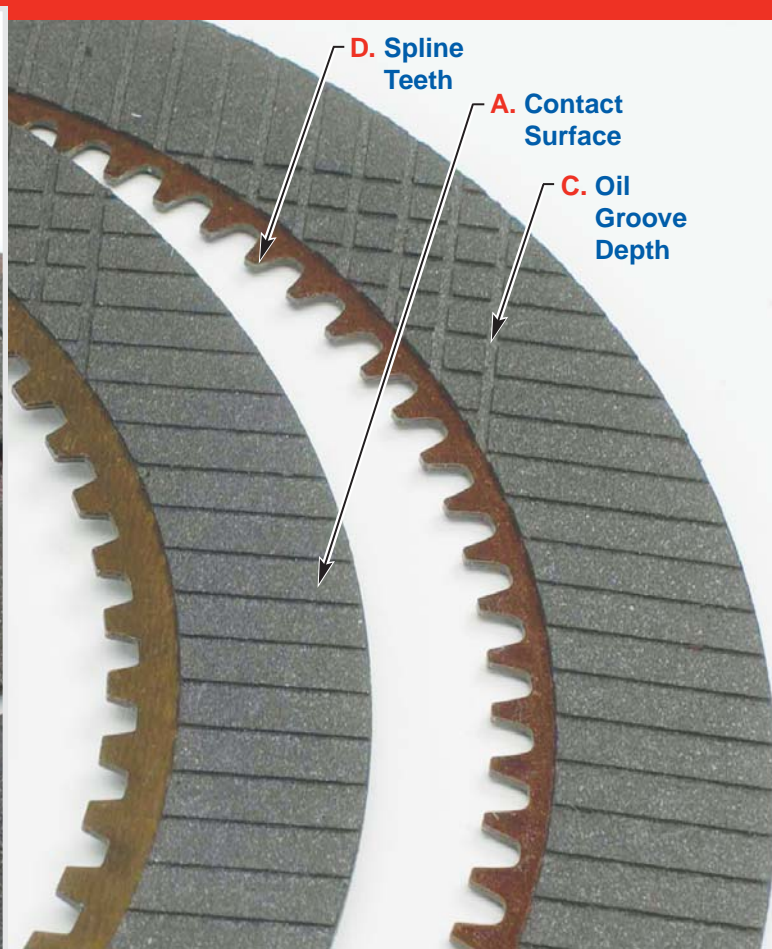
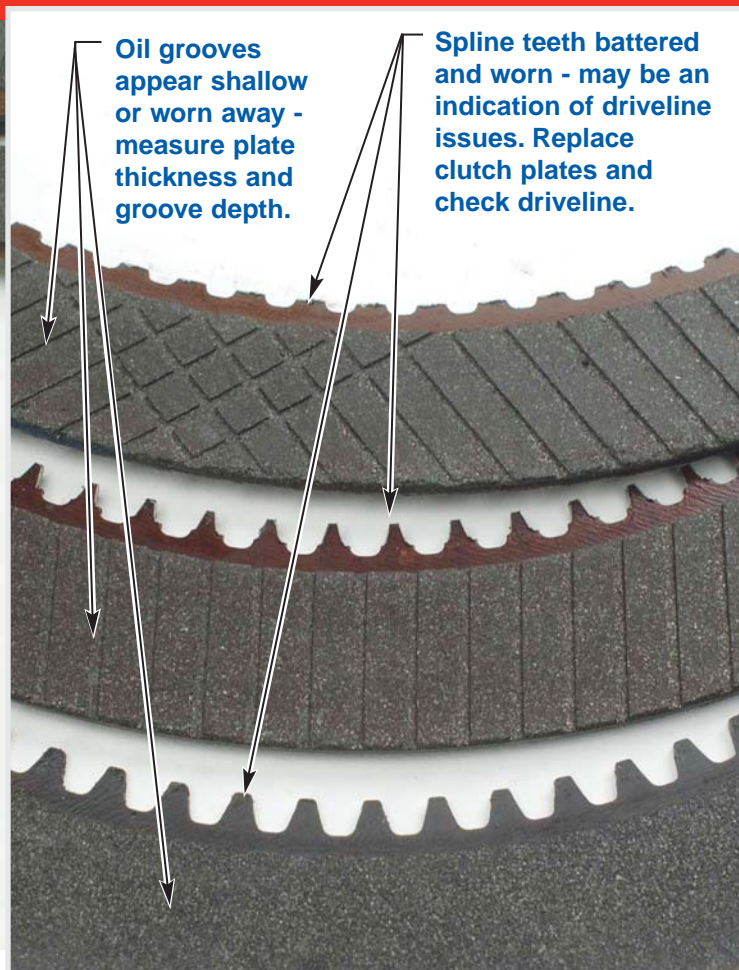
ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR THRUST WASHERS



A. Replace thrust washers if they are worn beyond service limits. Replace thrust washers if they are galled, abraded or distorted. Replace thrust washers if they are damaged due to a lack of lubrication.

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR CLUTCH PLATES



A. Inspect friction plate contact faces and splines for excessive wear, damage and coning. Inspect the plates for burrs, pitted faces, cracks, distortion and damaged spline teeth.

B. Measure friction plate thickness and coning. Reference the Service Manual for minimum thickness and maximum coning specifications. Do not reuse friction plates that do not meet published specifications. If reused plates are slightly coned (within specification), make sure each plate is stacked with the cone facing the same direction.

C. Measure friction plate oil groove depth. Replace any plates that are not within Service Manual minimum groove depth specification.

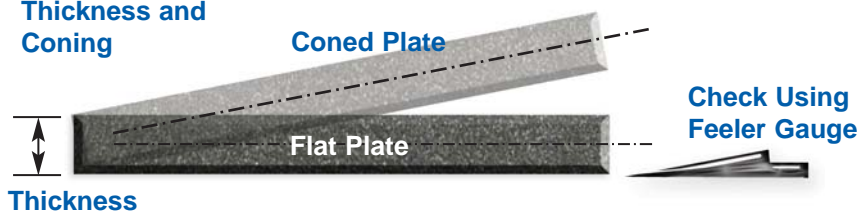
D. Inspect spline teeth for excessive wear and battering. Replace the clutch plate if damage cannot be repaired using a soft

stone or crocus cloth. Replace the clutch plate if spline teeth are broken or missing.

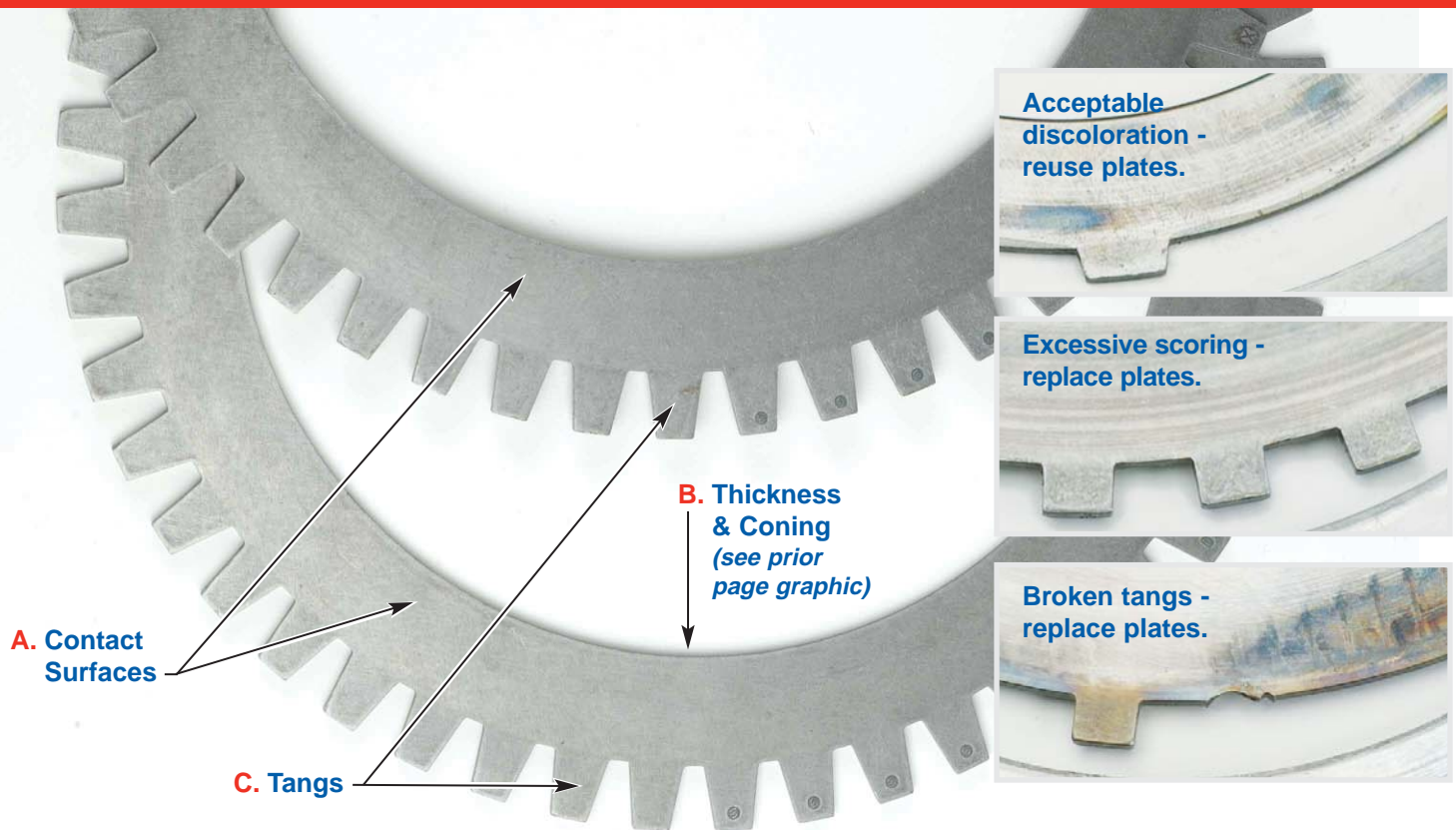
NOTE: Anti-freeze (glycol) and/or water can adversely affect the bonding agent between the friction material and steel core. Replace any friction plates which have been exposed to water and/or glycol.

(continued)

B. Clutch Plate Thickness and Coning



ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR (continued) CLUTCH PLATES



NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will have two or more missing splines. Former friction plates will either have one spline missing or none missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission ECU. The rest of the clutches in the main housing (C1 through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU calibration from

Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if updating from former C5 frictions. If any 4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

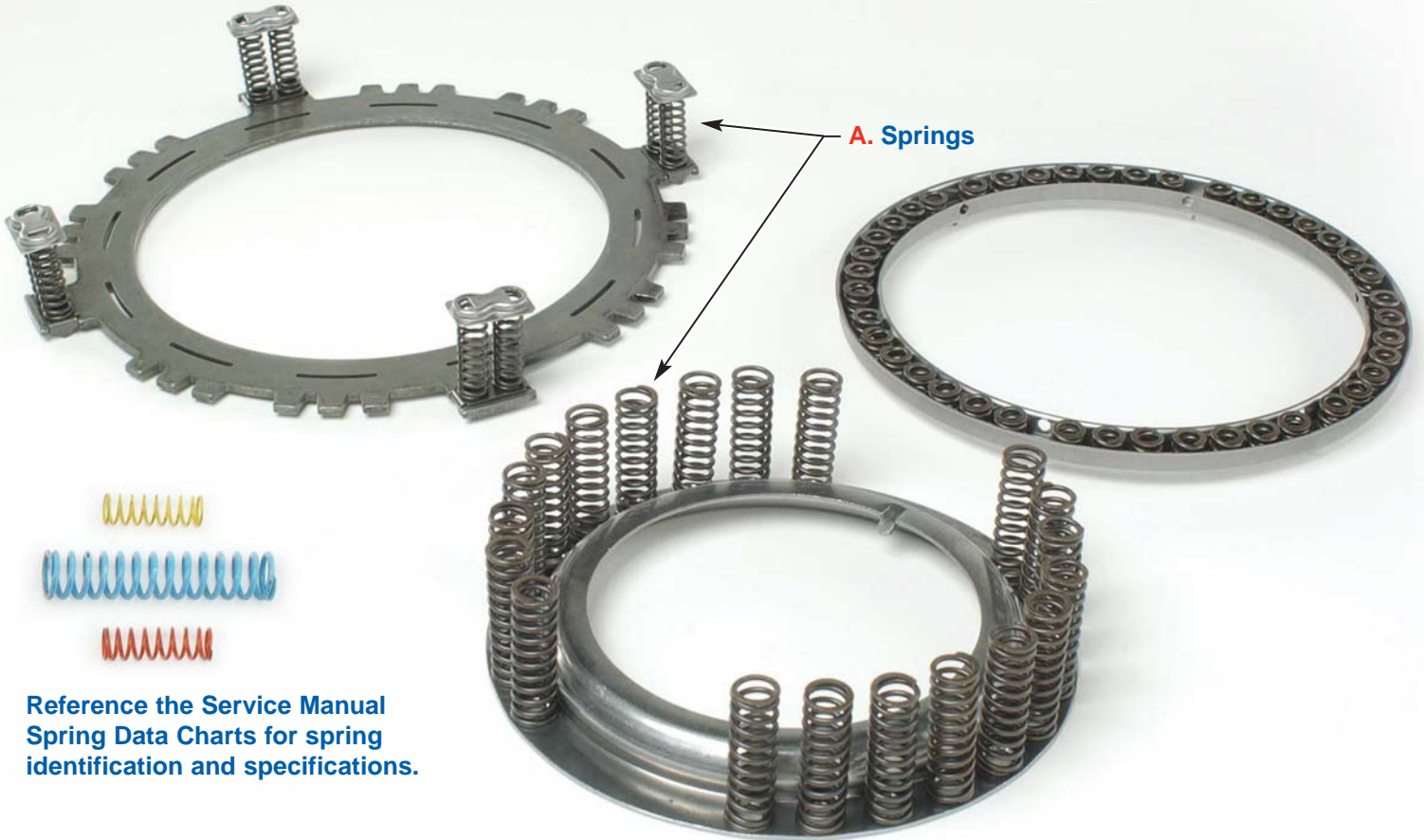
A. Inspect reaction plates for excessive wear, warping, coning and surface damage. Replace any plate with wear exceeding service limits or with damage which cannot be repaired using a soft stone or crocus cloth..

B. Measure reaction plate thickness and coning. Reference the Service Manuals for minimum thickness and maximum coning specifications. Do not reuse plates that do not meet published specifications. If reused plates are slightly coned (within specification), make sure each plate is stacked with the cone facing the same direction.

C. Inspect reaction plate tangs for damage. Replace the plate if damage cannot be repaired using a soft stone or crocus cloth.

ALLISON 4000/B 500 PRODUCT FAMILIES

GENERAL INSPECTION GUIDELINES FOR SPRINGS



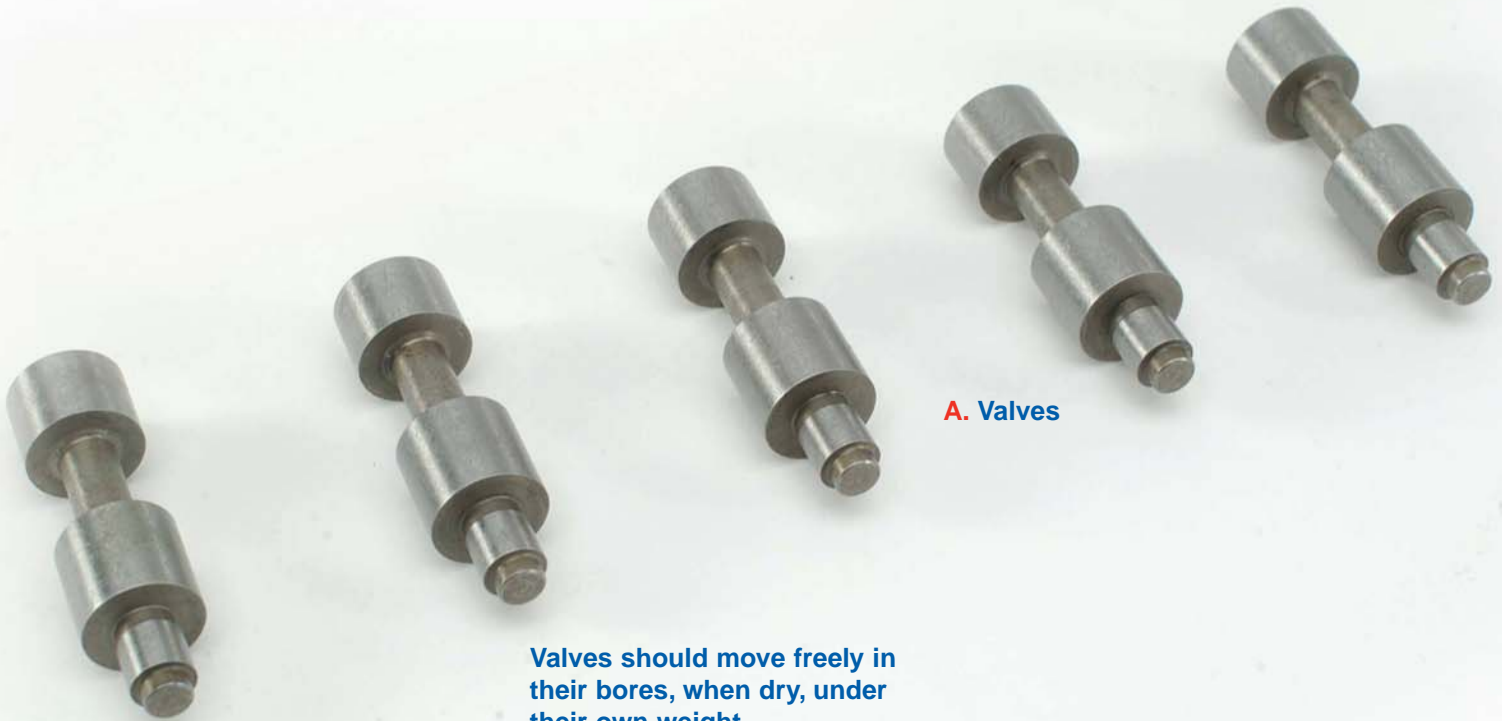
Reference the Service Manual Spring Data Charts for spring identification and specifications.

A. Inspect springs for permanent set and wear due to rubbing adjacent parts. Replace the spring if any of these defects are identified or if the spring fails to meet published service limits. Reference the Spring Data Charts in Service Manual SM2457EN for spring identification and service limit specifications.



Inspect springs for signs of overheating, permanent set or wear due to rubbing adjacent parts.

ALLISON 4000 / B 500 PRODUCT FAMILIES GENERAL INSPECTION GUIDELINES FOR VALVES & VALVE BORES



A. Valves

Valves should move freely in their bores, when dry, under their own weight.

A. Valves must be free of nicks, burrs and scoring and operate smoothly in their bores without sticking. Dry valves must move freely in their bores by their own weight. Replace damaged valves. A soft stone or crocus cloth can be used in an attempt to repair slight irregularities.

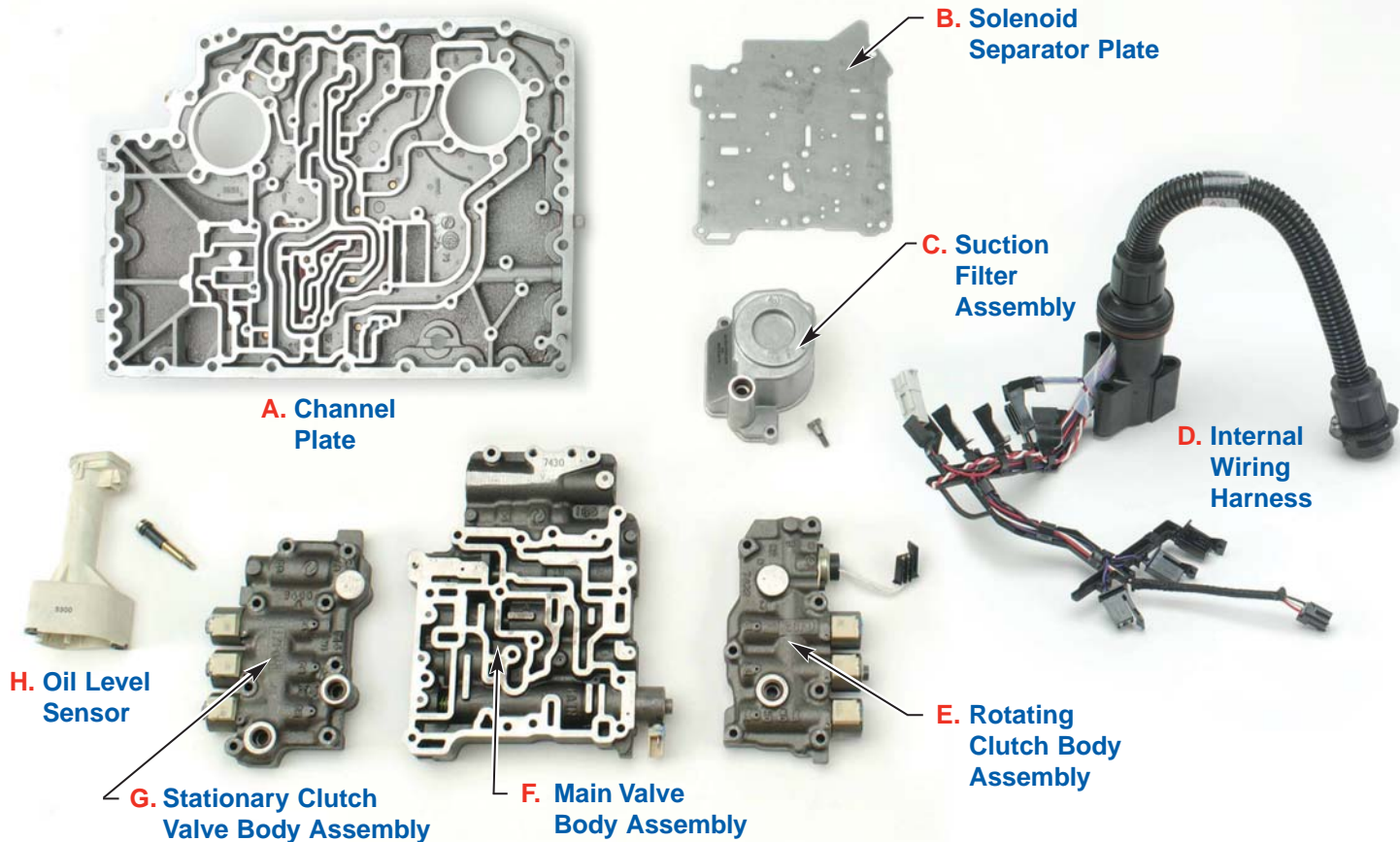
B. Valve bores must be free of nicks, burrs and scoring. No honing of any kind is allowed. A soft stone or crocus cloth can be used in an attempt to repair slight irregularities.



B. Valve Bores

Valve bores must be free of nicks, burrs and scoring.

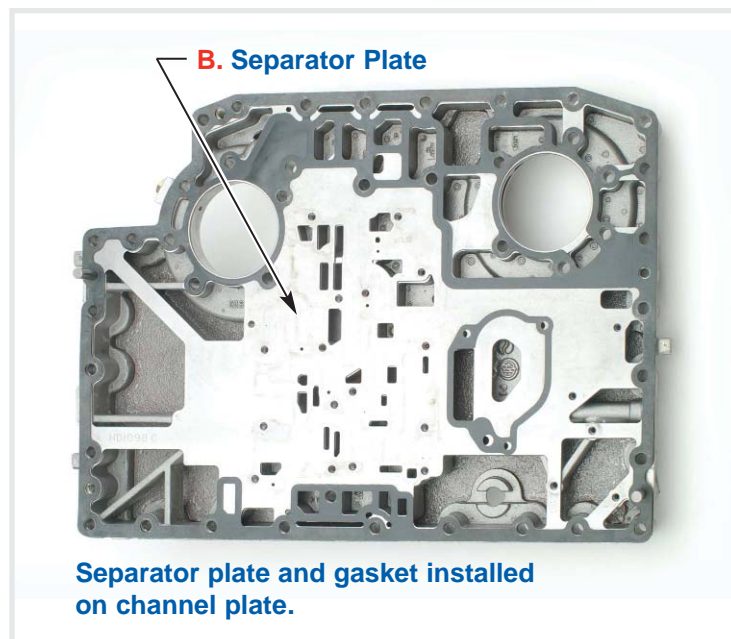
ALLISON 4000/B 500 PRODUCT FAMILIES CONTROL MODULE



A. Inspect the channel plate for damage. All passages must be clear of debris. Inspect all machined surfaces for burrs, nicks or scoring. Light stoning and crocus cloth may be used to eliminate minor high spots. If a channel plate cannot be repaired so that all machined surfaces can seal correctly to their mating parts, or if thread damage cannot be repaired, replace the channel plate.

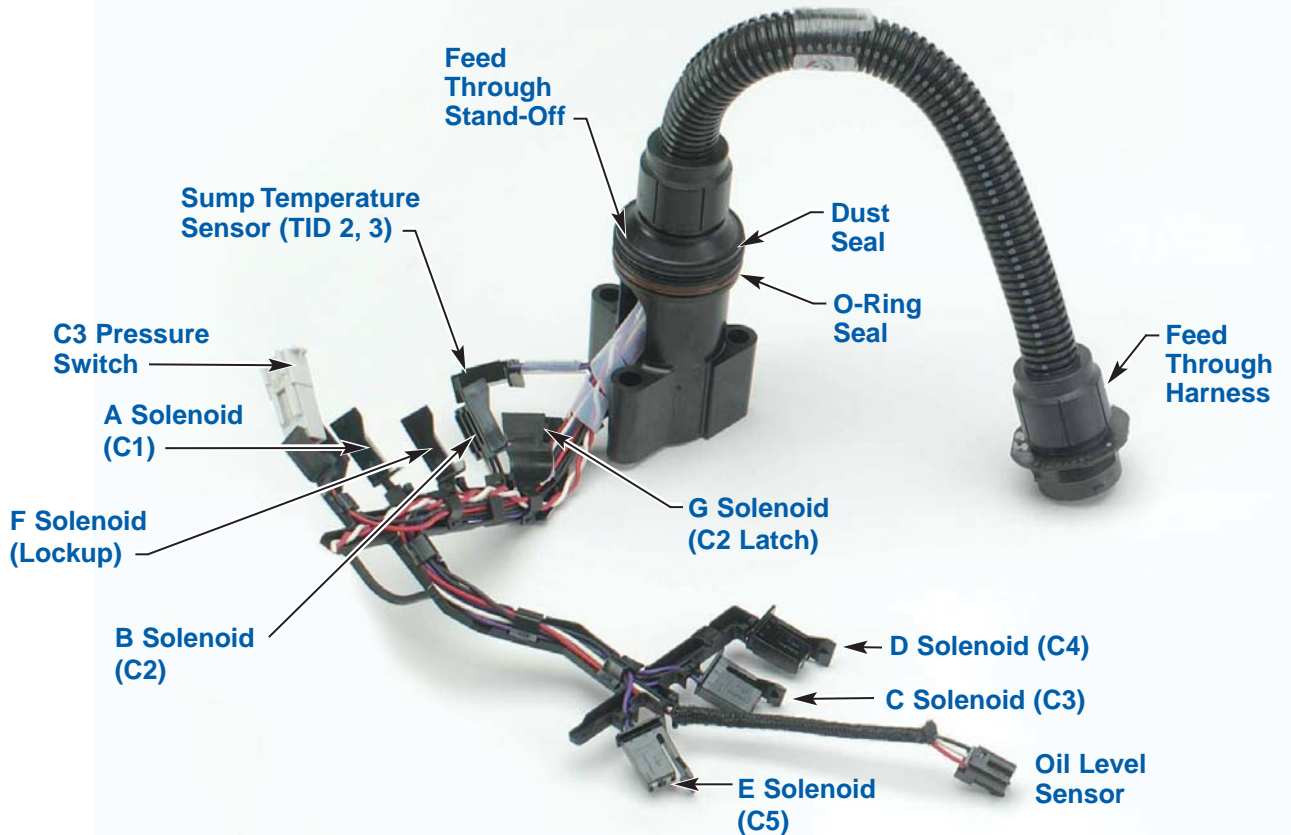
NOTE: Do not use impact guns (air wrenches, electric impact wrenches, etc.) when working with aluminum threads or when torque sequencing bolts.

B. Inspect both separator plates for dents, nicks, burrs and other damage or distortion. Replace the plate if it has damage which cannot be repaired using a soft stone or crocus cloth. All passages must be clean and debris free.
(continued)



ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) CONTROL MODULE

Identification Detail: Internal Wiring Harness



C. Replace the suction filter assembly during overhaul.

D. Replace or repair the control module wiring harness if the wires, terminals or connectors are visibly damaged. Inspect the molded harness channel for cracks or breaks. Replace the harness if the molded channel is damaged. Check sump temperature resistance following the guidelines and specifications listed in the Service Manual and Troubleshooting Manual.

NOTE: Transmissions built prior to S/N 6610014067 used the former design sump temperature sensor. Sensor resistance specifications

differ between the former and current designs. Be sure to use the correct resistance specification chart for the sensor being checked.

(continued)



ALLISON 4000/B 500 PRODUCT FAMILIES CONTROL MODULE *(continued)*

Supersession Information

Oil Drain Plug Redesign - SIL 5-WT-98, Rev. A



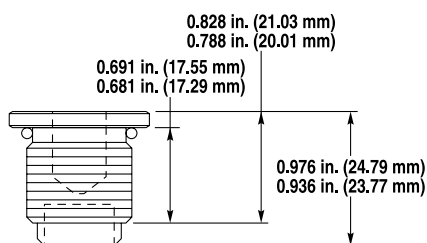
Current



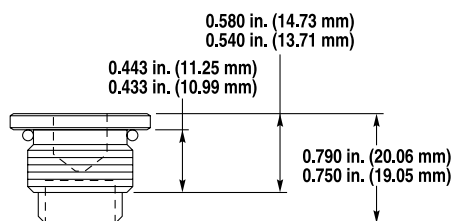
Former

Current plug is backward compatible with all control modules.

CURRENT OIL DRAIN PLUG ASSEMBLY - 29534362

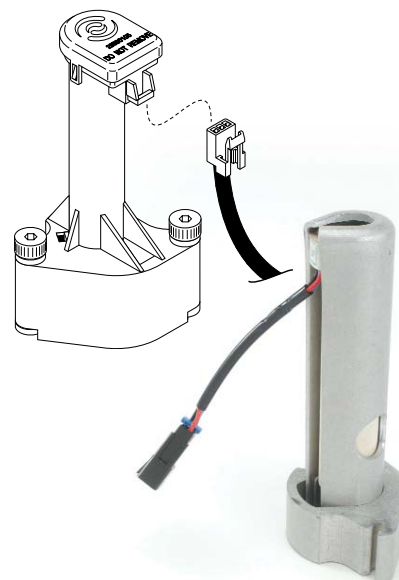


FORMER OIL DRAIN PLUG ASSEMBLY - 29503360



Supersession Information

Oil Level Sensor Redesign - SIL 19-WT-99



Kit must be used when replacing former sensor with current sensor.

E, F, G. Valves, valve body bores and oil passages must be free of debris, nicks, burrs, scoring and galling. Valves should move freely in their bores, when dry, under their own weight. Repair or replace valves and/or valve bodies failing to meet these requirements.

Valve body machined surfaces must be free of debris, nicks, burrs and scoring. Light stoning of these machined surfaces is permitted to correct minor defects. Replace any valve body that cannot be repaired.

Inspect all threaded holes for damage and debris. Replace the valve body if the thread damage cannot be repaired.

NOTE: Do not use impact guns (air wrenches, electric impact wrenches, etc.) when working with aluminum threads or when torque sequencing bolts.

Replace valve springs which are broken, permanently set or worn due to rubbing adjacent parts. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

Valve stops and retention pins must not be damaged or battered. Replace valve stops or pins which have damage that cannot be removed using a soft stone or crocus cloth.

Replace solenoids if they are visibly damaged. Proper solenoid resistance is 3 to 4 ohms measured between the two solenoid terminals. Check resistance between each solenoid terminal and the solenoid body. Replace the solenoid if resistance measures less than 100k ohms.

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) CONTROL MODULE



2" Channel Plate



4" Channel Plate

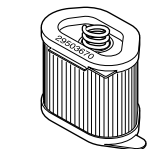
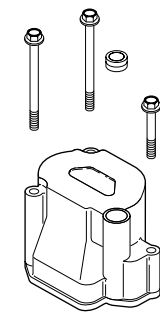
Supersession Information

Suction Filter Redesign - SIL 1-WT-00



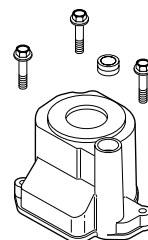
Former

Current



**FORMER
FILTER ASSEMBLY**

Replace the assembly during overhaul.



**CURRENT
FILTER ASSEMBLY**

Replace the C3 pressure switch if it is visibly damaged. Resistance between the two switch terminals should measure 20k ohms or higher when the switch is open (and no pressure is present). Resistance between the two terminals should not exceed 2 ohms when the switch is closed (159 kPa-255 kPa or 23-37 psi present).

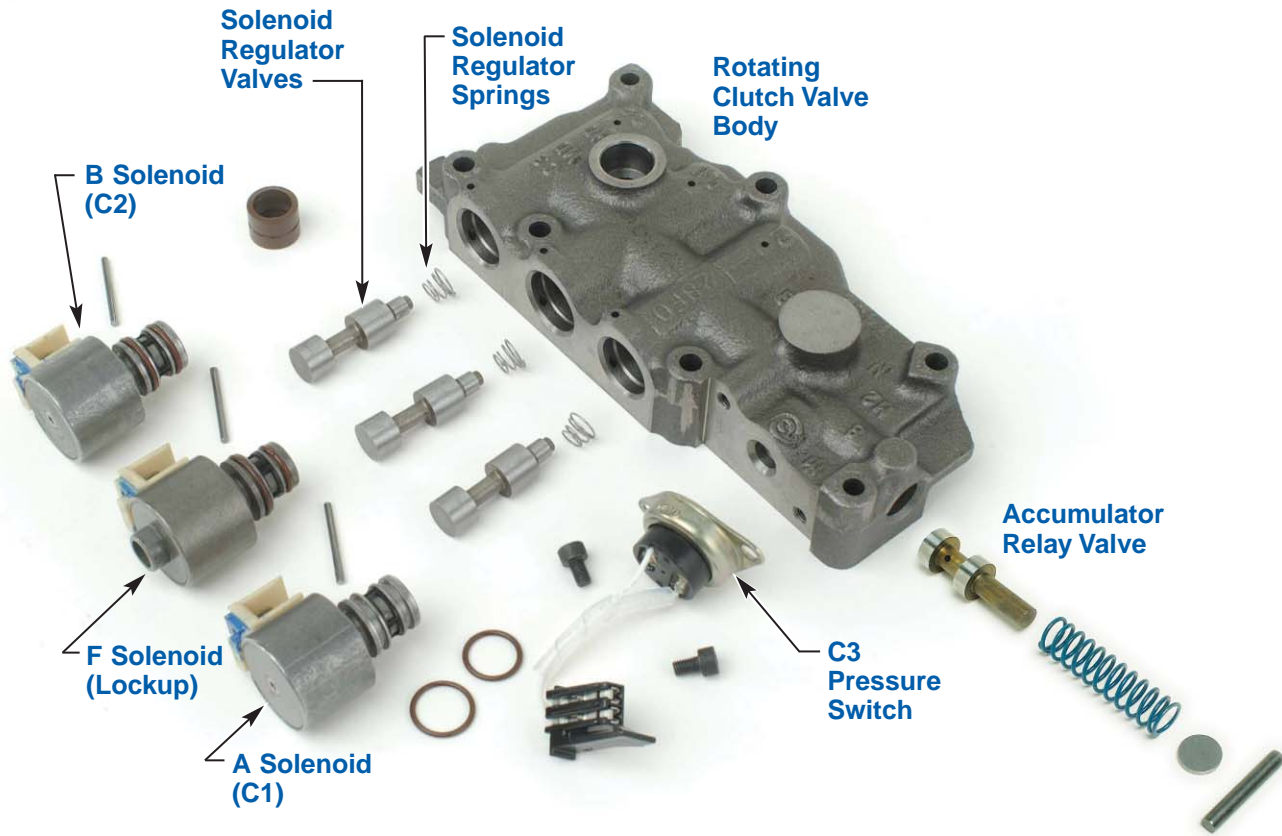
H. Replace the optional oil level sensor if it is determined it is not functioning correctly.

(continued)

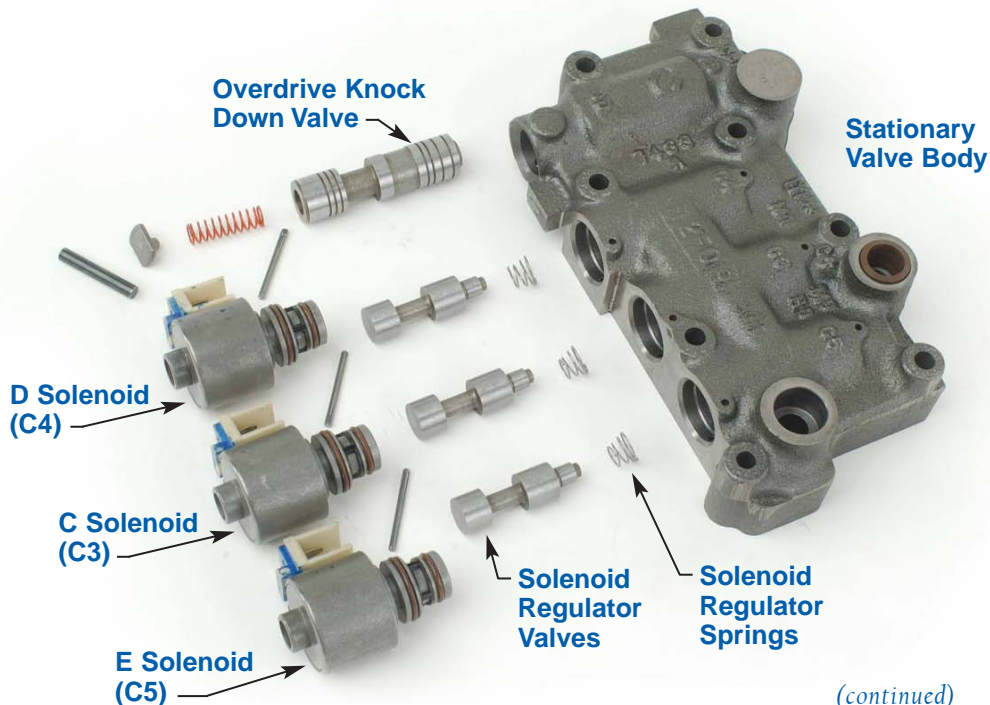
ALLISON 4000/B 500 PRODUCT FAMILIES

CONTROL MODULE (continued)

Identification Detail: Rotating Clutch Valve Body Assembly



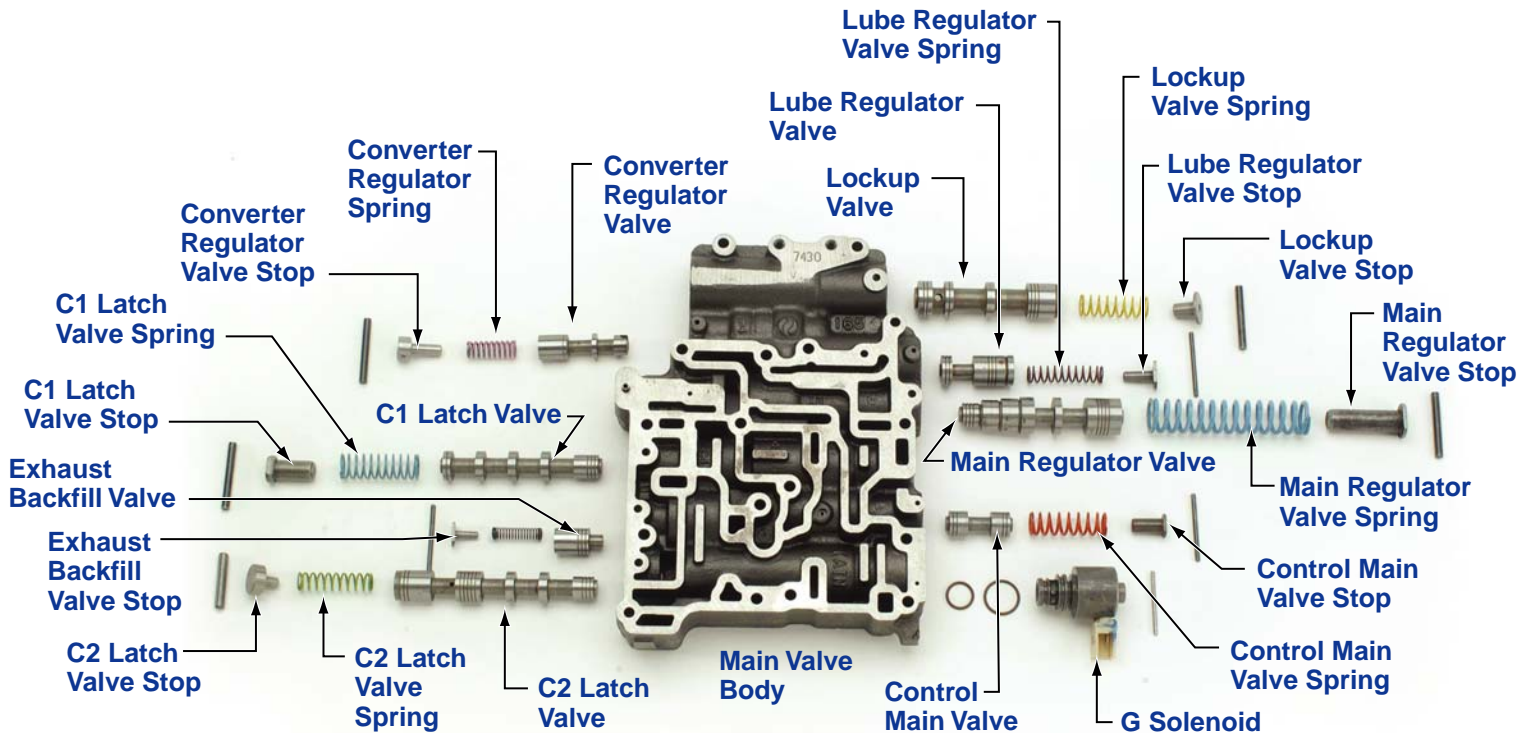
Identification Detail: Stationary Clutch Valve Body Assembly



(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) CONTROL MODULE

Identification Detail: Main Valve Body Assembly



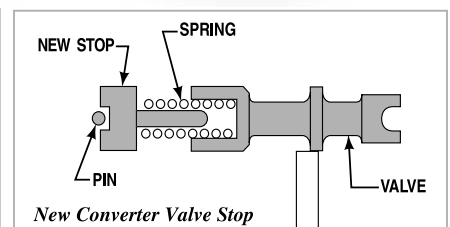
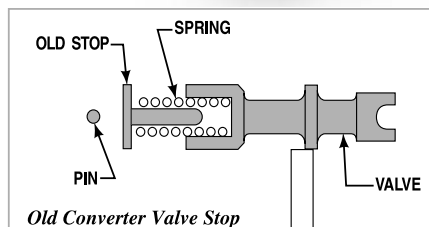
Supersession Information

Converter Regulator Valve Stop Redesign - SIL 12-WT-99

Current Stop



Former Stop



(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES TORQUE CONVERTER MODULE



Inspect the pump hub tangs for cracks, impact damage and broken tangs.

A. Inspect the converter pump exterior for dents and sealing surface damage. Replace the converter pump if damage cannot be removed with a soft stone or crocus cloth.

B. Inspect the converter pump hub for damage and excessive wear. Minimum pump hub diameter is 88.99 mm (3.504 inch). Inspect the pump hub tangs for cracks, impact damage or broken tangs. Maximum allowable tang step wear is 0.31 mm (0.012 inch). On PTO-equipped models, check the splines inside the hub for wear and damage. Maximum spline wear is 0.38 mm (0.015 inch).

NOTE: Do not use crocus cloth on the converter pump hub. Polishing the hub with crocus cloth can cause improper input seal performance resulting in fluid leakage.

NOTE: Pump hub tang breakage or deformity accompanied by churning

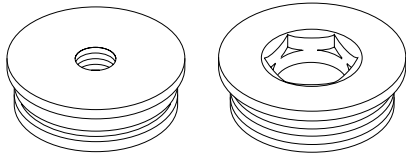
and pump bushing failure and ground sleeve wear is often caused by poor transmission fluid condition due to improper maintenance intervals. Observation of proper fluid change intervals is key to optimum transmission life. *(continued)*

4000 Product Family Torque Converter Identification Chart

Torque Converter Model Designation	TC-521	TC-531	TC-541	TC-551	TC-561
Front Cover Sticker and Converter Paint Dot Color (Exterior Marker)	Green	Pink	Blue	Orange	Yellow
Engraved Letter Identifiers (Torus Ring of Converter Pump) Ink Stamped Letter (Exterior of Converter Pump)	E	D	C	B	A
Number of Stator Blades	19	19	19	19	19
Paint Dot Color on Stator	None	None	None	None	None

Supersession Information

Converter Plug and Front Cover Update SIL-21-WT-98



FORMER PLUG
"Push to Seat
with Snap Ring"

CURRENT PLUG
"Threaded"

The current front cover has a threaded pilot to accept the current converter plug. Plugs are not interchangeable

Model Identifiers (see chart previous page)



D. Pilot

C. Front Cover Mounting Face

ALLISON 4000 / B 500 PRODUCT FAMILIES TORQUE CONVERTER MODULE

(continued)



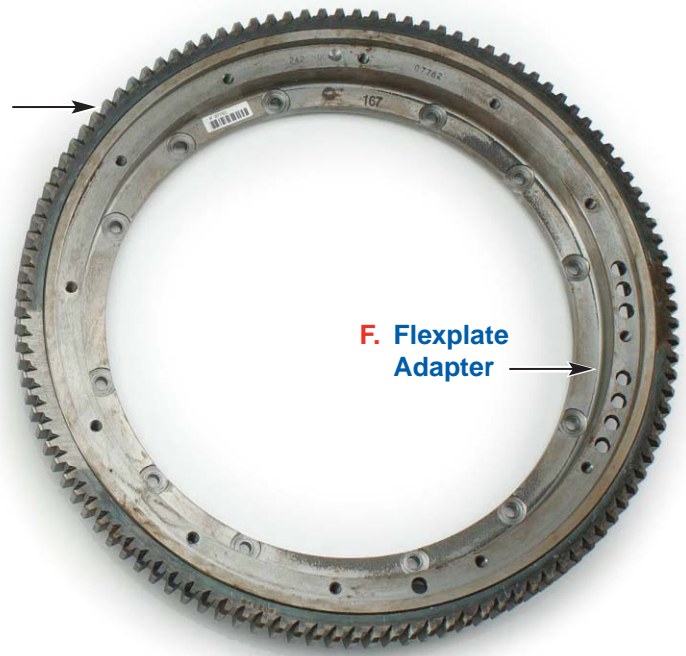
Current Plug

Converter Retaining Bolt

Turbine Shaft Selective Shim

E. Ring Gear

F. Flexplate Adapter



C. Inspect the torque converter front cover mounting faces for damage. Inspect the flexplate adapter bolt holes for stripped or damaged threads.

D. Inspect the front cover pilot for damage and wear. Maximum pilot diameter is 61.77 mm (2.432 inches). Inspect the torque converter end plug and the retaining bolt for stripped or damaged threads. Verify that the correct turbine shaft selective shim is installed following the Service Manual procedures.

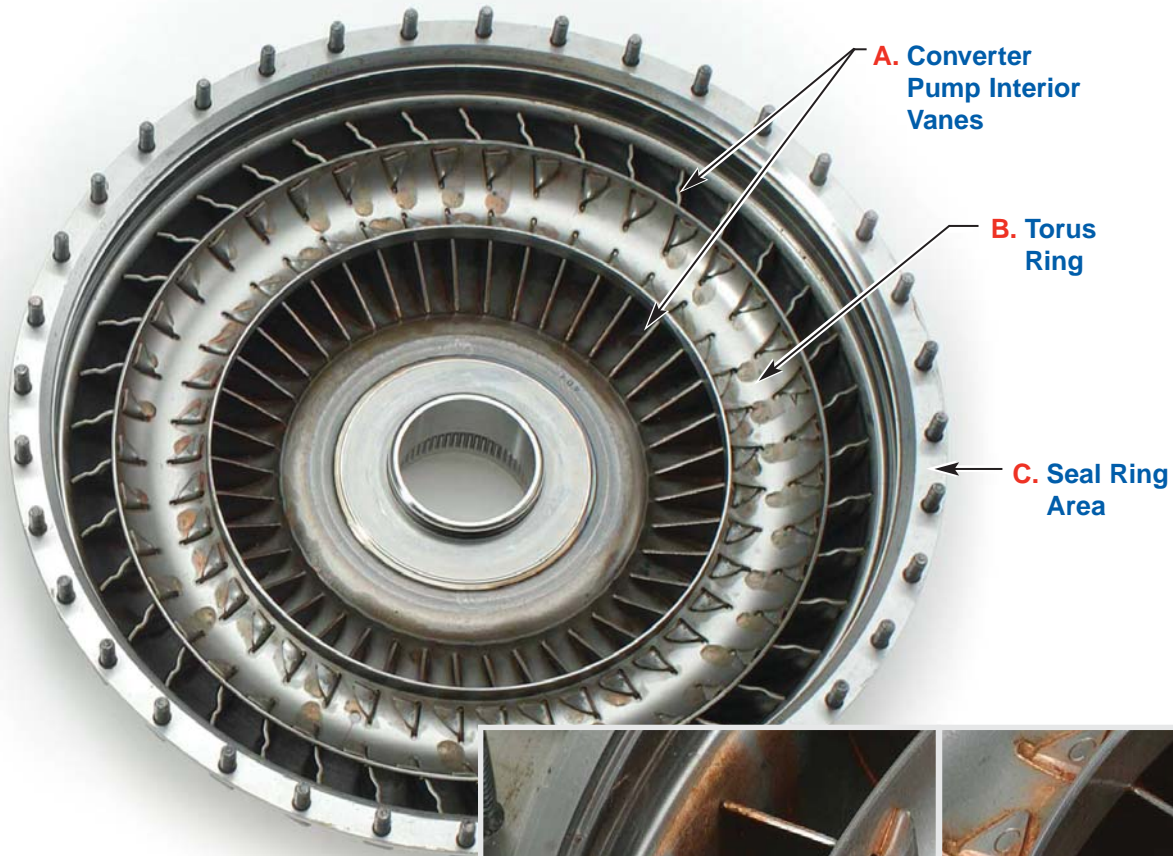
E. Inspect the engine starter ring gear for chipped, worn or broken teeth.

F. Inspect the flexplate adapter mounting faces for surface damage. Replace the adapter if damage cannot be repaired using a soft stone or crocus cloth. Inspect the flexplate adapter bolt holes for stripped or damaged threads. Clean damaged threads using the correct size tap. Replace the adapter if damage cannot be repaired.

NOTE: The flexplate adapter bolt holes use Spiralock® threads. A Spiralock® tap must be used when repairing damaged threads. Using a standard tap will destroy the locking feature. If this occurs, the torque converter front cover must be replaced.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES TORQUE CONVERTER MODULE *(continued)*



A. Inspect the converter pump interior. Replace the assembly if the vanes are damaged, cracked or loose.

B. Replace the converter pump assembly if the torus ring is loose or cracked.

C. Inspect the seal surface between the converter pump assembly and the front cover. Light stoning is permitted to remove slight irregularities.

(continued)



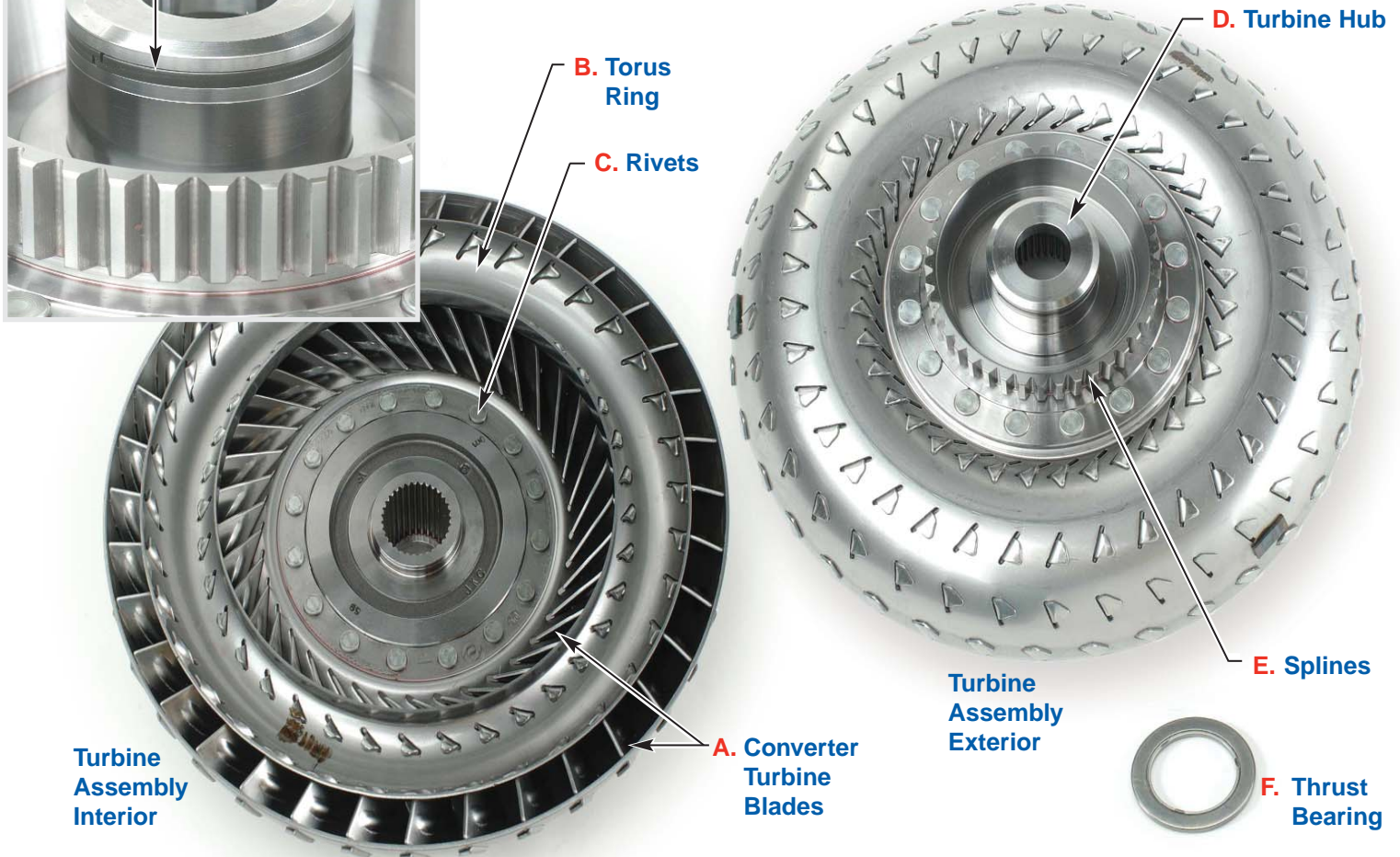
Replace the assembly if the vanes are damaged, cracked or loose.



C. Front Cover-to-Converter Pump Sealing Surface

ALLISON 4000 / B 500 PRODUCT FAMILIES TORQUE CONVERTER MODULE

(continued)



A. Inspect the converter turbine assembly. Replace the assembly if the blades are cracked, broken or loose.

B. Inspect the torus ring. Replace the turbine assembly if the torus ring is loose or cracked.

C. Inspect the rivets. Replace the turbine assembly if the rivets are loose or cracked.

D. Inspect the converter turbine hub. Replace the converter turbine assembly if the hub is worn beyond limits. Minimum allowable hub diameter is 66.69 mm (2.626 inches). Inspect the sealring groove for damage.

E. Inspect the hub splines for damage and wear. Spline movement between the lockup damper and turbine hub cannot exceed 0.38 mm (0.015 inch). Replace the turbine assembly if splines are excessively worn.

F. Inspect the thrust bearing following the “General Inspection Guidelines for Bearings” section of this manual. Replace any thrust bearing failing these inspection procedures.

(continued)



Inspect the hub splines and rivets for damage and wear.

ALLISON 4000/B 500 PRODUCT FAMILIES TORQUE CONVERTER MODULE *(continued)*

B. Bushing

Front Cover

A. Sealing Bore

E. Lockup Damper

C. Lockup Clutch Piston

F. Thrust Bearing

Supersession Information

Lockup Clutch Damper Assembly
Update SIL-4-WT-00, Rev. B



Current damper is backward compatible with all torque converter assemblies. ECU recalibration is not necessary.

D. Backplate

A. Torque converter lockup clutch components fit inside the front cover. Install a new turbine sealing in the converter cover bore then measure the sealing inside diameter. Replace the cover assembly if diameter exceeds 61.77 mm (2.432 inch).

B. Inspect the converter cover bushing for damage. Replace the bushing if damage cannot be removed with crocus cloth. Maximum allowable bushing inside diameter is 66.91 mm (2.634 inch).

C. Inspect the lockup clutch piston for damage. Minimum allowable piston thickness is 6.53 mm (0.257 inch).

D. Inspect the lockup clutch backplate for damage, scoring and overheating. Minimum allowable plate thickness is 11.79 mm (0.464 inch).

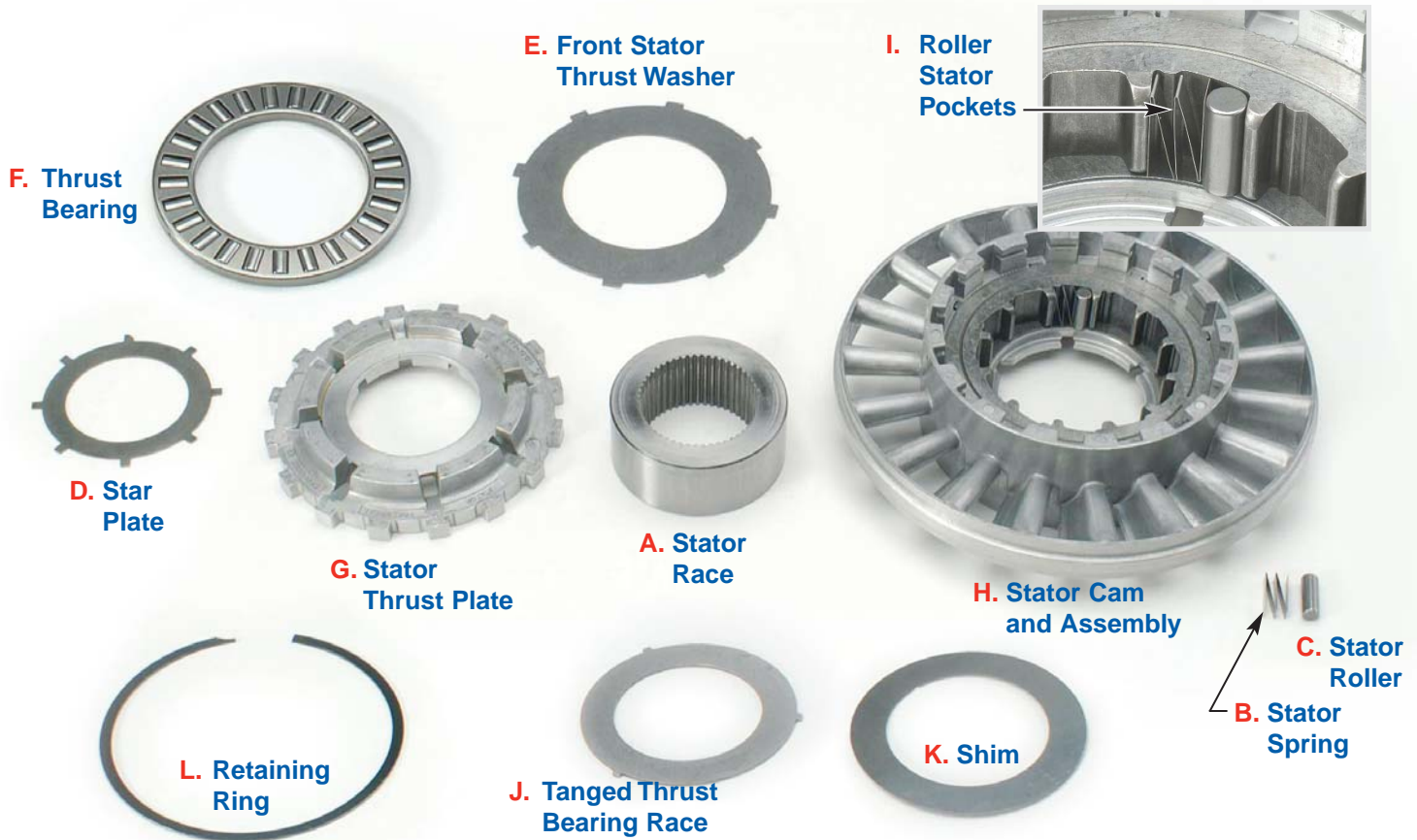
NOTE: If the backplate is within thickness limits but has surface damage due to metal transfer between the backplate and lockup damper, the plate may be reused by turning it over so that the lockup damper has a new contact surface.

E. Replace the lockup clutch damper if the friction surfaces are worn beyond service limits. Minimum allowable friction surface thickness is 8.51 mm (0.335 inch). Maximum allowable damper distortion is 0.51 mm (0.020 inch). Maximum allowable movement between the damper and converter turbine splines is 0.38 mm (0.015 inch). Replace the damper if any of these measurements are beyond allowable limits.

F. Inspect thrust bearing following the "General Inspection Guidelines for Bearings" section of this manual. Replace any thrust bearing failing these inspection procedures.

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) TORQUE CONVERTER MODULE



A. Inspect the stator race for damage. Replace the race if damage cannot be repaired using a soft stone or crocus cloth.

B. Inspect the stator springs for correct spring height following per the Service Manual. Replace any spring which has a free length below 17.8 mm (0.700 inch).

C. Inspect the stator rollers for damage. Rollers should be smooth, round and defect-free. Replace damage or worn rollers.

D. Inspect the star plate for excessive wear. Replace the star plate if damage cannot be repaired using a soft stone or crocus cloth.

E. Inspect the front stator thrust washer for wear beyond service limits. Replace the stator thrust washer if it is worn 0.40 mm (0.010

inch) or more. If it is within service limits, the thrust washer can be turned over and the un-worn surface can be used.

F. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any thrust bearings failing these inspection procedures.

G. Inspect the stator thrust plate for damage and wear. Replace the plate if damage cannot be removed using a soft stone or crocus cloth. Minimum allowable plate thickness is 9.45 mm (0.372 inch).

H. Inspect the stator and cam assembly for damage. Replace the stator and cam assembly if damaged.

NOTE: Use care when cleaning the stator and cam assembly. Hot tank

temperatures may be high enough to release the cam assembly from the stator.

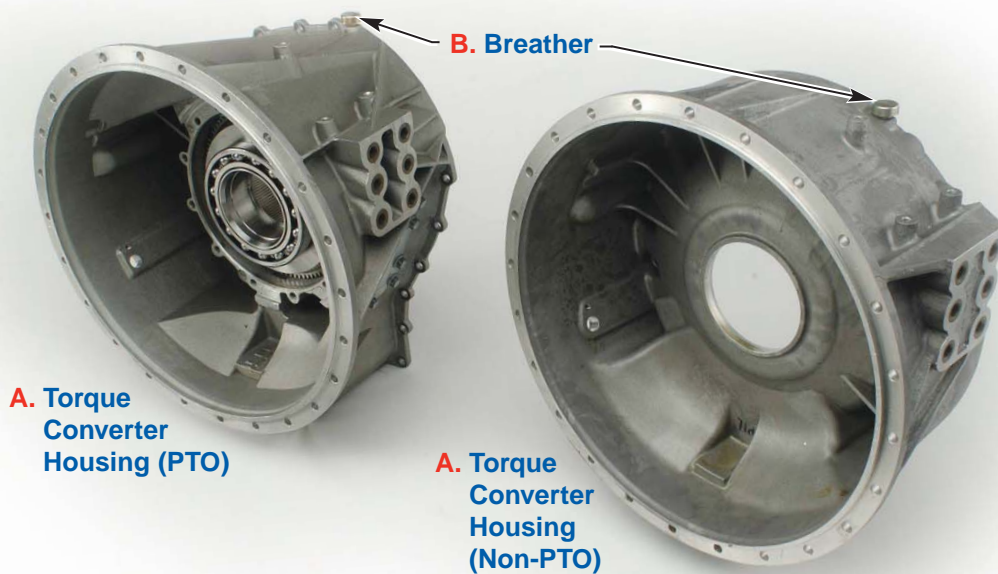
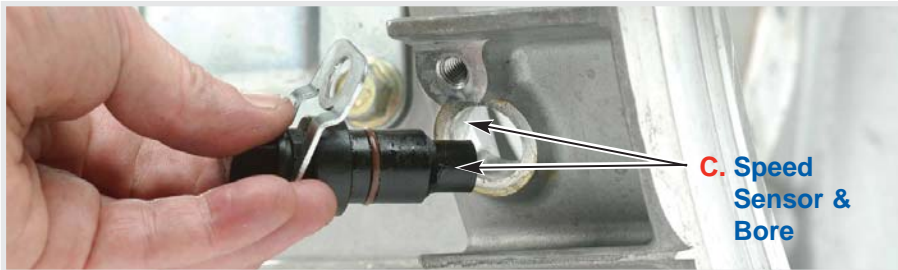
I. Inspect the stator roller pockets for wear and damage. Verify correct spring-to-roller orientation. Inspect the bottom of the cam pocket for wear. Replace the stator and cam assembly if it is worn 0.40 mm (0.010 inch) or more in the bottom of the pocket.

J. Inspect tanged thrust bearing race for damage. Replace any damaged race.

K. Inspect shim for damage. Replace any damaged shims. Use procedure for shim selection in 4000 Series Service Manual.

L. Inspect the retaining ring for damage and distortion. Replace any distorted or damaged retaining rings.

ALLISON 4000/B 500 PRODUCT FAMILIES TORQUE CONVERTER HOUSING MODULE



A. Inspect for torque converter housing damage. High spots may be removed with crocus cloth or a soft stone. Inspect threaded holes for debris and thread damage. Replace the torque converter housing if it is cracked, if it leaks from a damaged machined surface, or if it has thread damage which cannot be repaired.

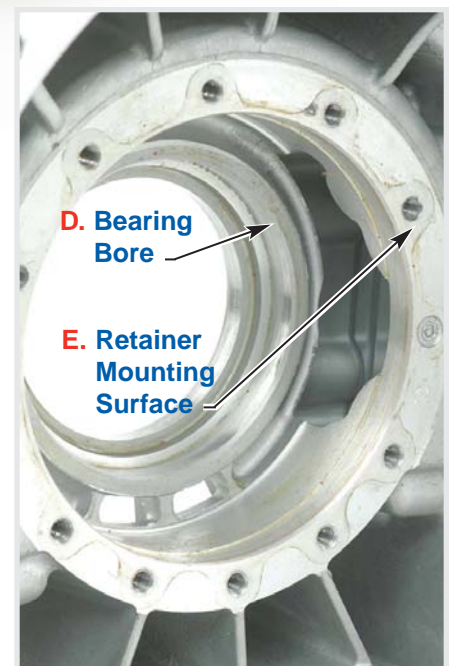
B. Inspect the breather for damage and obstructions. Replace the breather if it is damaged. Clean the breather if it is blocked with debris.

C. Replace the input speed sensor if the sensor body or electrical terminals are damaged. Speed sensor resistance is 300 ohms (plus or minus 30 ohms). Replace the

speed sensor if it does not meet the service limit.

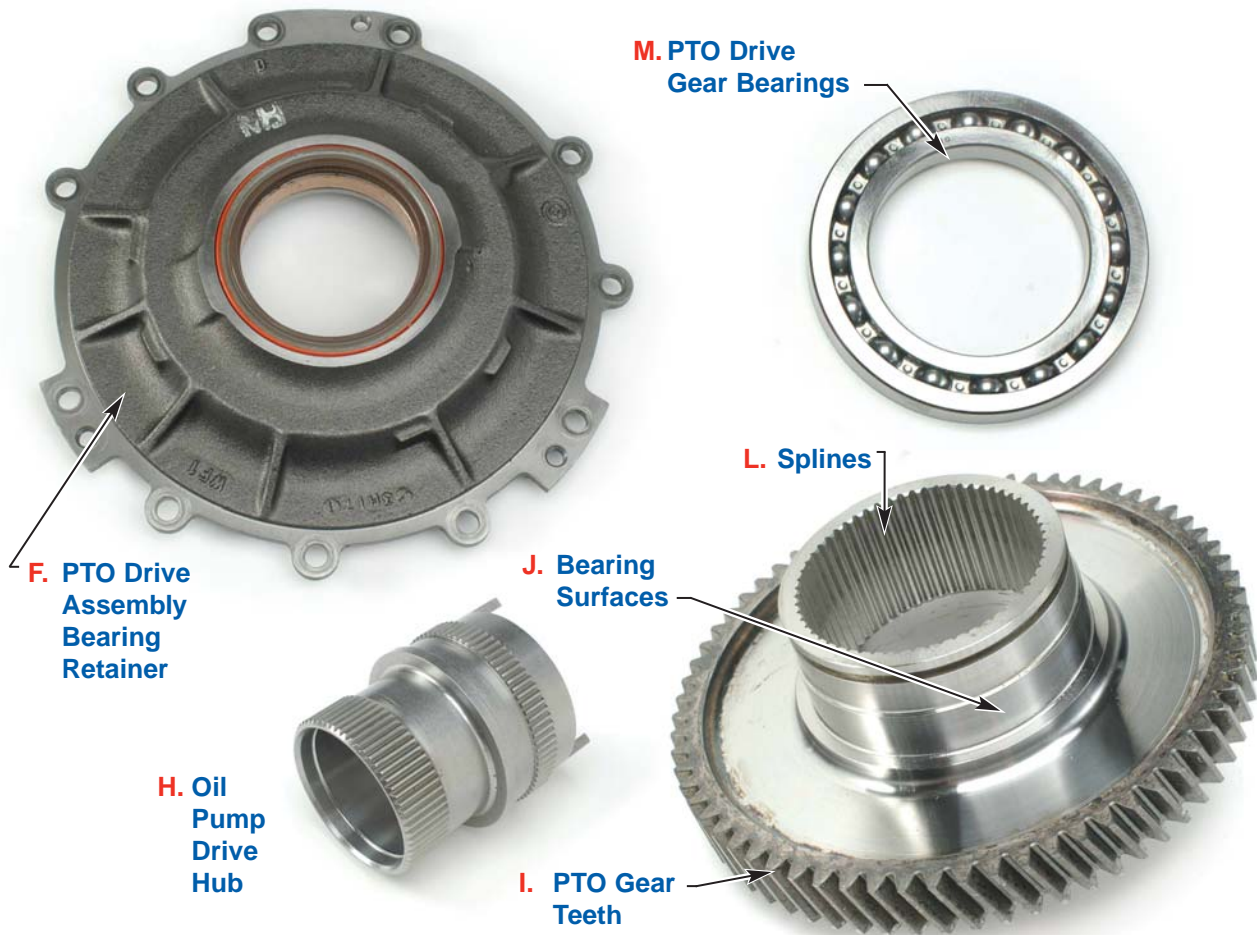
D. On PTO-equipped models, inspect the converter housing bearing bore for wear. Maximum allowable bearing bore inside diameter is 180.05 mm (7.088 inches). Replace the housing if damage cannot be repaired using a soft stone or crocus cloth.

E. Inspect the PTO bearing retainer mounting face surface and threads for damage. Replace the housing if surface damage cannot be repaired using a soft stone or crocus cloth. Replace the housing if thread damage cannot be repaired.



ALLISON 4000 / B 500 PRODUCT FAMILIES

(continued) TORQUE CONVERTER HOUSING MODULE



F. On PTO-equipped models, inspect the PTO drive bearing retainer housing bore for damage. Replace the retainer if damage cannot be repaired using a soft stone or crocus cloth. Replace the retainer housing if the bushing has spun in the bushing bore.

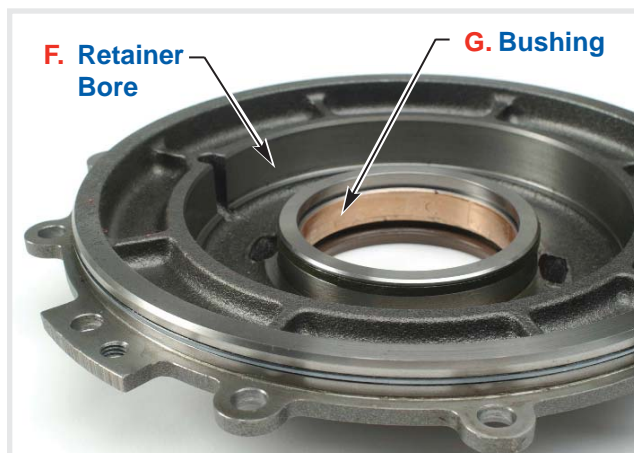
G. Inspect the retainer housing bushing for damage and wear. Replace the bushing if damaged. Maximum allowable bushing inside diameter is 89.19 mm (3.511 inches). Replace the bushing if it is worn beyond service limits.

I. Inspect the PTO drive gear teeth for chips, pitting and excessive wear. Replace the gear if damage cannot be repaired using a soft stone or crocus cloth.

NOTE: Some axial movement of the gear is normal, but movement should not exceed 3.175 mm (0.125 inch). Replace the PTO bearings if axial movement exceeds service limit.

NOTE: Normal operating backlash after PTO is installed is 0.1 mm to 0.66 mm (0.004 to 0.026 inch).

(continued)



H. Inspect the oil pump drive hub. Replace the drive hub if damage cannot be repaired using a soft stone or crocus cloth.

ALLISON 4000/B 500 PRODUCT FAMILIES TORQUE CONVERTER HOUSING MODULE *(continued)*

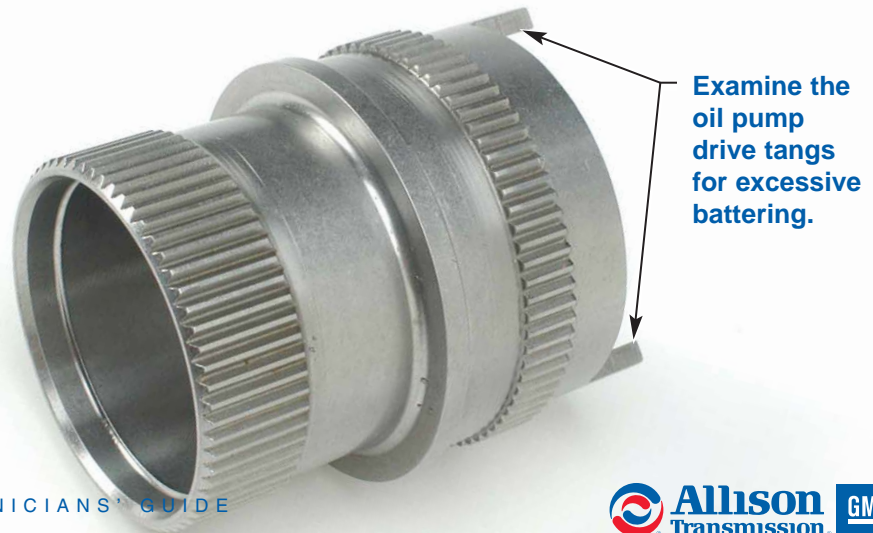


J. Inspect the PTO drive hub tangs for step wear, deformation and cracks. Replace the drive hub if tang step wear exceeds 0.38 mm (0.015 inch) or if either tang is deformed or cracked.

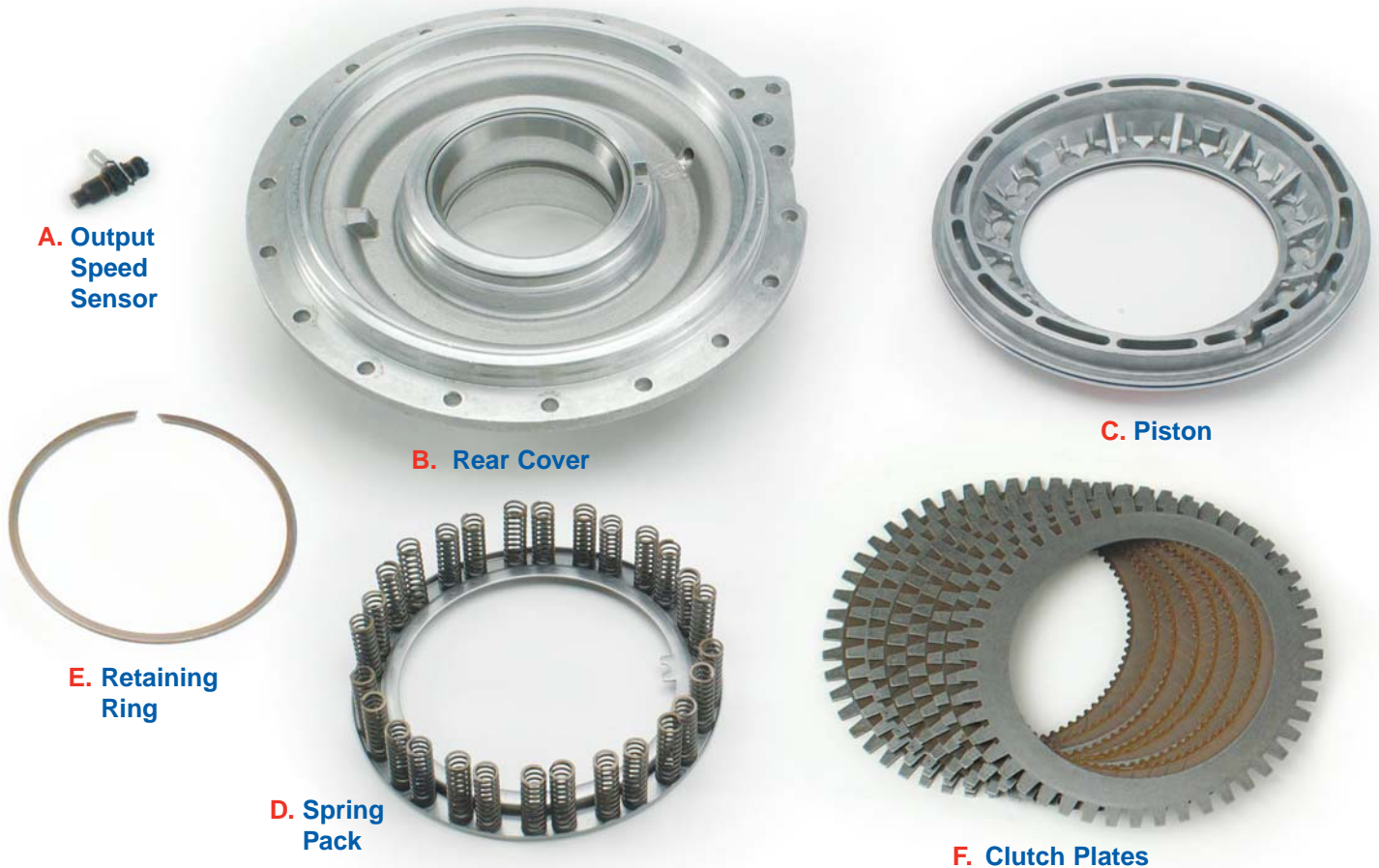
NOTE: Drive hub tang breakage or deformity accompanied by charging pump bushing failure and ground sleeve wear is often caused by poor transmission fluid condition due to improper maintenance intervals. Observation of proper fluid change intervals is key to optimum transmission life.

K. Inspect the drive hub splines for wear. Replace the drive hub if spline wear exceeds 0.38 mm (0.015 inch).

L. Inspect the PTO drive gear bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace either bearing as needed.



ALLISON 4000/B 500 PRODUCT FAMILIES STANDARD REAR COVER & P3 PLANETARY MODULE



A. Inspect the output speed sensor for damage. Replace any sensor that has body, terminal or connector seat damage. Allowable output speed sensor resistance is 300 ohms plus or minus 30 ohms.

B. Inspect the rear cover following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. High spots on machined surfaces can be removed using a soft stone or crocus cloth. Inspect the slot on the back side of the housing where the C5 piston tang indexes. Replace the rear cover if

damage to any machined surface cannot be repaired using a soft stone or crocus cloth. Replace the rear cover if it is cracked.

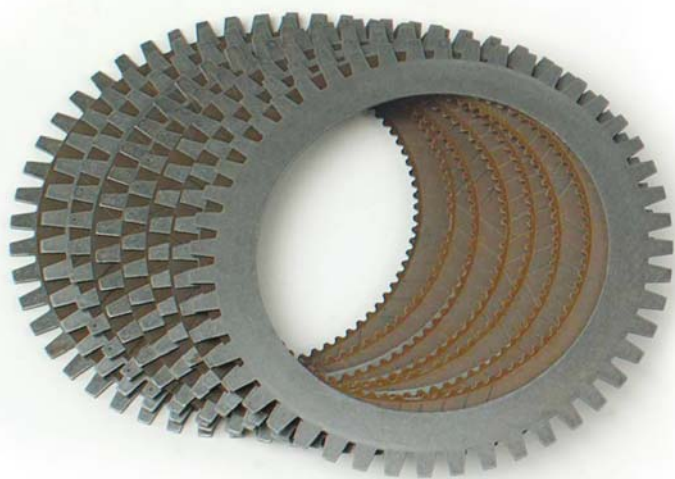
C. Inspect the C5 clutch piston following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the piston if it fails to meet the inspection guidelines. Inspect the C5 piston tang for excessive wear.

D. Inspect the C5 clutch spring pack for damage due to rubbing adjacent parts and cracked or broken pieces. Check springs for wear, breakage and damage. Reference the Spring Data Charts in the Service Manual SM2457EN for spring specifications and identification.

E. Replace the C5 retaining ring if it is bent or distorted.

(continued)

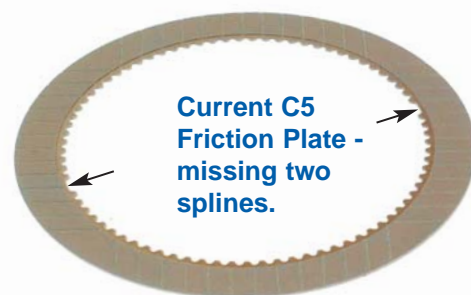
ALLISON 4000/B 500 PRODUCT FAMILIES STANDARD REAR COVER & P3 PLANETARY MODULE *(continued)*



F. Clutch Plates

Supersession Information

**C5 Friction Plate Update -
SIL 4-WT-00, Rev. B and SIL 12-WT-03**



**Clutch plate identification is made by
counting the number of missing teeth.**

F. Inspect the C5 friction clutch plates following the “General Inspection Guidelines for Friction Plates” section of this manual. Discard any plates that do not meet the guidelines. Minimum allowable thickness for reuse is 3.48 mm (0.137 inch). Minimum oil groove depth for reuse is 0.20 mm (0.0008 inch). Maximum cone for reuse is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

Inspect the C5 reaction clutch plates following the “General Inspection Guidelines for Reaction Plates” section of this manual. Discard any plates that do not meet the guidelines. Minimum allowable thickness for reuse is 2.41 mm (0.095 inch). Maximum cone for reuse is 0.25 mm (0.010 inch).

NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will have two or more missing splines. Former friction plates will either have one spline missing or none

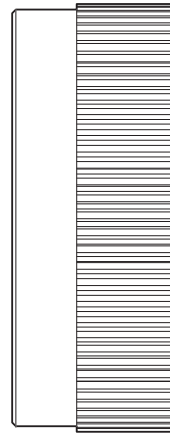
missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission ECU. The rest of the clutches in the main housing (C1 through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES STANDARD REAR COVER & (continued) P3 PLANETARY MODULE

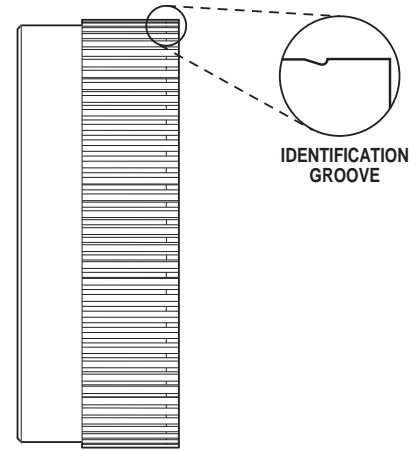
Supersession Information

P3 Ring Gear Update - SIL 12-WT-03



**FORMER (NON-HARDENED)
P3 RING GEAR**

**Use C5 friction
plate missing
3 internal teeth.**



**HARDENED
P3 RING GEAR**

**Use C5 friction
plate missing
2 internal teeth.**



from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU calibration from Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if updating from former C5 frictions. If any

4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

STANDARD REAR COVER & P3 PLANETARY MODULE *(continued)*



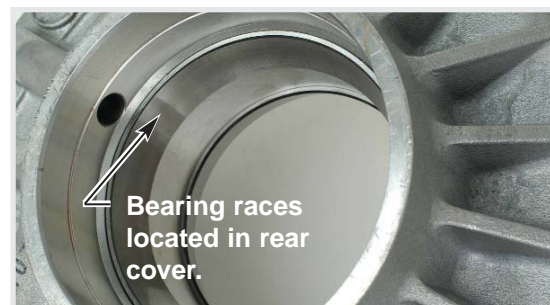
A. Verify a proper press fit between the P3 carrier and rear cover or retarder housing by inverting the carrier over a table or workbench. If the P3 carrier falls out of the rear cover or retarder housing without using a press or mallet, the press fit between the tapered bearings and P3 carrier no longer exists and the carrier must be replaced.

Inspect the P3 carrier for spline wear. Replace the carrier if spline wear exceeds 0.38 mm (0.015 inch). Inspect the pinion spindle bores in the carrier and the pinion thrust surfaces for excessive wear and damage. Replace the P3 carrier if a

spindle has more than 0.051 mm (0.002 inch) clearance in the bore. Inspect for thread damage on the carrier hub. Replace the carrier if threads are damaged.

B. Inspect the tapered roller bearings and races following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearings failing to meet the inspection guidelines. Bearing races are located in the rear cover housing and should also be inspected for wear and damage.

C. Inspect the P3 indexing ring for step wear in the area where it contacts the spindle. Replace the



indexing ring if it is broken or if it has excess step wear or damage which cannot be repaired using a soft stone or crocus cloth. Indexing rings with acceptable wear can be flipped during reassembly so that a new contact surface is used.

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES STANDARD REAR COVER & (continued) P3 PLANETARY MODULE

Supersession Information

P3 Carrier Update - SIL 25-WT-01



Current P3 carriers use a drill point hole and a Belleville spring washer.

Supersession Information

Planetary Spindle and Indexing Ring Updates - SIL 10-WT-00



Planetary spindles and indexing rings are backward compatible. Current spindles are stamped with the number "2." Indexing rings are stamped with the identifier "HD5."

D. Inspect planetary spindles for wear and damage. Discoloration is only a concern if spindle surface damage exists.

E. Inspect the pinion gear thrust washers for damage, distortion and signs of excessive wear. Minimum allowable thrust washer thickness is 1.39 mm (0.054 inch). Replace damaged or worn thrust washers.

F. Inspect the pinion gears following the "General Inspection Guidelines for Gears" section of this manual. Replace any gears which fail these inspection procedures or if the damage cannot be repaired using a soft stone.

G. Inspect the pinion roller bearings following the "General Inspection Guidelines for Bearings" section of this manual. Replace any bearings which fail these inspection procedures.

H. Replace the output shaft spacer if it is bent, cracked or if it is distorted in any way. An attempt can be made to repair some minor damage using a soft stone.

I. Inspect the output shaft external retaining ring. Replace the retaining ring if it is distorted or fits loosely on the shaft.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES STANDARD REAR COVER & P3 PLANETARY MODULE *(continued)*

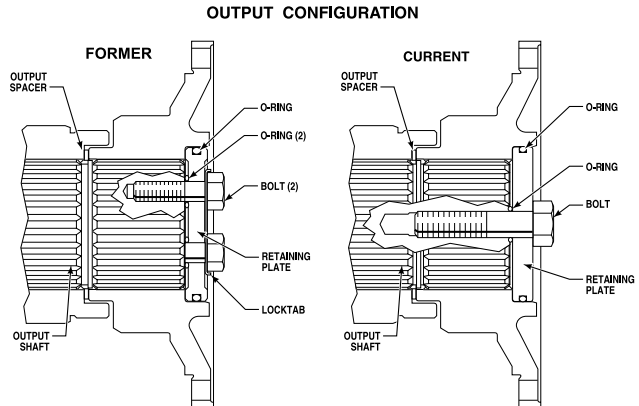


J. Inspect the output shaft bushing for damage.

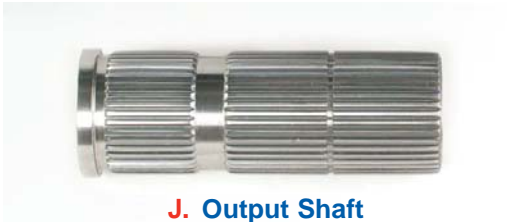
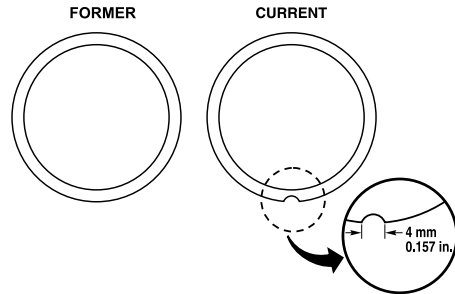
Supersession Information

Flange / Yoke Retaining Bolt Update - Reference SIL 1-WT-99

Single Bolt design increases clamp load.



Output spacers are not interchangeable between the former and current designs.



J. Output Shaft

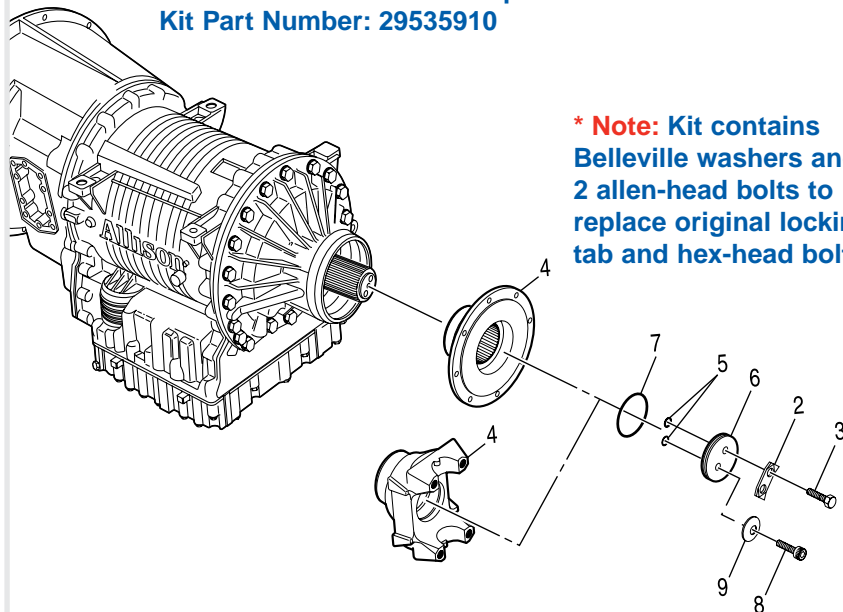
J. Inspect the output shaft following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the output shaft if it fails these inspection procedures.

Inspect the output shaft bushing following the “General Inspection Guidelines for Bushings” section of this manual. Replace the bushing if it fails these inspection procedures. Maximum allowable bushing inside diameter is 36.14 mm (1.423 inch).

(continued)

Supersession Information

Service Kit for Two-Bolt Output - SIL 15-WT-98 Kit Part Number: 29535910



ALLISON 4000 / B 500 PRODUCT FAMILIES STANDARD REAR COVER & (continued) P3 PLANETARY MODULE



**4000 Series
Wide Ratio
P3 Carrier
Assembly**

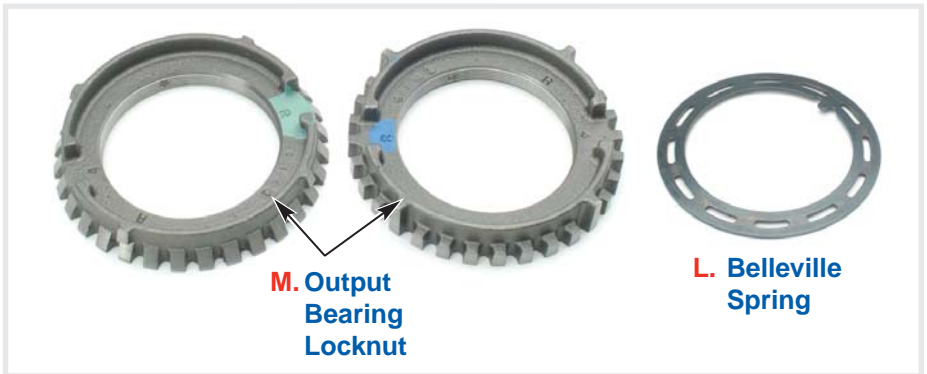
**4000 Series
Close Ratio
P3 Carrier
Assembly**

K. Replace the output bearing locknut retainer whenever the locknut is removed.

L. Inspect the Belleville spring washer for damage. Replace the washer if it is distorted or the tang is worn.

M. Replace the output bearing locknut if it is cracked, distorted, has damaged threads. The current locknuts have three buttons in the threaded area. This nut should be replaced if it does not have a minimum of 10 N·m (7.5 ft. lb.) of running torque when threading the nut.

(continued)



**M. Output
Bearing
Locknut**

**L. Belleville
Spring**

**Former output bearing
locknut and retainer**



**K. Locknut
Retainer**

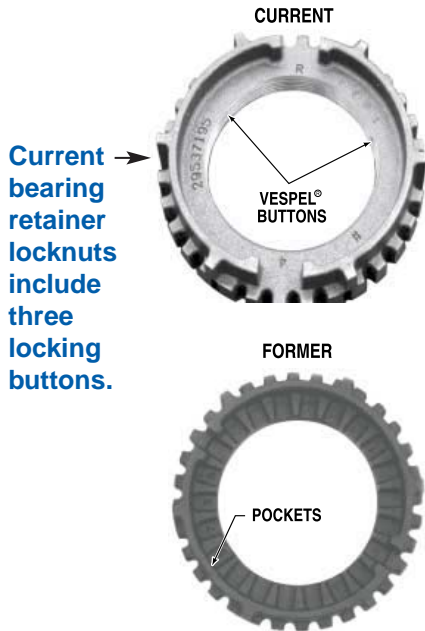


ALLISON 4000 / B 500 PRODUCT FAMILIES

STANDARD REAR COVER & P3 PLANETARY MODULE *(continued)*

Supersession Information

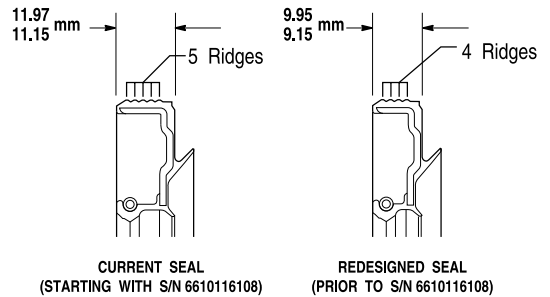
Bearing Retainer Locknut Update - Reference SIL 25-WT-01



Supersession Information

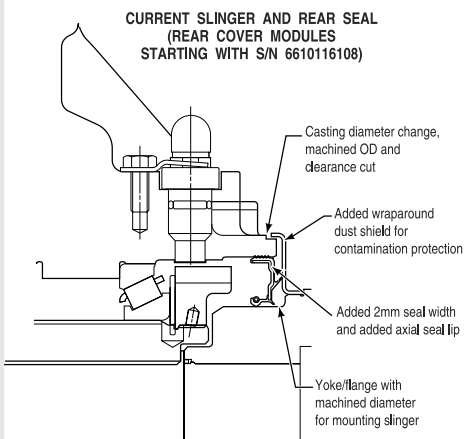
Output Seal Update - Reference SIL 4-WT-03

Two seals are currently available - to fit former and current rear covers. They are **NOT** interchangeable.



Supersession Information

Output Yoke/Flange Update - Reference SIL 4-WT-03



Not all yoke / slinger combinations can be used with all transmissions. Rear cover design determines yoke / slinger combination.

Supersession Information

Rear Cover Update - Reference SIL 4-WT-03



Current rear cover has interior cut relief to accommodate 5-ridge output seal. Former rear cover has interior cut relief to accommodate 4-ridge output seal (reference *Output Seal Update Supersession Information*).

Supersession Information

Retarder Exhaust Backfill Valve Update - Reference SIL 14-WT-02

Current Retarder Exhaust Backfill Valve Stop



Former Retarder Exhaust Backfill Valve Stop



The current stop is backward compatible with all 4000/B 500 retarder - equipped transmissions.

ALLISON 4000 / B 500 PRODUCT FAMILIES RETARDER MODULE



B. Retarder Stator Housing

F. Retarder Temp Sensor Assembly



G. Output Speed Sensor



A. Retarder Housing



D. P3 Carrier Assembly (Retarder)



C. Retarder Rotor



E. Autoflow Valve, Spring & Plug

A. Inspect the retarder housing following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. High spots on machined surfaces can be removed using a soft stone or crocus cloth. Replace the retarder housing if it is cracked or if machined surface damage cannot be removed using a soft stone or crocus cloth.

Install a “known good” rotor sealring in the retarder housing and measure sealring inside diameter. If the retarder housing is slightly grooved or worn, place the sealring directly in the grooved or worn area. Replace the housing if sealring

inside diameter is greater than 139.72 mm (5.501 inches). A bearing race fits into the housing and should be inspected for damage.

B. Inspect the stator housing following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Some light housing imperfections can be removed using a soft stone. Discard and replace the housing if damage is excessive.

NOTE: Transmissions built prior to January 1998 included two small check balls and retainers located in the retarder stator housing. Minimum allowable check ball movement is 0.50 mm (0.020 inch).

Inspect the slot on the back side of the housing where the C5 piston tang indexes for excessive wear. Replace the stator housing if damage to any machined surface cannot be repaired using a soft stone or crocus cloth. Replace the stator housing if it is cracked.

C. Inspect the retarder rotor following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Check for loose, cracked or broken rivets. Replace the rotor if movement exists between the center hub and the vaned assembly. Inspect the rotor splines for wear.

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES RETARDER MODULE (continued)

Supersession Information

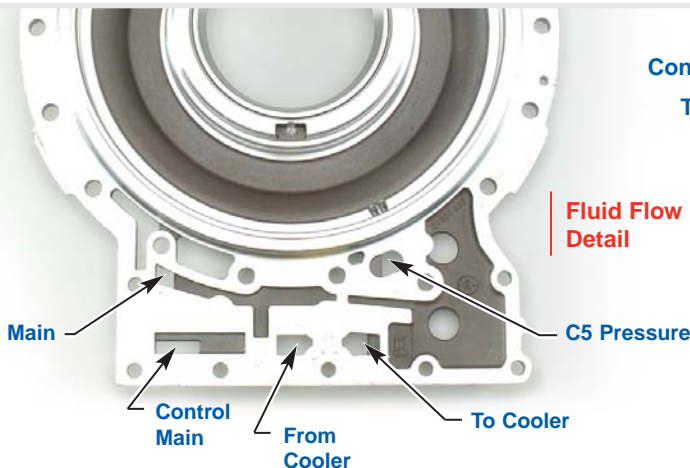
Retarder Sump Cooling Feature - Reference SIL 25-WT-00, Rev. A

No Sump
Cooling
Feature

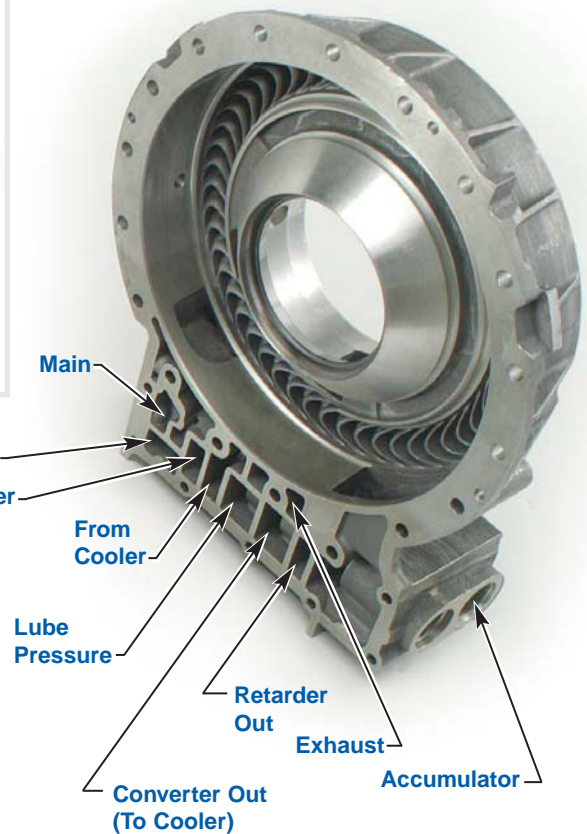


The sump cooling feature provides additional cooling when the retarder is active through either an additional auxiliary cooler or the direct mount cooler for retarder transmissions. The direct mount cooler for retarder transmissions works as both the main cooler and auxiliary cooler.

Sump
Cooling
Provision



Fluid Flow
Detail



Spline wear cannot exceed 0.38 mm (0.015 inch). Replace the rotor if it exceeds this wear limit.

D. Reference the “Inspection and Analysis of the Standard Rear Cover” section of this manual for P3 planetary carrier assembly details.

NOTE: Inspect retarder P3 carriers for excessive step wear on the splines of the P3 carrier hub. Replace those P3 carriers that exhibit step wear.

E. Inspect the retarder autoflow valve for wear and damage. The autoflow valve must move freely in its bore, when dry, under its own

weight. Replace or repair the autoflow valve and/or retarder housing as necessary. Crocus cloth can be used to remove slight high spots.

Inspect the autoflow valve spring for defects and permanent set. Reference the Spring Data Charts in Service Manual SM2457 for spring specifications and identification. Replace the spring if it fails any inspection procedures.

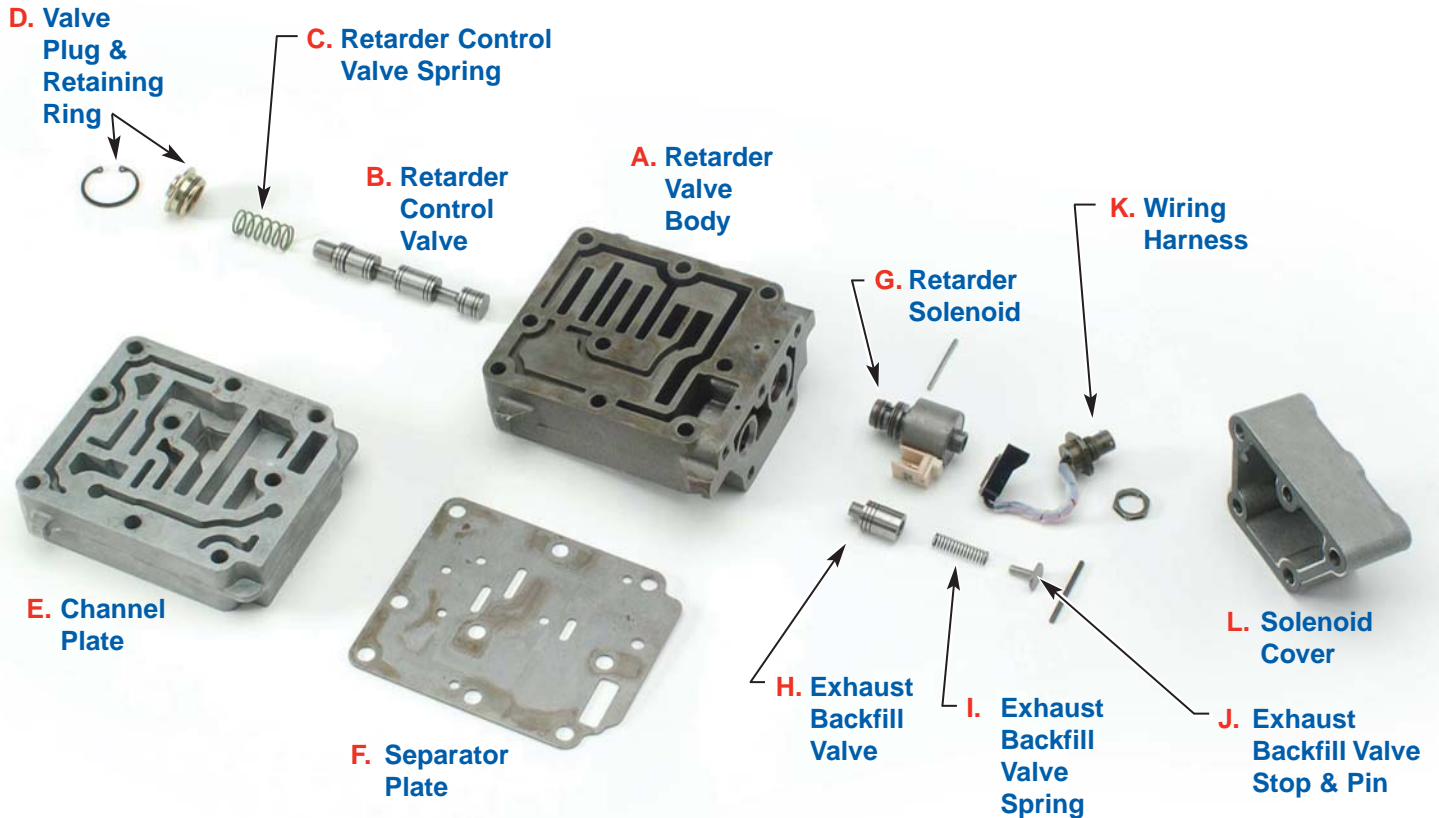
F. Inspect the retarder temperature sensor exterior for defects. Replace the temperature sensor if it is damaged. There are two temperature sensor types - TID

1 and post-TID 1 (TID 2 and TID 3). Resistance specifications vary between the two sensor types. Be sure to use the correct Troubleshooting Manual chart for the sensor being tested. Replace the temperature sensor if its measured resistance is not within Troubleshooting Manual specifications.

G. Inspect the output speed sensor for damage. Replace the sensor if it has body, terminal or connector seat damage. Allowable output speed sensor resistance is 300 ohms plus or minus 30 ohms.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES (continued) RETARDER MODULE



A. Inspect the retarder control valve body following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. All passages must be clean and debris free. Valve bores must be free of nicks, burrs and scoring. Crocus cloth or a soft stone can be used to attempt removal of slight irregularities, however no honing of any kind is permitted.

B & H. Inspect the retarder control valve and exhaust backfill valve for nicks, burrs, scoring and other damage. A soft stone or crocus cloth can be used to attempt

removal of slight irregularities. Valves must move freely in their bores, when dry, under their own weight.

C & I. Replace the retarder control valve spring or exhaust backfill spring for damage or permanent set. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

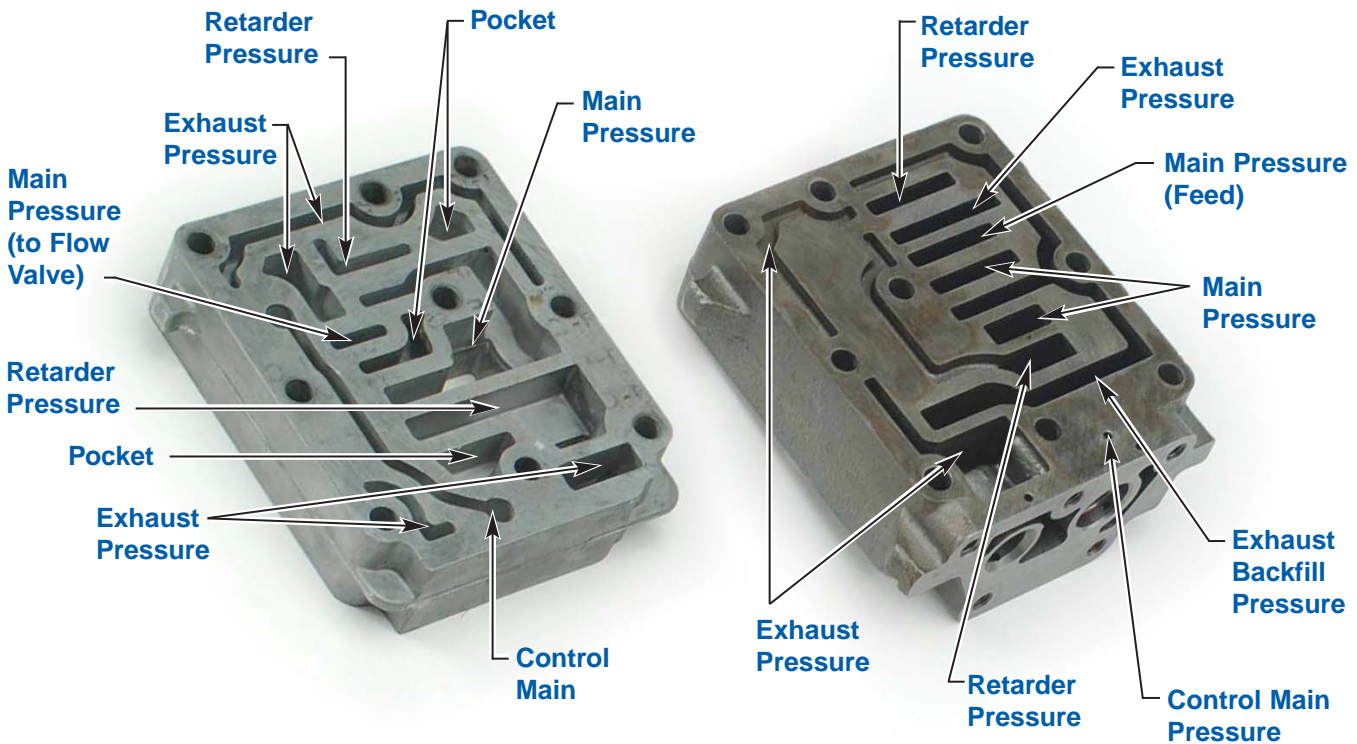
D. Inspect the valve plug for damage. Replace the plug if damage cannot be repaired using a soft stone or crocus cloth.

E. Inspect the channel plate following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the channel plate if it fails any of these inspection procedures or if it has damage which cannot be repaired using a soft stone or crocus cloth. All passages must be clean and debris free.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

RETARDER MODULE (continued)



F. Inspect the separator plate for nicks, burrs, scoring and distortion (flatness). Replace the plate if damage cannot be repaired using a soft stone or crocus cloth.

G. Replace the retarder solenoid if the body, connector or terminals show visible signs of damage. Solenoid resistance should be 3 to 4 ohms measured between the two solenoid terminals. Check resistance between each solenoid terminal and the solenoid body. Replace the solenoid if either reading is less than 100k ohms resistance.

J. Inspect the exhaust backfill valve stop for damage. Replace the stop if damage cannot be repaired using a soft stone or crocus cloth. Inspect the exhaust backfill valve pin for damage. Replace the pin if it is bent or has damage.

K. Replace or repair the wiring harness if the wires, terminals or connectors are visibly damaged. Check the installed harness for tight bends or crimps which might damage harness wires.

L. Inspect the solenoid cover following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the housing if it fails any of these inspection procedures.

ALLISON 4000/B 500 PRODUCT FAMILIES CLOSE RATIO MAIN SHAFT MODULE



Close Ratio Main Shaft Module

A. Inspect the main shaft following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the main shaft if it fails any of these inspection procedures.

B. Inspect the front and rear main shaft pilots for damage. The front main shaft pilot fits inside the turbine shaft. The rear main shaft pilot fits inside the output shaft. Replace the main shaft if pilot outside diameter is less than 35.92 mm (1.414 inch).

C. Inspect the P2 bushing journal area for damage. Replace the main shaft if P2 planetary bushing

journal diameter is less than 52.98 mm (2.085 inch).

D. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearing that fails any of these inspection procedures.

E. Inspect the P2 sun gear following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the gear if it fails any of these inspection procedures.

F. Inspect the main shaft bearing spacer following the “General Inspection Guidelines for Cast Parts

and Machined Surfaces” and “General Inspection Guidelines for Splines” sections of this manual. Replace the spacer if it fails any of these inspection procedures.

G. Inspect the selective shim for damage. Replace the shim if it is distorted or if damage cannot be removed by light stoning.

H. Inspect the P3 sun gear following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the gear if it fails any of these inspection procedures.

I. Replace the spiral retaining ring if it is removed.

ALLISON 4000/B 500 PRODUCT FAMILIES

WIDE RATIO MAIN SHAFT MODULE



A. Inspect the main shaft following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the main shaft if it fails any of these inspection procedures.

B. Inspect the front and rear main shaft pilots for damage. The front main shaft pilot fits inside the turbine shaft. The rear main shaft pilot fits inside the output shaft. Replace the main shaft if pilot outside diameter is less than 35.92 mm (1.414 inch).

C. “Inspect the P2 bushing journal for damage. Replace the main shaft if P2 planetary bushing journal diameter is less than 52.98 mm (2.085 inch).

D. Inspect the P2 sun gear following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the gear if it fails any of these inspection procedures.

E. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearing that fails any of these inspection procedures.

F. Inspect the main shaft bearing spacer following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” “General Inspection Guidelines for Splines” sections of this manual. Replace the spacer if it fails any of these inspection procedures.

G. Inspect the selective shim for damage. Replace the shim if it is distorted or if damage cannot be removed by light stoning.

H. Replace the spiral retaining ring if it is removed.

ALLISON 4000 / B 500 PRODUCT FAMILIES P2 PLANETARY MODULE



A. Inspect the P2 carrier following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the carrier if any spindle has more than 0.051 mm (0.002 inch) clearance in its bore.

B. Inspect the P2 carrier bushing for damage. Replace the bushing if damaged. Replace the bushing if inside diameter exceeds 53.23 mm (2.096 inches).

C. Inspect the carrier hub for damage. Replace the carrier if damage cannot be repaired using a soft stone or crocus cloth.

D. Inspect the P3 ring gear following the “General Inspection Guidelines for Gears” and “General Inspection Guidelines for Splines” sections of this manual. Replace the ring gear if it fails any of these inspection procedures.

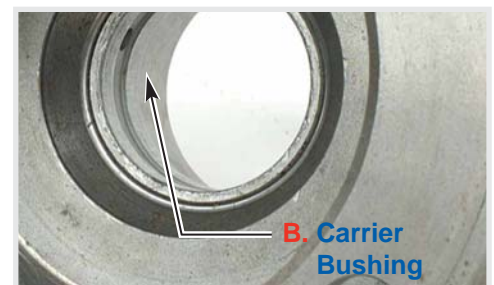
E. Inspect the P2 indexing ring for step wear in the area where it contacts the spindle. Replace the indexing ring if it is broken or if it has excessive step wear or damage. Indexing rings with acceptable wear can be flipped during reassembly so that a new contact surface is used.

F. Replace the pinion gear thrust washers if they are damaged, distorted, galled or showing signs of

excessive wear. Minimum allowable thrust washer thickness is 1.40 mm (0.055 inch). Maximum allowable thrust washer step wear is 0.12 mm (0.005 inch).

G. Replace planetary spindles if they are worn or damaged. Discoloration is only a concern if spindle surface damage exists.

(continued)



ALLISON 4000/B 500 PRODUCT FAMILIES

P2 PLANETARY MODULE *(continued)*

Supersession Information

Planetary Spindle and Indexing Ring Updates - Reference SIL 10-WT-00

Planetary spindles and indexing rings are backward compatible. Current spindles are stamped with the number "2." Indexing rings are stamped with the identifier "HD5."



4000 Series
Wide Ratio
P2 Carrier
Assembly



4000 Series
Close Ratio
P2 Carrier
Assembly



H. Inspect the pinion roller bearings following the "General Inspection Guidelines for Bearings" section of this manual. Replace any bearing failing these inspection procedures.

I. Inspect the P2 pinion gears following the "General Inspection Guidelines for Gears" section of this manual. Replace any gear that fails these inspection procedures or if damage cannot be removed using a soft stone.

J. Inspect the P2 carrier retaining rings for damage or distortion. Replace any retaining rings with damage that cannot be removed using a soft stone.

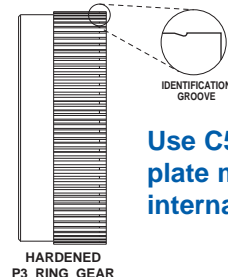
NOTE: Current P3 ring gears are hardened. Former P3 ring gears were non-hardened. Each ring gear requires a specific C5 clutch plate. There are two current versions of C5 clutch plates. Plates which are missing two splined teeth must be used with the hardened P3 ring gear (identified by the groove on the gear's outside diameter). Plates missing three splined teeth must be used with the non-hardened P3 ring gear (no identification groove). Reference the C5 clutch plate "Supersession Information" in this section and SILs 12-WT-03 and 4-WT-00, Revision B. The correct current C5 clutch plate must be used with each ring gear to avoid transmission damage.

Supersession Information

P3 Ring Gear Update -
SIL 12-WT-03

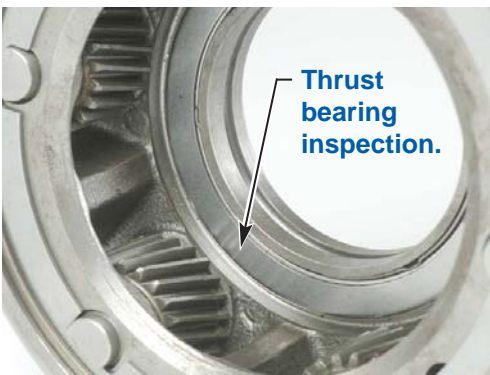
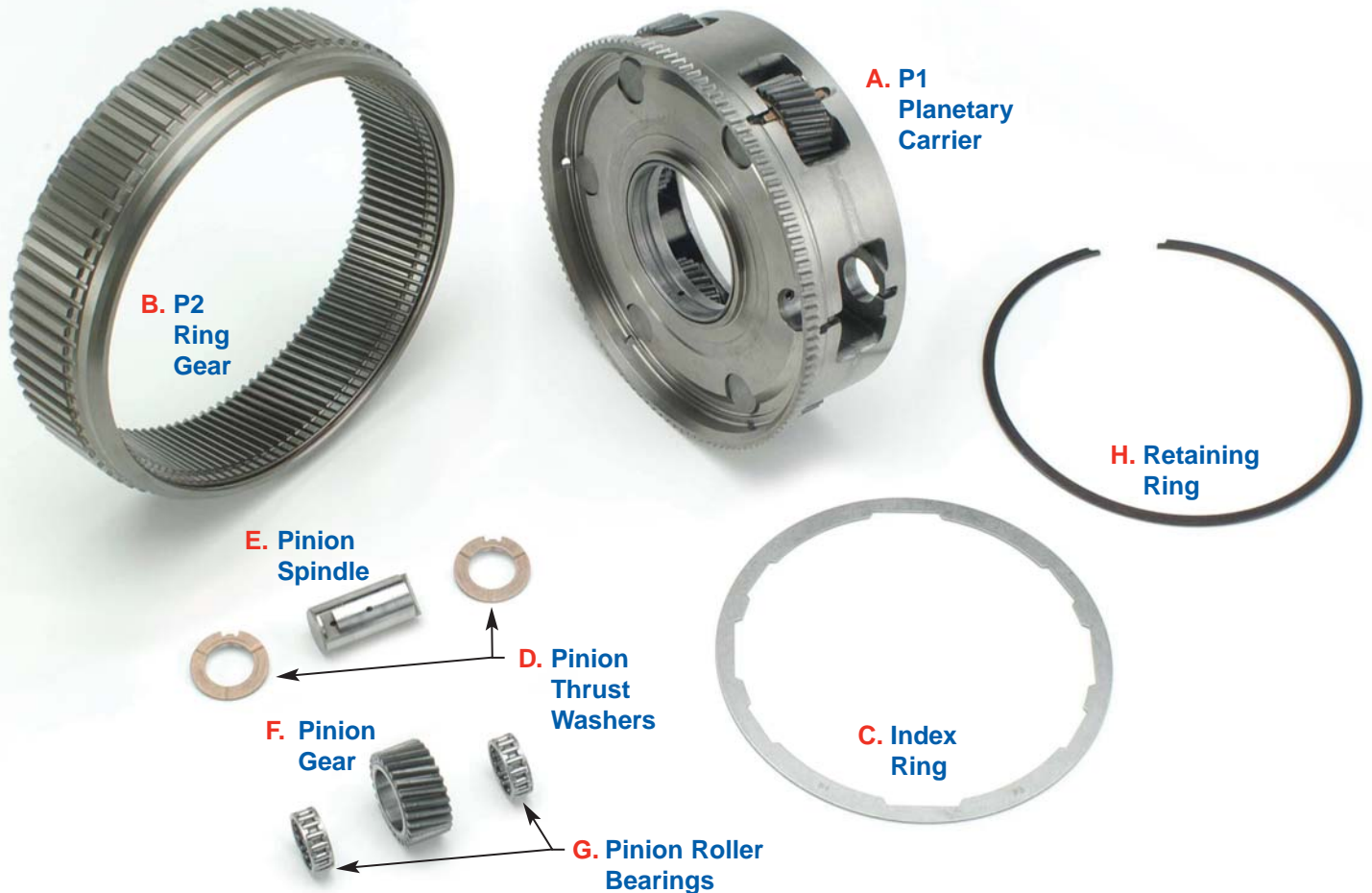


Use C5 friction plate missing 3 internal teeth.



Use C5 friction plate missing 2 internal teeth.

ALLISON 4000 / B 500 PRODUCT FAMILIES P1 PLANETARY MODULE



A. Inspect the P1 carrier following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the carrier if any spindle has more than 0.051 mm (0.002 inch) clearance in its bore.

Thrust bearings fit on both sides of the P1 carrier. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearing that fails any of these inspection procedures.

B. Inspect the P2 ring gear following the “General Inspection Guidelines for Gears” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the ring gear if it fails any of these inspection procedures.

C. Inspect the P1 indexing ring for step wear in the area where it contacts the spindle. Replace the indexing ring if it is broken or if it has excessive step wear or damage. Indexing rings with acceptable wear can be flipped during reassembly so that a new contact surface is used.

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES

P1 PLANETARY MODULE *(continued)*

Supersession Information

Planetary Spindle and Indexing Ring Updates - SIL 10-WT-00



Planetary spindles and indexing rings are backward compatible. Current spindles are stamped with the number “2.” Indexing rings are stamped with the identifier “HD5.”

D. Replace the pinion gear thrust washers if they are damaged, distorted, galled or showing signs of excessive wear. Minimum allowable thrust washer thickness is 1.39 mm (0.054 inch).

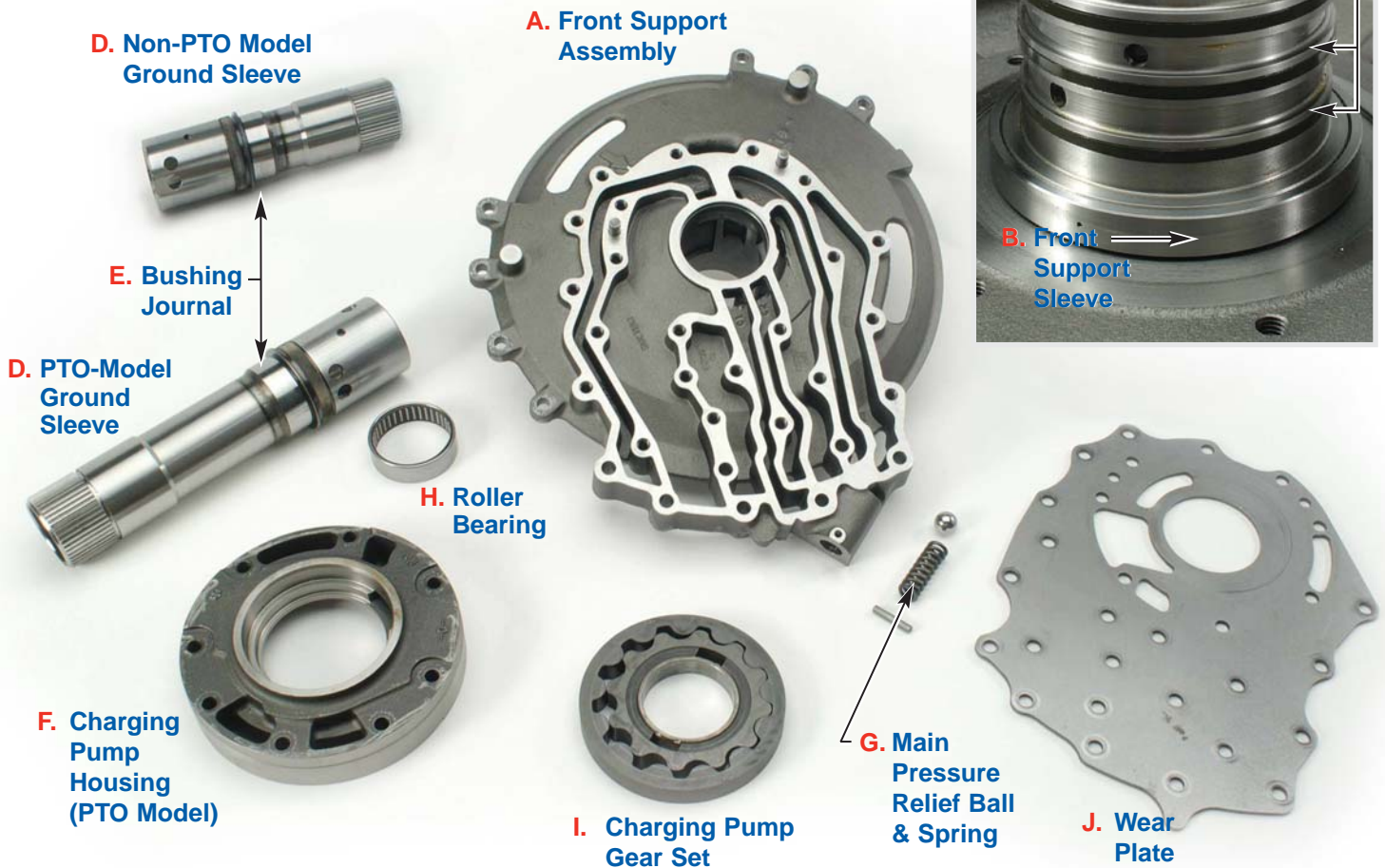
E. Replace planetary spindles if they are worn or damaged. Discoloration is only a concern if spindle surface damage exists.

F. Inspect the P1 pinion gears following the “General Inspection Guidelines for Gears” section of this manual. Replace any gear that fails these inspection procedures or if damage cannot be removed using a soft stone.

G. Inspect the pinion roller bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearing failing these inspection procedures.

H. Inspect the P1 carrier retaining rings for damage or distortion. Replace any retaining rings with damage that cannot be removed using a soft stone.

ALLISON 4000/B 500 PRODUCT FAMILIES FRONT SUPPORT & OIL PUMP MODULE



Supersession Information

Redesigned Charging Pump Gear Set - SIL 13-WT-04



Former



Current

Orange bushing identifies current gear set.

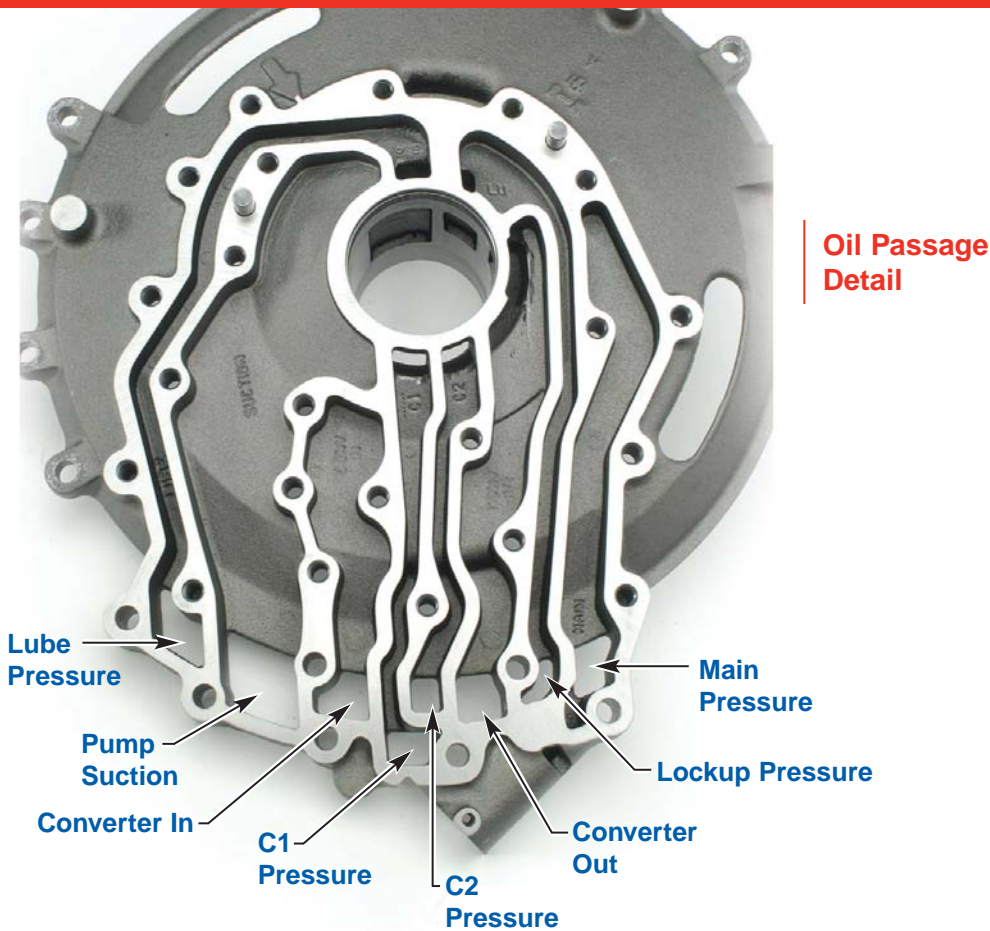
A. Inspect the front support assembly following the “General Inspection Guidelines for Cast Parts and Machined Parts” section of this manual. Replace the assembly if it fails any of these inspection procedures. If the ground sleeve has rotated in the front support, replace both components (the ground sleeve and the front support assembly). If the ground sleeve is replaced, check the front support for flatness after ground sleeve installation. Replace the front support if it is more than 0.051 mm (0.002 inch) from flat.

B. Replace the front support if the sleeve has damage that cannot be repaired using a soft stone or crocus cloth. Minimum allowable front support sleeve diameter is 119.81 mm (4.717 inches).

C. Inspect the three sealing grooves on the front support assembly hub for nicks, burrs, cracks and other damage.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES FRONT SUPPORT & OIL PUMP MODULE *(continued)*



D. Inspect the ground sleeve following the “General Inspection Guidelines for Splines” section of this manual. Replace the shaft if it fails any of these inspection procedures.

E. Inspect the journal area where the charging pump driven gear bushing rides. Replace the shaft if the journal is damaged or galled. Minimum allowable journal diameter is 66.67 mm (2.265 inches).

NOTE: Ground sleeve galling is typically an indicator of poor transmission fluid condition due to improper maintenance intervals. Observation of proper fluid change

intervals is key to optimum transmission life.

Inspect the area in the ground sleeve where the turbine shaft sealrings ride for grooves, scoring and other wear or damage. Install new sealrings in the ground sleeve and measure the end gap. If the ground sleeve is grooved or worn, place the sealrings directly in the grooved or worn area. Maximum allowable sealring end gap is 1.01 mm (0.039 inches). Replace the ground sleeve if any of the seal ring end gaps exceeds this specification.

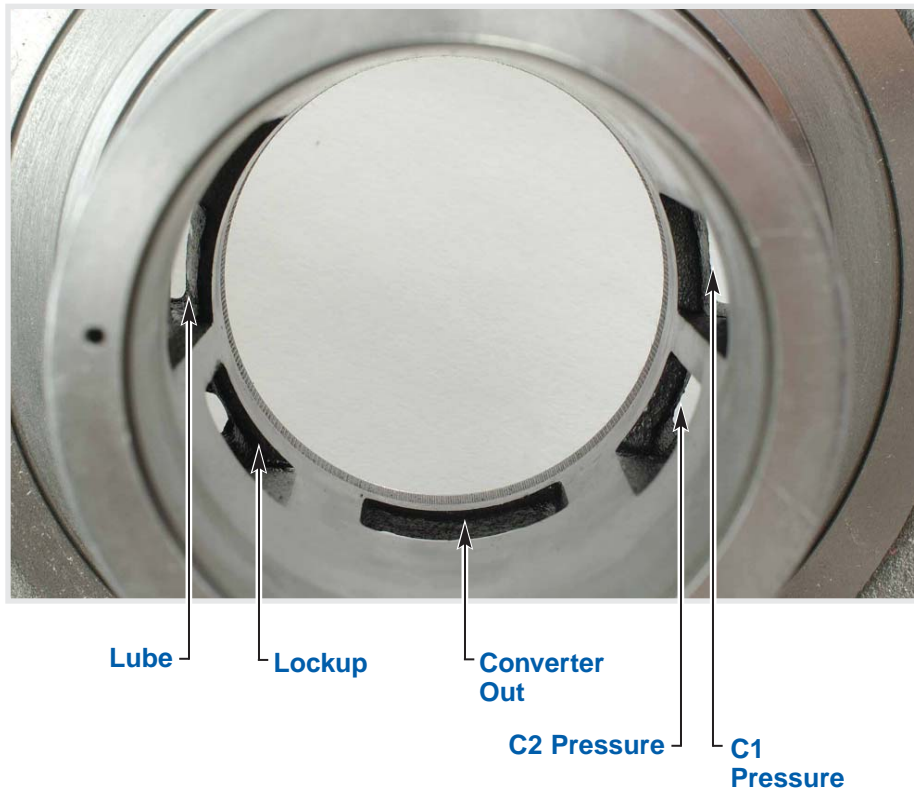
NOTE: When replacing the ground sleeve, total shaft runout cannot exceed 0.30 mm (0.012 inch) once it is pressed into the front support.



(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) FRONT SUPPORT & OIL PUMP MODULE

Oil passage detail -
inside hub.



F. Inspect the charging pump housing following the “General Inspection Guidelines for Cast Parts and Machined Parts” section of this manual. Replace the housing if it fails any of these inspection procedures. Replace the charging pump housing if gear cavity depth exceeds 19.04 mm (0.750 inches). Replace the charging pump housing if gear cavity diameter exceeds 150.25 mm (5.915 inches).

G. Replace the main pressure relief ball if it is damaged. Inspect the main pressure relief spring following the “General Inspection Guidelines for Springs” section of this manual. Replace the spring if it is bent, broken, distorted or shows signs of wear from rubbing adjacent parts. Reference the Spring Data Charts in the Service Manual for spring identification and specifications.

H. The roller bearing fits inside the back of the front support hub. Inspect this bearing following the “General Guidelines for Bearings” section of this manual. Replace the bearing if it fails any of these inspection procedures.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

FRONT SUPPORT & OIL PUMP MODULE *(continued)*

Ground sleeve oil passage detail.



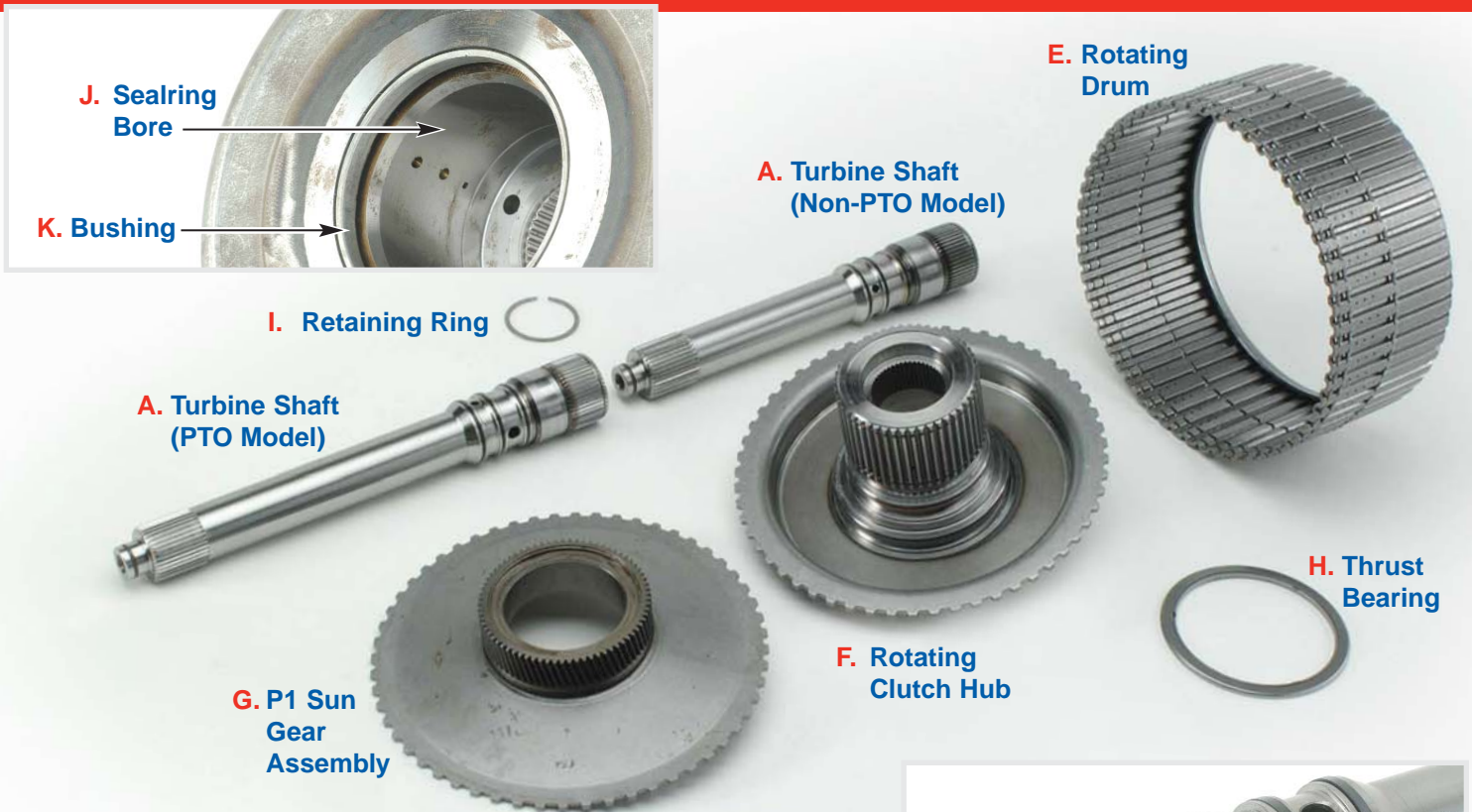
I. Replace the charging pump gear set if the sides, faces or gear teeth are damaged. Replace the gear set if the inside gear shows damage or battering at the point where the torque converter drive tangs (or the PTO drive hub tangs) index into the gear. Replace the gear set if the bushing inside diameter exceeds 57.30 mm (2.256 inch). Minimum allowable outside diameter of the outer gear is 149.94 mm (5.903 inch).

NOTE: Install the pump gear set in the oil pump housing to perform the following inspections and measurements.

Maximum allowable clearance between the installed gear set and mounting face of the pump housing is 0.10 mm (0.004 inch). This is often referred to as pump gear side clearance. Maximum allowable gear tooth tip clearance (the gap between a tooth on the outer gear and a tooth on the inner gear) is 0.15 mm (0.006 inch). The maximum allowable clearance between the outer gear and the pump housing is 0.30 mm (0.012 inch).

J. Replace the wear plate if it is galled or moderately scored. Pay particular attention to the area where the charging pump gear set rides. Minimum allowable wear plate thickness is 4.70 mm (0.0185 inch). Replace the wear plate if it is worn past service limits or if it has damage that cannot be repaired using a soft stone or crocus cloth.

ALLISON 4000/B 500 PRODUCT FAMILIES ROTATING CLUTCH MODULE



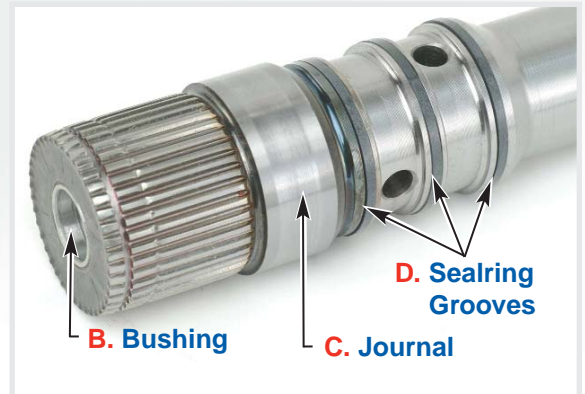
A. Inspect the turbine shaft following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the turbine shaft if it fails any of these inspection procedures. Maximum allowable spline wear is 0.38 mm (0.015 inch).

B. Inspect the turbine shaft bushing following the “General Inspection Guidelines for Bushings” section of this manual. Replace the bushing if it fails any of these inspection procedures. Maximum allowable bushing inside diameter is 36.14 mm (1.423 inch).

C. Inspect the bearing journal area for damage. Replace the turbine shaft if damage cannot be repaired with a light stone or crocus cloth.

D. Inspect the three sealring grooves for damage. Replace the turbine shaft if damage cannot be repaired with a light stone or crocus cloth. Install three new sealrings and check end gap. Minimum end gap allowed is 0.65 mm (0.026 inch). Replace turbine shaft if end gap is below minimum.

E. Inspect the rotating drum following the “General Inspection Guidelines for Cast Parts and



Machined Surfaces” and “General Inspection Guidelines for Splines” sections of this manual. Replace the drum if it fails any of these inspection procedures. Maximum allowable spline wear is 0.38 mm (0.015 inch).

F. Inspect the rotating clutch hub following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES

ROTATING CLUTCH MODULE *(continued)*

Rotating clutch hub oil passage detail.

C2 Pressure
C1 Pressure



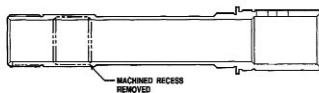
Supersession Information

Turbine Shaft Update -
Reference SIL 19-WT-94

Turbine Shaft



Ground Sleeve



Former turbine shaft and current ground sleeve are NOT compatible.

Supersession Information

Turbine Shaft Update -
Reference SIL 19-WT-94
& 22-WT-94

Current Turbine Shaft



Former Turbine Shaft

Former turbine shafts include a raised area toward the torque converter end of the shaft.

Supersession Information

Rotating Clutch Hub Update -
Reference SIL 8-WT-99, Rev. A



Former (No Weld)

Current (Weld)

Note: The rotating clutch hub was updated beginning with serial number 6610037353. The former rotating clutch hub is not welded in the area shown. The current rotating hub is welded and machined in the area shown.

“General Inspection Guidelines for Splines” sections of this manual. Replace the hub if it fails any of these inspection procedures.

G. Inspect the PI sun gear assembly following the “General Inspection Guidelines for Gears and “General Inspection Guidelines for Splines” sections of this manual. Replace the assembly if it fails any of these inspection procedures or if it has damage which cannot be repaired using a soft stone or crocus cloth.

H. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of

this manual. Replace any bearings which fail any of these inspection procedures.

I. Inspect the turbine shaft retaining ring following the “General Inspection Guidelines for Retaining Rings” section of this manual. Replace the retaining ring if it fails any of these inspection procedures or if the ring is bent, distorted or shows other signs of damage.

J. Inspect the area inside the hub where the front support sealrings ride for grooves and damage. Replace the hub if damage cannot be repaired using a soft stone or

crocus cloth. Install three new sealrings in the wear area of the bore and check each seal’s end gap. Replace the rotating clutch hub if end gap exceeds 1.44 mm (0.056 inch).

K. Inspect the rotating hub bushing following the “General Inspection Guidelines for Bushings” section of this manual. Replace the bushing if it fails any of these inspection procedures or if it has damage which cannot be repaired using a soft stone or crocus cloth. Maximum allowable bushing inside diameter is 120.27 mm (4.735 inch).

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES (continued) ROTATING CLUTCH MODULE



C1 Clutch Components



A. Inspect the C1 drive hub following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the hub if it fails any of these inspection procedures. Maximum allowable spline wear is 0.38 mm (0.015 inch).

B & C. Inspect the C1 clutch piston and C1 balance piston following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace any component if it fails any of these inspection procedures.

NOTE: Aluminum castings (like clutch housings) can be etched by caustic parts cleaners and solvents. Etched components are identified by a dull to dark gray color - not the bright finish of a normal machined aluminum part. Etched components are also identified by roughness in the piston seal surface which can cause piston seals to abrade and result in low clutch apply pressure and transmission damage. Replace etched or damaged components.

D. Replace the C1 return spring assembly if it has permanent spring set, wear due to rubbing adjacent parts or if springs are cracked or broken in any way. Reference the

Spring Data Charts in the Service Manual for spring specifications and identification.

E & F. Inspect the C1 pressure plate and C1 backplate for flatness, galling and other damage. Replace any plate with damage which cannot be removed using a soft stone or crocus cloth. Former C1 pressure plate minimum allowable thickness is 7.90 mm (0.311 inch). Current C1 apply plate minimum allowable thickness is 5.90 mm (0.232 inch). Current C1 backplate minimum allowable thickness is 9.90 mm (0.390 inch). Maximum allowable distortion of all plates is 0.15 mm (0.006 inch).

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

ROTATING CLUTCH MODULE *(continued)*

Supersession Information

C1 Drive Hub Update - Reference SIL 26-WT-04

Current: C1 Drive Hub

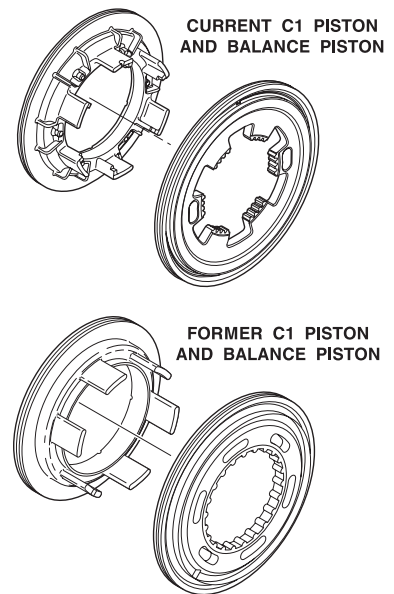
Former: C1 Drive Hub



Drill point identifies the current hub which is backward compatible.

Supersession Information

C1 Clutch Piston and Balance Piston Re-design - Reference SIL 30-WT-04



Former and current components can NOT be mixed.

NOTE: Transmissions built prior to S/N 6610032320 used two identical C1 pressure plates. Transmissions built after that used different plates. The current C1 apply pressure plate (next to the C1 piston) is approximately 2 mm thinner and has a different shape than the current C1 backplate (opposite end of the C1 clutch pack). When replacing the former pressure plates in a transmission with the current plate, both current plates must be used. Mixing former and current plates will result in C1 clutch failure.

G. Inspect the C1 clutch friction plates following the “General Inspection Guidelines for Friction

Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable friction plate thickness is 2.92 mm (0.115 inch). Minimum allowable oil groove depth is 0.20 mm (0.008 inch). Maximum allowable plate coning is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will

have two or more missing splines. Former friction plates will either have one spline missing or none missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission ECU. The rest of the clutches in the main housing (C1 through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update

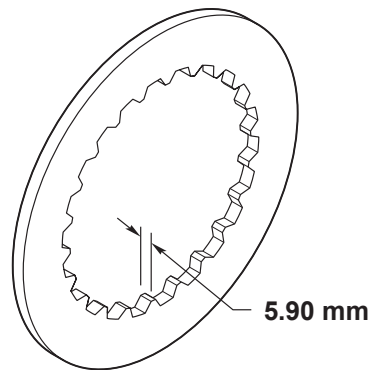
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ALLISON 4000/B 500 PRODUCT FAMILIES (continued) ROTATING CLUTCH MODULE

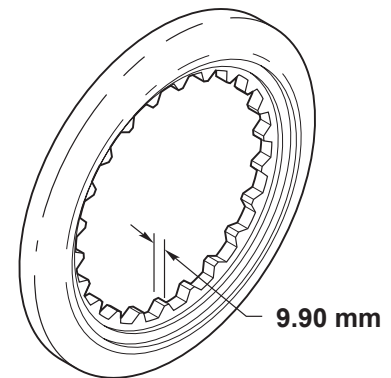
Supersession Information

C1 Backing and Apply Plate Updates - Reference SIL 22-WT-98, Rev. A

NEW STYLE APPLY PLATE



NEW STYLE BACKING PLATE



Former and current components can NOT be mixed

from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU calibration from Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if updating from

former C5 frictions. If any 4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

Inspect the C1 clutch reaction plates following the “General Inspection Guidelines for Reaction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable reaction plate thickness is 2.41 mm (0.095 inch). Maximum allowable reaction plate coning is 0.25 mm (0.010 inch).

H. Inspect the thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearings which fail any of these inspection procedures.

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

ROTATING CLUTCH MODULE *(continued)*



C2 Clutch Components



A. Inspect the C2 drive hub following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the hub if it fails any of these inspection procedures. Maximum allowable spline wear is 0.38 mm (0.015 inch).

B. Inspect the C2 clutch piston following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the piston if it fails any of these inspection procedures.

NOTE: Aluminum castings (like clutch housings) can be etched by caustic parts cleaners and solvents. Etched components are identified by a dull to dark gray color - not the bright finish of a normal machined aluminum part. Etched components are also identified by roughness in the piston seal surface which can cause piston seals to abrade and result in low clutch apply pressure and transmission damage. Replace etched or damaged components.

C. Replace the C2 return spring assembly if it has permanent spring set, wear due to rubbing adjacent parts or if springs are cracked or broken in any way. Reference the

Spring Data Charts in the Service Manual for spring specifications and identification.

D. Replace the C2 spring plate if it is cracked, broken or showing any signs of distortion or wear.

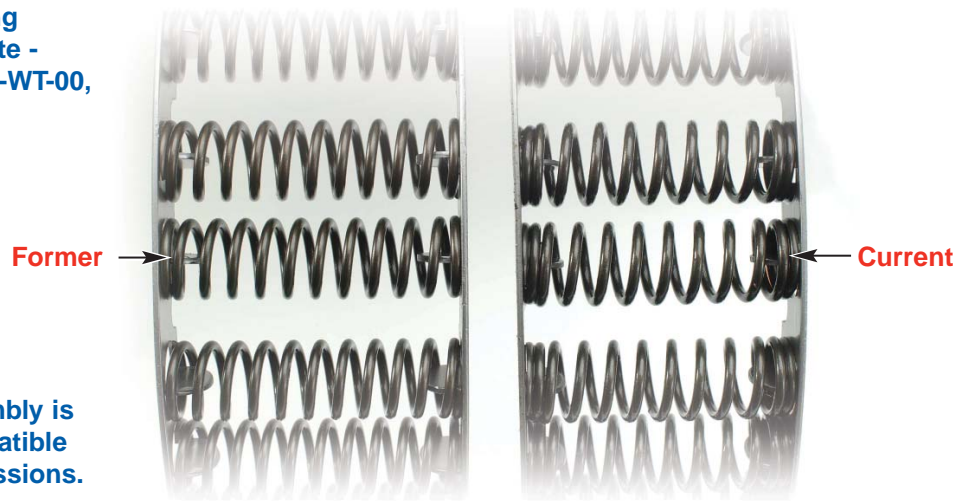
E. Inspect the C2 backplate for damage. Replace the plate if damage cannot be removed using a soft stone or crocus cloth. C2 backplate minimum allowable thickness is 7.90 mm (0.311 inch) when measured at the backing plate wear area. Maximum allowable distortion from flat is 0.015 mm (0.006 inch).

(continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) ROTATING CLUTCH MODULE

Supersession Information

**C2 Return Spring
Assembly Update -
Reference SIL 4-WT-00,
Rev. B**



**Currently assembly is
backward compatible
with all transmissions.**

F. Inspect the C2 clutch friction plates following the “General Inspection Guidelines for Friction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable friction plate thickness is 2.92 mm (0.115 inch). Minimum allowable oil groove depth is 0.20 mm (0.008 inch). Maximum allowable plate coning is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will have two or more missing splines. Former friction plates will either have one spline missing or none missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission ECU. The rest of the clutches in the main housing (C1

through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU calibration from Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if updating from former C5 frictions. If any 4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated

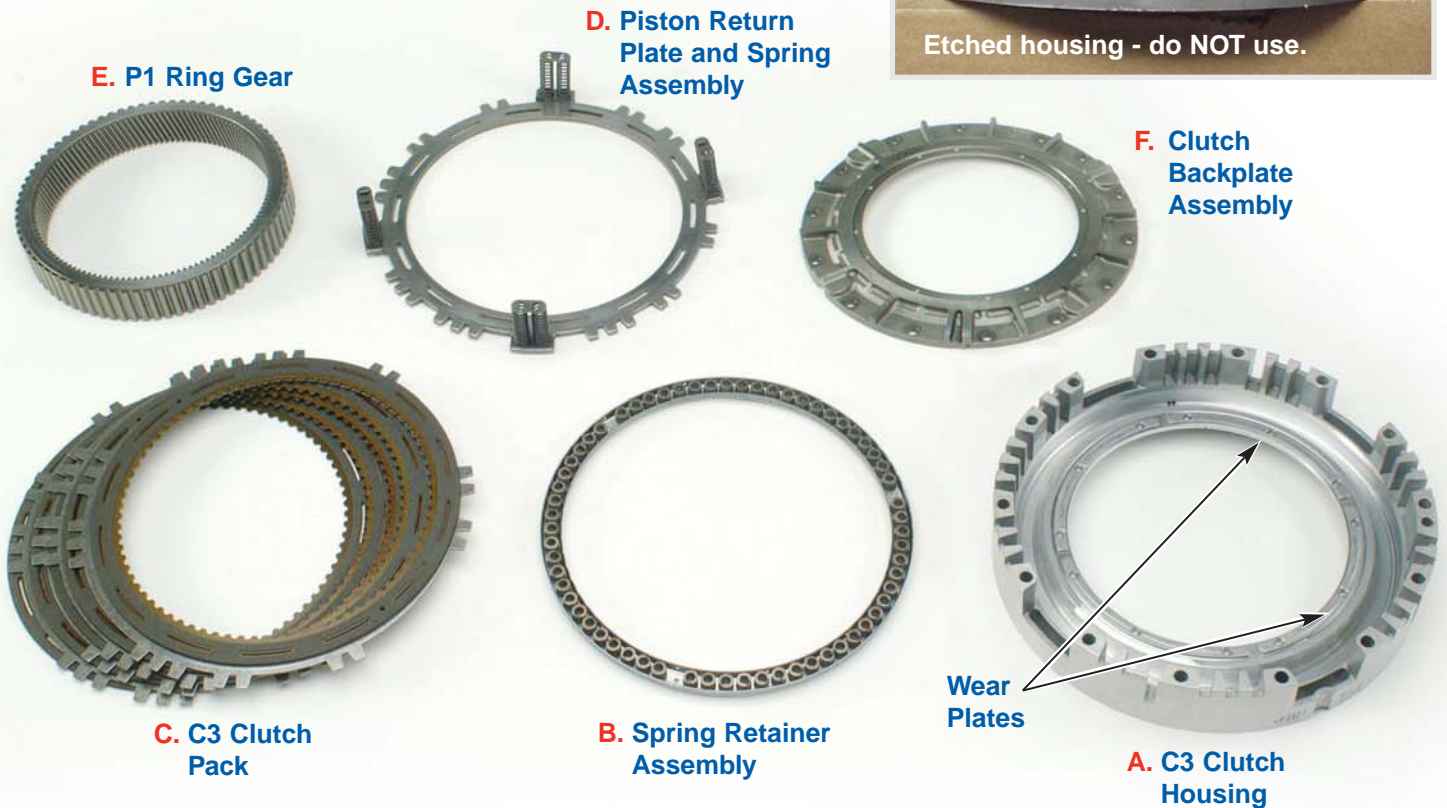
with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

Inspect the C2 clutch reaction plates following the “General Inspection Guidelines for Reaction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable reaction plate thickness is 2.41 mm (0.095 inch). Maximum allowable reaction plate coning is 0.25 mm (0.010 inch).

G. Inspect thrust bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearings which fail any of these inspection procedures.

ALLISON 4000/B 500 PRODUCT FAMILIES C3/C4 CLUTCH MODULE

C3 Clutch Components



A. Inspect the C3 clutch housing following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the housing if it fails any of these inspection procedures. Check for C3 housing spline wear. Maximum allowable spline wear is 1.15 mm (0.045 inch). Replace the C3 housing if excessive spline wear exists. Check the C3 housing wear plates for flatness. Maximum allowable distortion is 0.15 mm (0.006 inch). Minimum allowable wear plate thickness is 2.82 mm (0.111 inch).

NOTE: Aluminum castings (like clutch housings) can be etched by caustic parts cleaners and solvents. Etched components are identified by a dull to dark gray color - not the bright finish of a normal machined aluminum part. Etched components are also identified by roughness in the piston seals to abrade and result in low clutch apply pressure and transmission damage. Replace etched or damaged components.

B. Inspect the C3 spring retainer assembly following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Inspect the assembly for wear due to rubbing adjacent parts and cracked, broken or

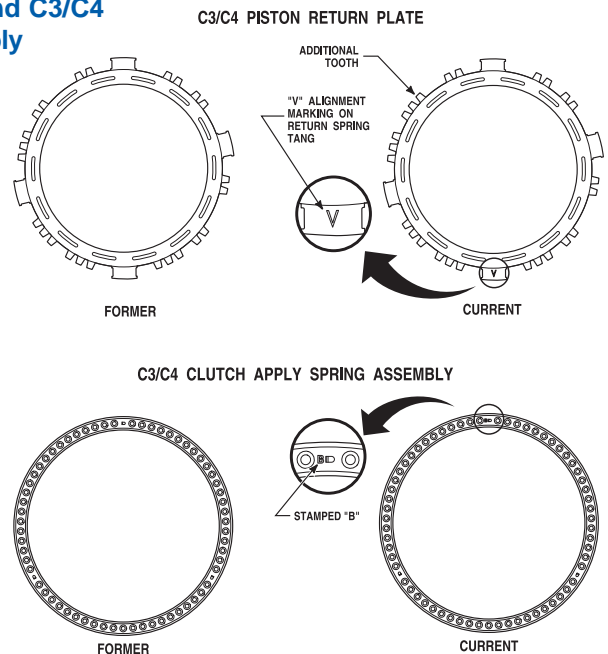
permanently set springs. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

NOTE: The C3/C4 spring retainer assemblies (sometimes referred to as clutch apply spring assemblies) and the C3/C4 piston return plate were updated starting with S/N 6610137389. Do not mix former and current parts in the same clutch pack. The identifier for the current return plate is a letter “V” stamped in the face with an additional external spline on the outside diameter. The identifier for the current apply spring assembly is the letter “B” stamped in the spring retainer. Reference SIL 9-V (continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) C3 / C4 CLUTCH MODULE

Supersession Information

C3/C4 Return Plate and C3/C4 Apply Spring Assembly Update - SIL 9-WT-04



Former and current components can NOT be mixed in the same clutch pack.

C. Inspect the C3 clutch friction plates following the “General Inspection Guidelines for Friction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable friction plate thickness is 3.485 mm (0.137 inch). Maximum allowable plate coning is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will have two or more missing splines. Former friction plates will either have one spline missing or none missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission

ECU. The rest of the clutches in the main housing (C1 through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU calibration from Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

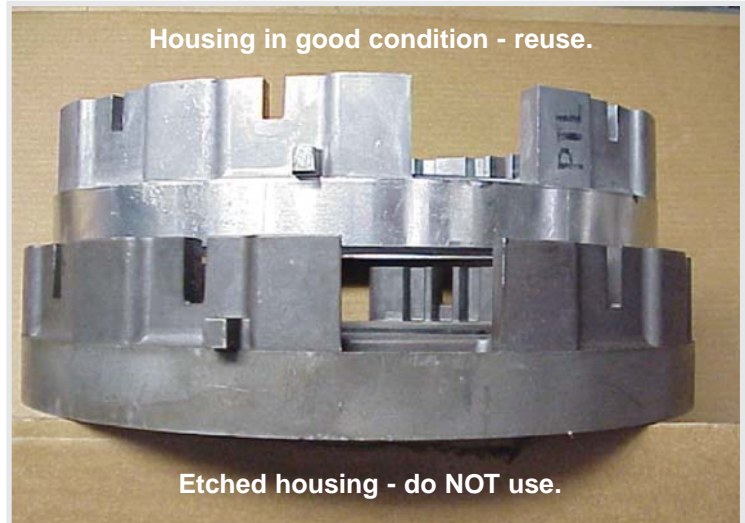
The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if

updating from former C5 frictions. If any 4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

Inspect the C3 clutch reaction plates following the “General Inspection Guidelines for Reaction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable reaction plate thickness is 2.41 mm (0.010 inch). Maximum allowable reaction plate coning is 0.25 mm (0.010 inch). (continued)

ALLISON 4000 / B 500 PRODUCT FAMILIES

C3 / C4 CLUTCH MODULE *(continued)*



D. Inspect the C3 piston return plate and spring assembly following the “General Inspection Guidelines for Reaction Plates” section of this manual. Minimum allowable plate thickness is 4.91 mm (0.193 inch). Replace springs which are cracked, broken or permanently set. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

NOTE: The C3/C4 spring retainer assemblies (sometimes referred to as clutch apply spring assemblies) and the C3/C4 piston return plate were updated starting with S/N 6610137389. Do not mix former and current parts in the same clutch pack. The identifier for the current return plate is a letter “V” stamped in the face with an additional external spline on the outside diameter. The identifier for the current apply spring assembly is the

letter “B” stamped in the spring retainer. Reference SIL 9-WT-04.

E. Inspect the P1 ring gear following the “General Inspection Guidelines for Gears” and General Inspection Guidelines for Splines” sections of this manual. Replace the ring gear if it fails any of these inspection procedures.

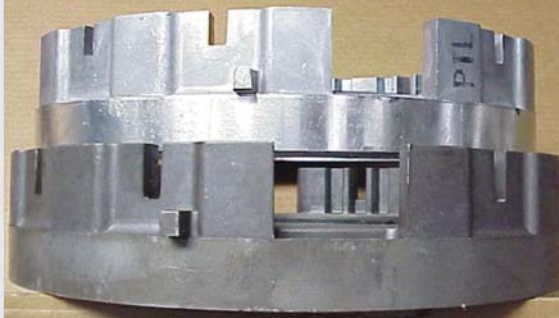
NOTE: The P1 ring gear end face grind operation was eliminated starting with S/N 6610136125. The former P1 ring gear identifier is a groove machined on the outside diameter of the gear. The current P1 ring gear does not have a groove on the O.D. The current P1 ring gear is not compatible with aluminum wear plates riveted to the C3 housing and the clutch backplate. If the former P1 ring gear is replaced with the current P1 ring gear and the unit has aluminum wear plates, then the

wear plates will have to be updated to the current wear plates that are black in color. The former P1 ring gear (with the O.D. groove identifier) is compatible with the black wear plates. Do not replace the former P1 ring gear just because a unit has the black wear plates installed. Reference SIL 18-WT-04.

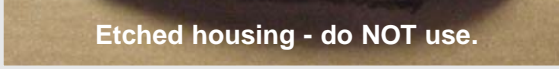
F. Inspect the clutch backplate assembly following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the assembly if it fails any of these inspection procedures. Check the backplate and wear plates for flatness. Maximum allowable distortion is 0.15 mm (0.006 inch). Minimum allowable wear plate thickness is 2.82 mm (0.111 inch).

(continued)

Housing in good condition - reuse.



Etched housing - do NOT use.



ALLISON 4000/B 500 PRODUCT FAMILIES C3/C4 CLUTCH MODULE (continued)

C4 Clutch Components

D. Piston Return Plate and Spring Assembly



A. C4 Clutch Housing



C. C4 Clutch Pack



B. Spring Retainer Assembly



A. Inspect the C4 clutch housing following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the housing if it fails any of these inspection procedures. Check for C4 housing spline wear. Maximum allowable spline wear is 1.15 mm (0.045 inch). Replace the C4 housing if excessive spline wear exists.

NOTE: Aluminum castings (like clutch housings) can be etched by caustic parts cleaners and solvents. Etched components are identified by a dull to dark gray color - not the bright finish of a normal machined aluminum part. Etched components are also identified by roughness in the piston seals to abrade and result in low clutch apply pressure and transmission damage. Replace etched or damaged components.

B. Inspect the C4 spring retainer assembly following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Inspect the assembly for wear due to rubbing adjacent parts and cracked, broken or permanently set springs. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

NOTE: The C3/C4 spring retainer assemblies (sometimes referred to as clutch apply spring assemblies) and the C3/C4 piston return plate were updated starting with S/N 6610137389. Do not mix former and current parts in the same clutch pack. The identifier for the current return plate is a letter “V” stamped in the face with an additional external spline on the outside diameter. The identifier for the current apply spring assembly is the letter “B” stamped in the spring retainer. Reference SIL 9-WT-04.

C. Inspect the C4 clutch friction plates following the “General Inspection Guidelines for Friction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable friction plate thickness is 3.485 mm (0.137 inch). Maximum allowable plate coning is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

Inspect the C4 clutch reaction plates following the “General Inspection Guidelines for Reaction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable reaction plate thickness is 2.41 mm (0.095 inch). Maximum allowable reaction plate coning is 0.25 mm (0.010 inch).

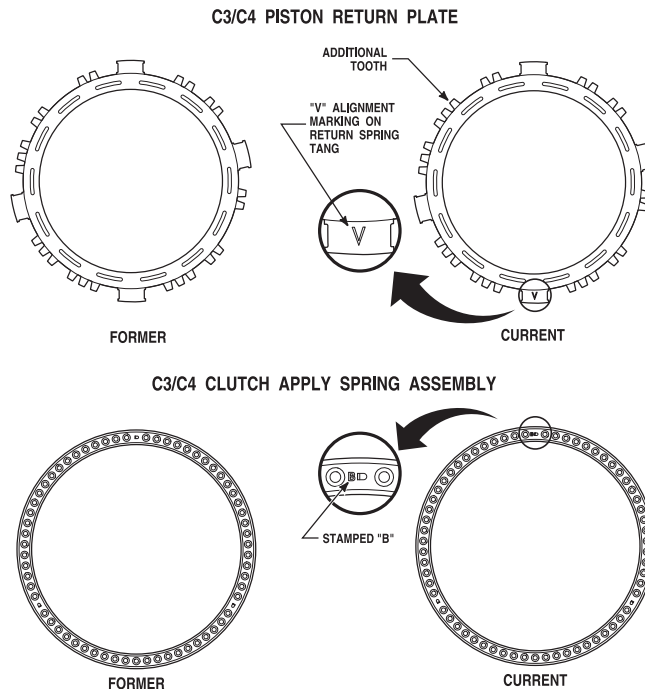
(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES

C3/C4 CLUTCH MODULE *(continued)*

Supersession Information

C3/C4 Return Plate and C3/C4 Clutch Apply Spring Assembly Update - SIL 9-WT-04



Former and current components can NOT be mixed in the same clutch pack.

NOTE: The current clutch friction plates were implemented April of 2000 starting with s/n 6610062126. Current clutch friction plates will have two or more missing splines. Former friction plates will either have one spline missing or none missing. Any 4000/B 500 model transmission may be updated from former C5 friction plates to current C5 frictions without recalibrating the transmission ECU. The rest of the clutches in the main housing (C1 through C4) must be updated with current friction plates if any other individual clutch besides C5 is updated from former to current friction plates. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC II ECU will require a new ECU calibration from Allison Transmission. Any update from former frictions to current frictions in C1 through C4 for a 4000 Series or B500 with a WTEC III ECU with a calibration prior to October 25, 1999 will require an updated ECU

calibration from Allison Transmission. Do not intermix both former and current friction plates in a clutch pack.

The P3 ring gear changed to a harder ring gear on s/n 6610027070. The current P3 ring gear identifier is a groove machined around the outer diameter of the gear. The P3 ring gear with a groove identifier requires the C5 friction with two missing splines if updating from former C5 frictions. If any 4000/B500 series model without the harder ring gear (no groove on O.D.) is being updated with current C5 frictions, then it will require the C5 friction that has three missing internal splines. The C5 friction plate missing three splines will exhibit spline wear if used with the current P3 ring gear with a groove identifier on the O.D. The former P3 ring gear (no groove on O.D.) will exhibit premature wear if used with the current C5 friction with two missing internal splines. No ECU calibration is necessary for updating C5 clutch plates.

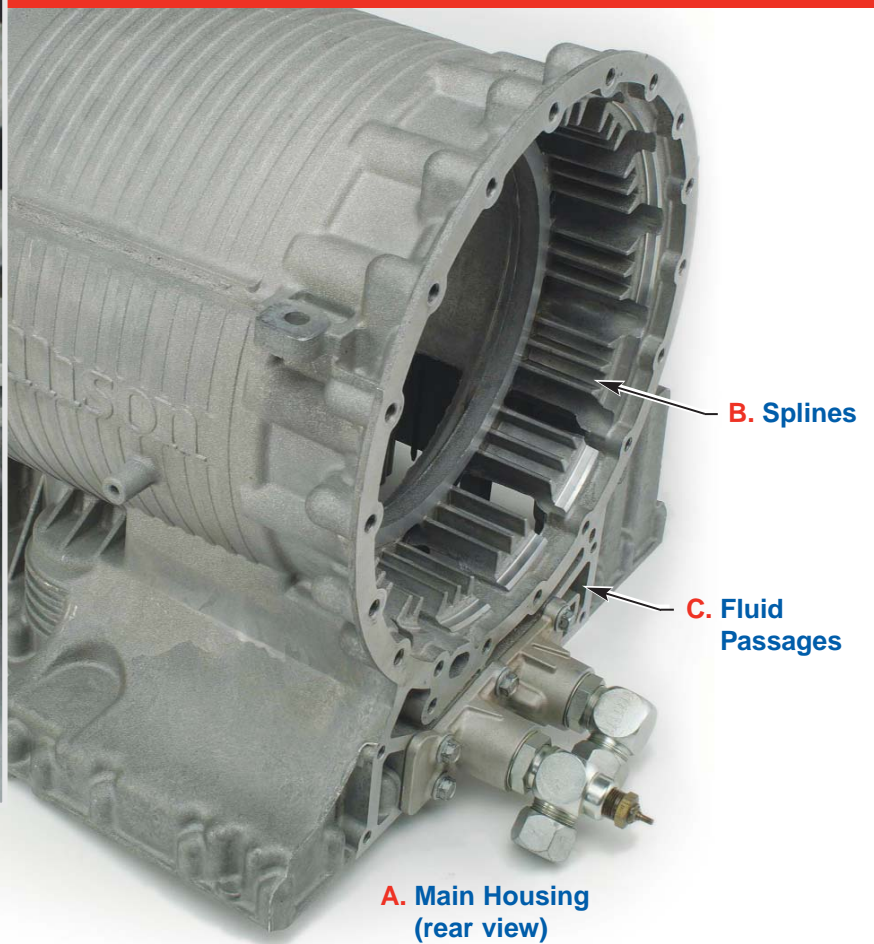
D. Inspect the C4 piston return plate and spring assembly following the “General Inspection Guidelines for Reaction Plates” section of this manual. Minimum allowable plate thickness is 4.91 mm (0.193 inch). Replace springs which are cracked, broken or permanently set. Reference the Spring Data Charts in the Service Manual for spring specifications and identification.

NOTE: The C3/C4 spring retainer assemblies (sometimes referred to as clutch apply spring assemblies) and the C3/C4 piston return plate were updated starting with S/N 6610137389. Do not mix former and current parts in the same clutch pack. The identifier for the current return plate is a letter “V” stamped in the face with an additional external spline on the outside diameter. The identifier for the current apply spring assembly is the letter “B” stamped in the spring retainer. Reference SIL 9-WT-04.

ALLISON 4000/B 500 PRODUCT FAMILIES MAIN HOUSING



Check for spline wear.



A. Main Housing
(rear view)

B. Splines

C. Fluid Passages

A. Inspect the main housing assembly following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and “General Inspection Guidelines for Splines” sections of this manual. Replace the housing if it fails any of these inspection procedures or if the damage cannot be repaired using a soft stone or crocus cloth.

B. Maximum C5 clutch spline wear is 1.15mm (0.045 inch).

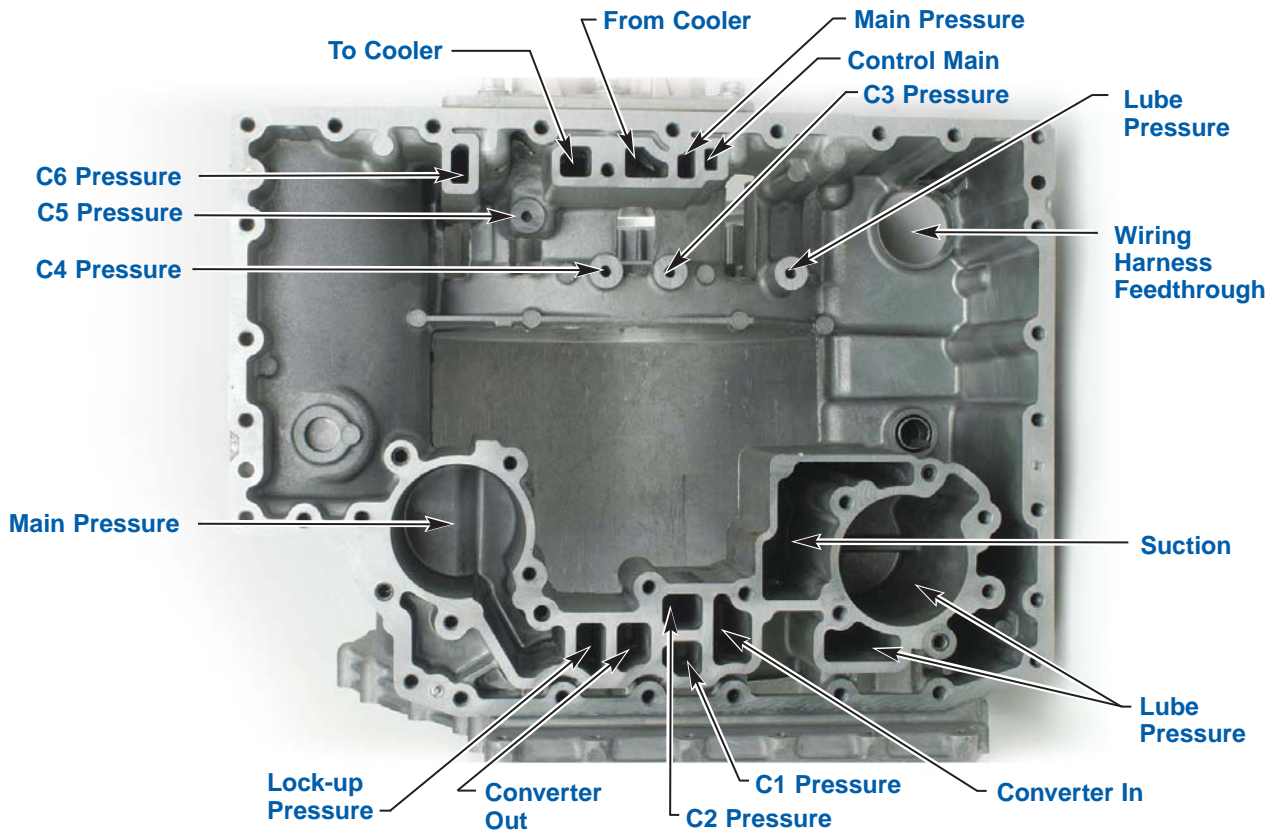
C. Inspect all fluid passages for obstructions, porosity and cracks. Inspect bolt holes for stripped or damaged thread. Replace the housing if damage cannot be repaired.

(continued)

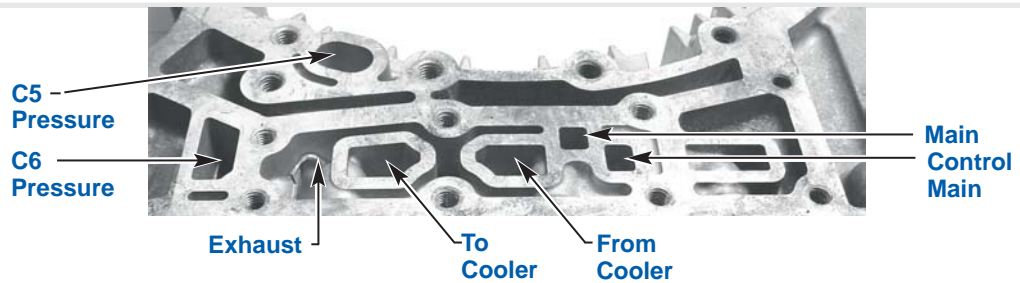
ALLISON 4000/B 500 PRODUCT FAMILIES

MAIN HOUSING (continued)

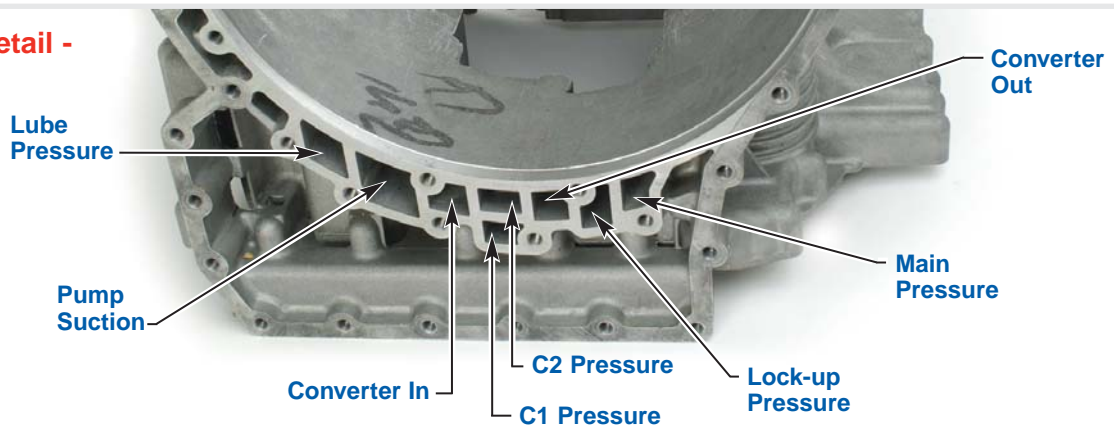
Oil Passage Detail: Main Housing (bottom view)



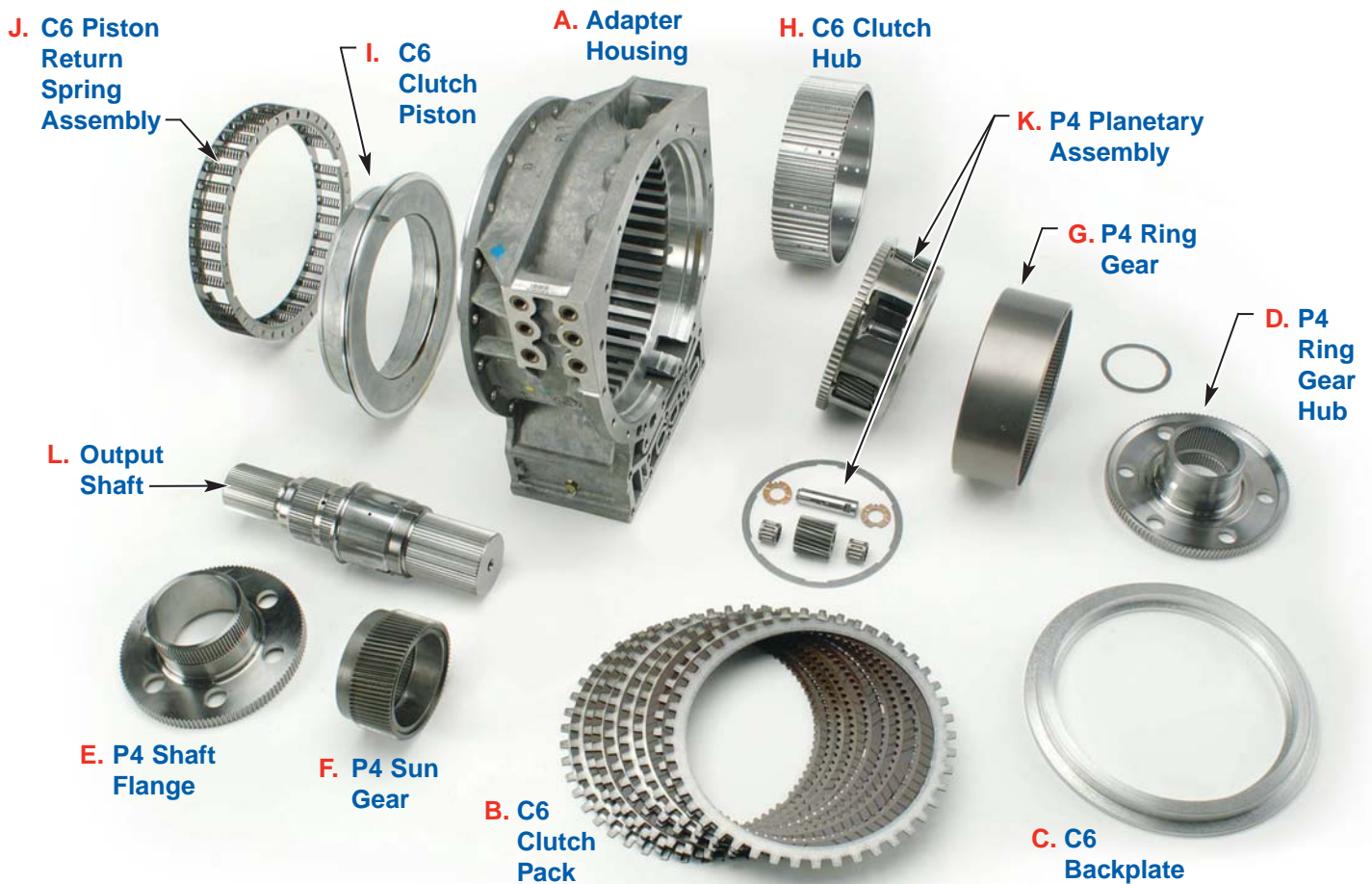
Oil Passage Detail - Main Housing Back View



Oil Passage Detail - Main Housing Front View



ALLISON 4000/B 500 PRODUCT FAMILIES C6 ADAPTER HOUSING MODULE



A. Inspect the adapter housing following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and “General Inspection Guidelines for Splines” section of this manual. Replace the housing if it fails any of these inspection procedures or if the damage cannot be repaired using a soft stone or crocus cloth. Maximum clutch spline wear is 1.15mm (0.045 inch). Inspect all fluid passages for obstructions, porosity and cracks. Inspect bolt holes for stripped or damaged threads. Replace the housing if damage cannot be repaired.

B. Inspect the C6 clutch friction plates following the “General Inspection Guidelines for Friction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable friction plate thickness is 3.68 mm (0.145 inch). Maximum allowable plate coning is 0.25 mm (0.010 inch).

NOTE: Battered and worn spline teeth may be an indicator of driveline issues. Replace the clutch plates and check the driveline.

Inspect the C6 clutch reaction plates following the “General

Inspection Guidelines for Reaction Plates” section of this manual. Replace any plates failing these inspection procedures. Minimum allowable reaction plate thickness is 3.24 mm (0.128 inch). Maximum allowable reaction plate coning is 0.25 mm (0.010 inch).

C. Inspect the clutch backplate assembly following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the assembly if it fails any of these inspection procedures.

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ALLISON 4000/B 500 PRODUCT FAMILIES

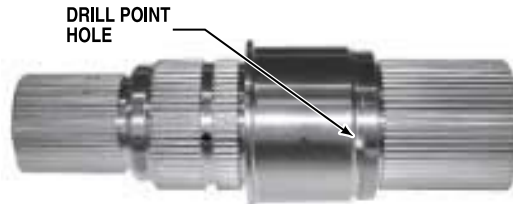
C6 ADAPTER HOUSING MODULE *(continued)*

Supersession Information

**4070 Output Shaft Update -
Reference SIL 25-WT-01**



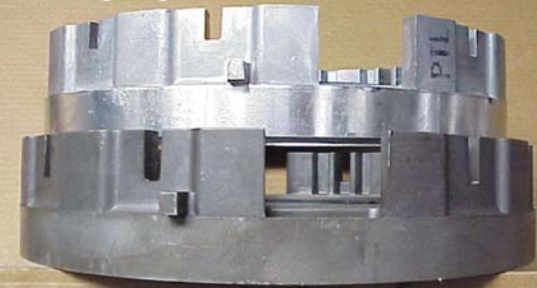
**Former 4070
Non-Retarder
Output Shaft**



**Current 4070
Non-Retarder
Output Shaft**

**Current output shaft requires
current bearing retainer locknut
and Belleville washer.**

Housing in good condition - reuse.



Etched housing - do NOT use.

D. E. F. G. & H. Inspect the P4 ring gear hub, P4 shaft flange, P4 sun gear, P4 ring gear and C6 clutch hub following the “General Inspection Guidelines for Gears” and General Inspection Guidelines for Splines” sections of this manual. Replace any components failing any of these inspection procedures. Replace any components with damage which cannot be repaired using a soft stone or crocus cloth.

I. Inspect the C6 clutch piston following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” section of this manual. Replace the piston if it fails any of these inspection procedures.

NOTE: Aluminum castings (like clutch housings) can be etched by caustic parts cleaners and solvents. Etched components are identified by a dull to dark gray color - not the bright finish of a normal machined aluminum part. Etched components are also identified by roughness in the piston seal surface which can cause piston seals to abrade and result in low clutch apply pressure and transmission damage. Replace etched or damaged components.

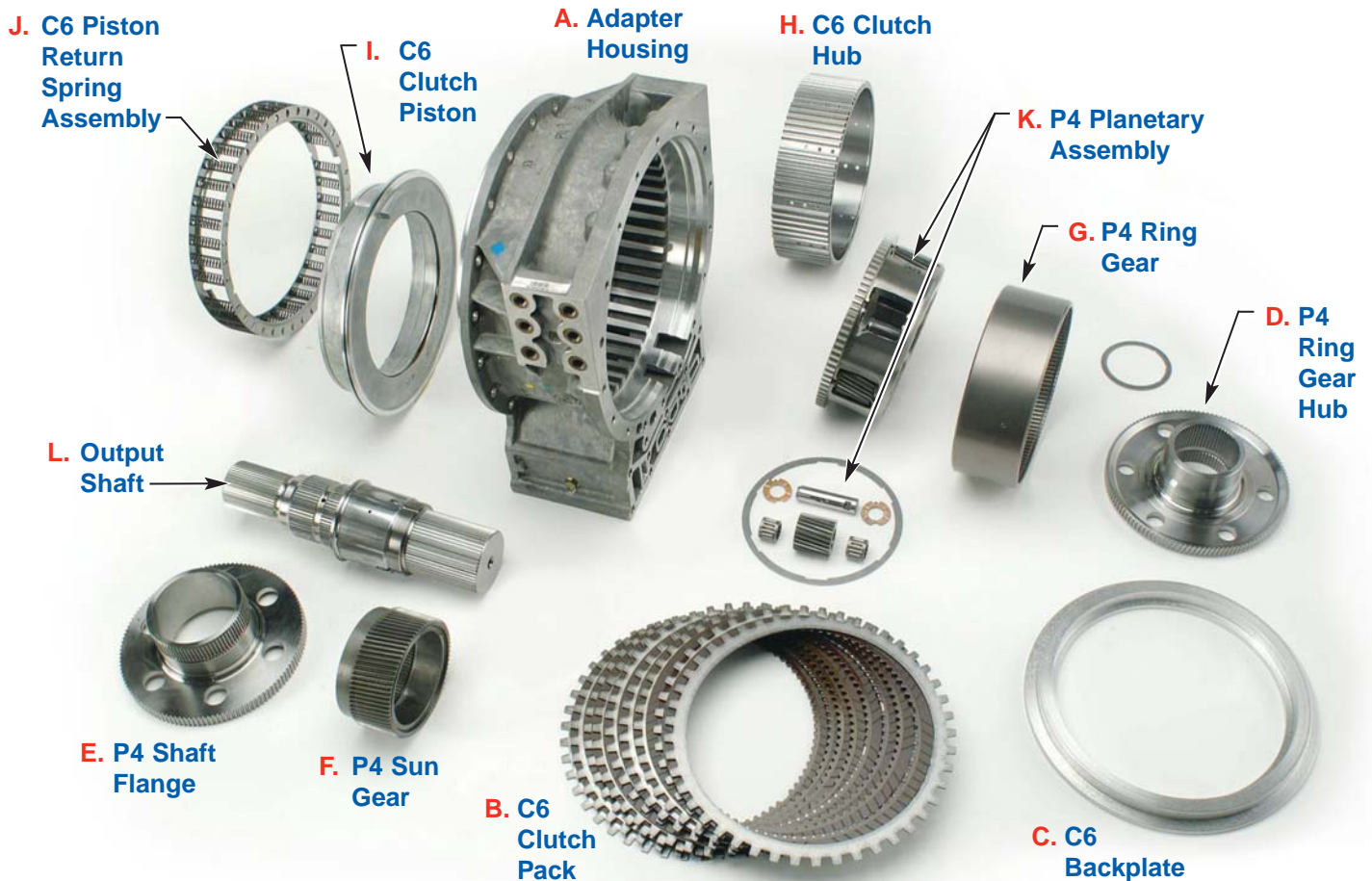
J. Replace the C6 return spring assembly if it has permanent spring set, wear due to rubbing adjacent parts or if springs are cracked or broken. Reference the Spring Data Charts in the Service Manual for

spring specifications and identification.

K. Inspect the P4 carrier following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the carrier if it fails any of these inspection procedures. Replace the carrier if it fails any of these inspection procedures. Replace the carrier and spindles if the spindle bores are worn, out-of-round or otherwise damaged. Maximum allowable movement between the P4 carrier and P4 ring gear is 0.38mm (0.015 inch).

(continued)

ALLISON 4000/B 500 PRODUCT FAMILIES (continued) C6 ADAPTER HOUSING MODULE



Inspect the P4 carrier indexing ring for wear and damage, especially where the spindles make contact with the ring. Replace the indexing ring if it shows signs of spindle battering or has damage which cannot be repaired using a light stone.

Replace the pinion gear thrust washers if they are damaged, distorted or showing signs of overheating. Minimum allowable thrust washer thickness is 1.40 mm (0.055 inch).

Replace pinion spindles if they are damaged or showing signs of overheating.

Inspect the P4 pinion gears following the “General Inspection Guidelines for Gears” section of this manual. Replace any gear that fails these inspection procedures or if damage cannot be repaired using a soft stone or crocus cloth.

Inspect the pinion roller bearings following the “General Inspection Guidelines for Bearings” section of this manual. Replace any bearing failing these inspection procedures.

L. Inspect the output shaft following the “General Inspection Guidelines for Cast Parts and Machined Surfaces” and the “General Inspection Guidelines for Splines” sections of this manual. Replace the output shaft if it fails any of these inspection procedures. Inspect the output shaft bushing following the “General Inspection Guidelines for Bushings” section of this manual. Replace the bushing if it fails these inspection procedures. Maximum allowable bushing inside diameter is 36.14 mm (1.423 inch).

ALLISON 4000/B 500 PRODUCT FAMILIES

WEAR LIMITS AND SPRING DATA

7-1. WEAR LIMITS DATA

A. Maximum Variations. Wear limit information in this Section shows the maximum wear at which components are expected to function satisfactorily. Table 7-1 lists the Wear Limits Data and is referenced to the exploded views (Foldouts 4 through 12) in the back of this manual.

B. Cleaning and Inspection. Parts must be clean to permit effective inspection for wear or damage. Refer to Section 3.

7-2. SPRING DATA

A. Spring Replacement. Springs should be replaced if there are signs of overheating, wear due to rubbing

adjacent parts, or permanent set. Discard springs which do not meet the load height specifications according to Table 7-2, Spring Data.

B. Inspection. Inspection criteria (load vs. height) and identification characteristics of the springs are presented in Table 7-2. The Spring Data are keyed to the exploded views (Foldouts 4 through 12) in the back of this manual.

NOTE:

When more than one spring part number is listed for the same location, refer to the HD/B 500/T 400 Series Parts Catalog PC2456EN to determine which spring is used in your specific assembly number.

Table 7-1. Wear Limits Data

Illustration	Description	Wear Limit	
		mm	(inches)
Foldout 4,B TORQUE CONVERTER MODULE			
10	Converter Cover Bushing, Maximum ID	66.91	2.634
12	Lockup Piston Assembly, Minimum Thickness	6.53	0.257
14	Damper Assembly Plate, Maximum Distortion	0.51	0.020
14	Damper Assembly Plate, Minimum Thickness	8.51	0.335
14, 18	Turbine-To-Damper, Maximum Spline Wear	0.38	0.015
15	Backplate, Maximum Distortion	0.15	0.006
15	Backplate, Minimum Wear Surface Thickness	11.79	0.464
18	Turbine Hub, Minimum OD	66.69	2.626
19	Turbine Hub Sealring, Maximum ID	61.77	2.432
24	Stator Thrust Plate, Minimum Thickness	9.45	0.372
36	Converter Pump Hub, Minimum OD	88.99	3.504
Foldout 5,B TORQUE CONVERTER HOUSING MODULE — PTO EQUIPPED			
6	Bearing Retainer Bushing, Maximum ID	89.19	3.511
8, 14	Oil Pump Drive Hub Seal, Minimum End Gap	1.18	0.047
8, 14	Oil Pump Drive Hub Seal, Maximum End Gap	1.66	0.065
13	Oil Pump Drive Hub, Maximum Tang Wear	0.31	0.012

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) WEAR LIMITS AND SPRING DATA

Table 7-1. Wear Limits Data (cont'd)

Illustration	Description	Wear Limit	
		mm	(inches)
Foldout 6,A FRONT SUPPORT AND CHARGING PUMP MODULE			
8	Pump Housing Bushing, Maximum ID	89.19	3.511
9, 10	Pump Housing Gear, Maximum Cavity Depth	19.04	0.750
9, 10	Pump Housing Gear, Maximum Cavity Diameter	150.25	5.915
9, 10, 11	Driven Gear-To-Pump Housing, Maximum Diametric Clearance	0.30	0.012
9, 10, 13	Gear-To-Plate, Maximum Side Clearance	0.10	0.004
11	Gear Set, Maximum Gear Tooth Tip Clearance	0.15	0.006
12	Pump Gear Bushing, Maximum ID	66.93	2.635
16, 17	Ground Sleeve, Minimum OD In Bushing Area	66.67	2.625
16, 17, 20	Spline OD, Maximum Total Runout	0.13	0.005
20	Front Support, Minimum OD	119.81	4.717
25	Front Support Seal, Minimum End Gap	1.00	0.040
25	Front Support Seal, Maximum End Gap	1.44	0.056
Foldout 6,B ROTATING CLUTCH MODULE			
5	Turbine Shaft Bushing, Maximum ID	36.14	1.423
8	Turbine Seal, Minimum End Gap	0.65	0.026
8	Turbine Seal, Maximum End Gap	1.01	0.039
9	Drum Spline, Maximum Wear	0.38	0.015
12	Rotating Clutch Hub Bushing, Maximum ID	120.27	4.735
29	C1 Clutch Apply Plate, Minimum Thickness	5.90	0.232
29, 39	C1 Clutch Apply Plate or C2 Backplate, Maximum Distortion	0.15	0.006
30, 38	C1, C2 Friction Plate, Maximum Cone	0.25	0.010
30, 38	C1, C2 Friction Plate, Minimum Thickness	2.92	0.115
30, 38	C1, C2 Friction Plate, Minimum Oil Groove Depth	0.20	0.008
31, 37	C1, C2 Reaction Steel Plate, Maximum Cone	0.25	0.010
31, 37	C1, C2 Reaction Steel Plate, Minimum Thickness	2.41	0.095
32	C1 Clutch Backplate, Minimum Thickness @ ID	9.90	0.390
34, 36	C1, C2 Drive Hub, Maximum Spline Wear	0.38	0.015
39	C2 Backplate, Minimum Thickness	7.90	0.311
39	C2 Backplate, Maximum Distortion	0.15	0.006

ALLISON 4000/B 500 PRODUCT FAMILIES

WEAR LIMITS AND SPRING DATA *(continued)*

Table 7-1. Wear Limits Data *(cont'd)*

Illustration	Description	Wear Limit	
		mm	(inches)
Foldout 7 MAIN HOUSING MODULE			
4	Backplate, Maximum Step Wear	0.13	0.005
4	Backplate, Maximum Distortion	0.15	0.006
5, 18	P1 Ring Thrust Plate, Minimum Thickness At Wear Point	2.82	0.111
7	P1 Ring Gear Spline, Maximum Wear	0.38	0.015
8, 21, 29	C3, C4, C5 Friction Plate, Maximum Cone	0.25	0.010
8, 21, 29	C3, C4, C5 Friction Plate, Minimum Thickness	3.485	0.137
9, 20, 30	C3, C4, C5 Reaction (Steel) Plate, Maximum Cone	0.25	0.010
9, 20, 30	C3, C4, C5 Reaction (Steel) Plate, Minimum Thickness	2.41	0.095
11, 23	C3, C4 Piston Return Plate, Minimum Thickness	4.91	0.193
19, 28	C3, C4 Clutch Housings, Maximum Spline Wear	1.15	0.045
43	Main Housing, Maximum Spline Wear	1.15	0.045
Foldout 8 MAIN SHAFT MODULE — WIDE RATIO AND CLOSE RATIO			
7, 8	Main Shaft Bearing Journal, Minimum OD	52.98	2.085
7, 8	Main Shaft Pilots (both ends), Minimum OD	35.92	1.414
Foldout 9,A P1 PLANETARY MODULE			
3	P1 Planetary Carrier Assembly, Maximum Pinion End Play	0.94	0.037
9	P1 Carrier Bushing, Maximum ID	89.32	3.516
10, 13	P1 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
10, 13	P1 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005
15	P2 Ring Gear Spline, Maximum Wear	0.38	0.015
Foldout 9,B P2 PLANETARY MODULE			
1	P2 Planetary Carrier Assembly, Maximum Pinion End Play	0.94	0.037
8	P2 Carrier Bushing, Maximum ID	53.23	2.096
9, 12	P2 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
9, 12	P2 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005
15	P3 Ring Gear Spline, Maximum Wear	0.38	0.015

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) WEAR LIMITS AND SPRING DATA

Table 7-1. Wear Limits Data (cont'd)

Illustration	Description	Wear Limit	
		mm	(inches)
Foldout 9,C P3 PLANETARY AND C6 ADAPTER HOUSING MODULE (HD 4070/4076 MODELS)			
1	P3 Carrier Module, Maximum Pinion End Play	0.94	0.037
8	P3 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
8	P3 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005
27	C6 Reaction Plate, Minimum Thickness	3.24	0.128
27, 28	C6 Friction and Reaction Plate, Maximum cone	0.25	0.010
28	C6 Friction Plate, Minimum Thickness	3.68	0.145
32	P4 Carrier Assembly, Maximum Pinion End Play	0.94	0.037
38	P4 Carrier Bushing, Maximum ID	113.33	4.462
40	P4 Planetary Thrust Washer, Minimum Thickness	1.40	0.055
40	P4 Planetary Thrust Washer, Maximum Step Wear	0.12	0.005
Foldout 10,A RETARDER AND P3 MODULE (HD PRODUCT LINE MODELS PRIOR TO S/N 6610066447)			
3	P3 Planetary Carrier Assembly, Maximum Pinion End Play	0.94	0.037
5	Output Shaft Bushing, Maximum ID	36.14	1.423
13, 16	P3 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
13, 16	P3 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005
27, 30	Retarder Rotor Sealring, Maximum ID	139.72	5.501
29	Rotor Hub, Maximum Spline Wear	0.38	0.015
Foldout 10,B REAR COVER AND P3 MODULE (EXCEPT HD 4070/4076 MODELS)			
5	P3 Planetary Carrier Assembly, Maximum End Play	0.94	0.037
7	Output Shaft Bushing, Maximum ID	36.14	1.423
8	Output Shaft, Maximum Spline Wear	0.38	0.015
15, 18	P3 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
15, 18	P3 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005

ALLISON 4000/B 500 PRODUCT FAMILIES

WEAR LIMITS AND SPRING DATA *(continued)*

Table 7-1. Wear Limits Data *(cont'd)*

Illustration	Description	Wear Limit	
		mm	(inches)
Foldout 10,C RETARDER AND OUTPUT SHAFT MODULE (HD 4070/4076 MODELS PRIOR TO S/N 6610066447)			
4	Output Shaft Bushing, Maximum ID	36.14	1.423
5	Output Shaft, Maximum Spline Wear	0.38	0.015
16, 19	Retarder Rotor Sealring, Maximum ID	139.72	5.501
18	Rotor Assembly	0.38	0.015
Foldout 10,D REAR COVER & OUTPUT SHAFT MODULE (HD 4070/4076 MODELS)			
7	Output Shaft Bushing, Maximum ID	36.14	1.423
8	Output Shaft, Maximum Spline Wear	0.38	0.015
Foldout 10,E RETARDER AND P3 MODULE (ALL MODELS EXCEPT HD 4070/4076 STARTING WITH S/N 6610066447)			
3	P3 Planetary Carrier Assembly, Maximum Pinion End Play	0.94	0.037
5	Output Shaft Bushing, Maximum ID	36.14	1.423
13, 16	P3 Pinion Thrust Washer, Minimum Thickness	1.40	0.055
13, 16	P3 Pinion Thrust Washer, Maximum Step Wear	0.12	0.005
27, 30	Retarder Rotor Sealring, Maximum ID	139.72	5.501
29	Rotor Hub, Maximum Spline Wear	0.38	0.015
Foldout 10,F RETARDER AND OUTPUT SHAFT MODULE (HD 4070/4076 MODELS STARTING WITH S/N 6610066447)			
4	Output Shaft Bushing, Maximum ID	36.14	1.423
5	Output Shaft, Maximum Spline Wear	0.38	0.015
16, 19	Retarder Rotor Sealring, Maximum ID	139.72	5.501
18	Rotor Assembly	0.38	0.015
Foldout 12,A OUTPUT FLANGE AND YOKE			
1, 2, 8	Output Seal Journal, Minimum OD	85.0	3.346

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) WEAR LIMITS AND SPRING DATA

Table 7-1. Spring Data

Foldout	Ref.	Spring	Part No.	Color Code	No. of Coils	Wire Dia mm (in.)	Spring OD mm (in.)	Approx. Free Length mm (in.)	Length under load	
									mm (in.)	N (lb)
4,B	27	Stator	29501300	No Code	N/A	N/A	N/A	17.8 (0.70)	5.7 (0.224)	0.9 (0.2)
6,A	22	Main Relief	29507709	No Code	10	3.25 (0.128)	17.96 (0.707)	52.4 (2.06)	40.7 (1.60)	474 (106.5)
6,B	20	C2 Return	29505719	No Code	11.5*	2.04* (0.080)	19.06* (0.750)	70.76* (2.786)	28.2 (1.110)	5185** (1165.6)
6,B	25	C1 Return	29509453	No Code	12*	2.10* (0.083)	16.0* (0.630)	57.53* (2.265)	34.8 (1.37)	4649** (1045.4)
6,B	25	C1 Return	29537301	No Code	11.8*	2.17* (0.085)	16.8* (0.661)	52.89* (2.082)	34.5 (1.358)	4893** (1100.0)
7	10	C3 Return	29506206	No Code	13*	2.10* (0.083)	15.0* (0.590)	52.3* (2.06)	35.4 (1.39)	274.4** (61.69)
7	12	C3 Retainer	29507882	No Code	4*	2.36* (0.093)	12.62* (0.497)	11.2* (0.44)	9.3 (0.37)	16 408** (3689)
7	12	C3 Retainer	29515628	No Code	4*	2.36* (0.093)	12.62* (0.497)	11.1* (0.44)	10.40 (0.41)	15 403** (3463)
7	22	C4 Return	29506206	No Code	13*	2.10* (0.083)	15.0* (0.590)	52.3* (2.06)	35.4 (1.39)	274.4** (61.69)
7	24	C4 Retainer	29507882	No Code	4*	2.36* (0.093)	12.62* (0.497)	11.2* (0.44)	9.3 (0.37)	16 408** (3689)
7	24	C4 Retainer	29515628	No Code	4*	2.36* (0.093)	12.62* (0.497)	11.1* (0.44)	10.40 (0.41)	15 403** (3463)
9,C	17	C5 Return	29530488	No Code	11.6*	2.03* (0.080)	17.00* (0.669)	53.80 (2.11)	37.7 (1.48)	3611** (811.8)
10,A through F	20, 22, 9, 12, 20, 9	C5 Return	29503036	No Code	12*	2.10* (0.083)	17.00* (0.669)	57.3* (2.26)	37.6 (1.48)	3086** (693.8)
10,A	35	Retarder Flow Valve	29512751	Silver (End)	10.5	2.16 (0.085)	19.05 (0.750)	61.5 (2.42)	25.9 (1.020)	186.9 (42.02)

* Individual springs
** For the complete spring assembly

ALLISON 4000/B 500 PRODUCT FAMILIES

WEAR LIMITS AND SPRING DATA *(continued)*

Table 7-1. Spring Data *(cont'd)*

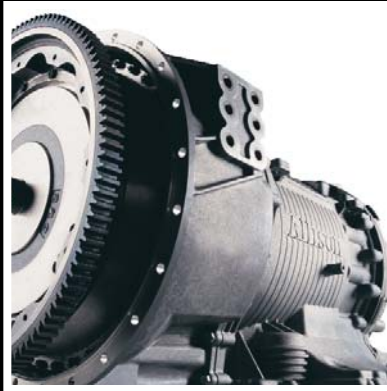
Foldout	Ref.	Spring	Part No.	Color Code	No. of Coils	Wire Dia mm (in.)	Spring OD mm (in.)	Approx. Free Length mm (in.)	Length under load	
									mm (in.)	N (lb)
10,A	35	Retarder Flow Valve	29515101	Green	16	3.78 (0.149)	36.58 (1.440)	106.68 (4.200)	73.66 (2.900)	133.4 (29.99)
10,A, C, E, and F	35, 25, 35, 25	Retarder Flow Valve	29515692	No Code	11.4	4.12 (0.162)	36.17 (1.424)	114.3 (4.500)	91.1 (3.587)	213.3 (47.95)
10,A, C, E, and F	76, 56, 75, 63	Exhaust Backbill	23049391	No Code	20.4	0.61 (0.024)	8.00 (0.315)	29.2 (1.15)	18.2 (0.716)	2.67 (0.60)
10,A	81	Retarder Control	29510495	Silver	7.5	1.40 (0.055)	15.1 (0.594)	30.8 (1.212)	18.0 (0.71)	33 (7.42)
10,A, C, E, and F	81, 65, 80, 68	Retarder Control	29512792	Lt. Green (on end)	7.5	1.40 (0.055)	15.09 (0.594)	33.69 (1.326)	18.0 (0.71)	40 (9.0)
10,A	81	Retarder Control	29510494	Orange	7	1.60 (0.063)	15.50 (0.610)	27.8 (1.09)	18.0 (0.71)	44 (9.9)
11,A and Fig. 5-31	101, 120, 152, 167	Solenoid Regulator	29502195	No Code	4	0.67 (0.026)	11.05† (0.440)	6.5 (0.26)	3.45 (0.14)	3 (0.7)
11,A	112	Accumulator Relay	29507455	Silver	12.8	1.28 (0.050)	11.68 (0.460)	43.6 (1.72)	20.0 (0.79)	49.8 (11.2)
11,A	112	Accumulator Relay	28537452	Dark Blue	12.8	1.275 (0.050)	11.68 (0.460)	43.6 (1.72)	20.0 (0.79)	49.8 (11.2)
11,A	127	Overdrive	23049332	Orange	12	0.76 (0.030)	7.75 (0.305)	26.6 (1.05)	12.5 (0.49)	12.0 (2.7)
11,B	134	Lockup	23049326	Yellow	10	1.37 (0.054)	14.1 (0.555)	42.1 (1.66)	17.0 (0.67)	49 (11.0)
11,B	138	Lube Regulator	23049327	Red	13	1.22 (0.048)	11.1 (0.437)	46.3 (1.82)	3.5 (0.93)	47 (10.6)
11,B	142	Main Regulator	29500963	Lt. Blue	15	2.87 (0.113)	22.00 (0.866)	98.5 (3.88)	54.6 (2.15)	305 (68.6)

ALLISON 4000 / B 500 PRODUCT FAMILIES (continued) WEAR LIMITS AND SPRING DATA

Table 7-1. Spring Data (cont'd)

Foldout	Ref.	Spring	Part No.	Color Code	No. of Coils	Wire Dia mm (in.)	Spring OD mm (in.)	Approx. Free Length mm (in.)	Length under load	
									mm (in.)	N (lb)
11,B	146	Control Main	23049325	Orange	10	1.83 (0.072)	14.8 (0.583)	44.6 (1.76)	24.0 (0.95)	131 (29.5)
11,B	156	C2 Latch	29501071	Lt. Green	11	1.32 (0.052)	11.43 (0.450)	41.3 (1.63)	19.0 (0.75)	71.0 (16.0)
11,B	160	Exh. Back	23049391	No Code	17	0.61 (0.024)	7.80 (0.307)	29.2 (1.14)	18.2 (0.72)	2 (0.5)
11,B	164	C1 Latch	6885065	Blue	12	1.37 (0.054)	16.26 (0.640)	46.2 (1.82)	29.2 (1.15)	18 (4.0)
11,B	168	Converter Regulator	29507456	Pink	10.2	1.53 (0.060)	11.00 (0.433)	30.3 (1.19)	22.8 (0.90)	54 (12.1)

ALLISON 4000 / B 500 PRODUCT FAMILIES NOTES



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