Mechanic's Tips

1000 and 2000 Product Family Transmissions

MT3190EN

Mechanic's Tips

2004 MARCH 01

MT3190EN

Allison Transmission

VOCATIONAL MODELS

1000 EVS	2100 EVS	2200 EVS	2500 EVS
1000 HS	2100 HS	2200 HS	2500 HS
1000 MH	2100 MH	2200 MH	2500 MH
1000 PTS	2100 PTS	2200 PTS	2500 PTS
1000 RDS	2100 RDS	2200 RDS	2500 RDS
1000 SP	2100 SP	2200 SP	2500 SP
B 210	B 220		

1000 Series™ 2000 Series™ 2000 MH Series 2400 Series™

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WARNINGS, CAUTIONS, AND NOTES

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions described in this handbook. It is, however, important to understand that these warnings and cautions are not exhaustive. Allison Transmission could not possibly know, evaluate, and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. The vehicle manufacturer is responsible for providing information related to the operation of vehicle systems (including appropriate warnings, cautions, and notes). Consequently, Allison Transmission has not undertaken any such broad evaluation. Accordingly, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION OR THE VEHICLE MANUFACTURER MUST first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service methods selected.

Proper service and repair is important to the safe, reliable operation of the equipment. The service procedures recommended by Allison Transmission (or the vehicle manufacturer) and described in this handbook are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

Three types of headings are used in this manual to attract your attention. These warnings and cautions advise of specific methods or actions that can result in personal injury, damage to the equipment, or cause the equipment to become unsafe.

WARNING: A warning is used when an operating procedure, practice, etc., if not correctly followed, could result in personal injury or loss of life.

CAUTION: A caution is used when an operating procedure, practice, etc., if not strictly observed, could result in damage to or destruction of equipment.

NOTE: A note is used when an operating procedure, practice, etc., is essential to highlight.

TRADEMARK INFORMATION

DEXRON® is a registered trademark of General Motors Corporation.
Allison DOC™ is a trademark of General Motors Corporation.
TranSynd™ is a trademark of Castrol Ltd.

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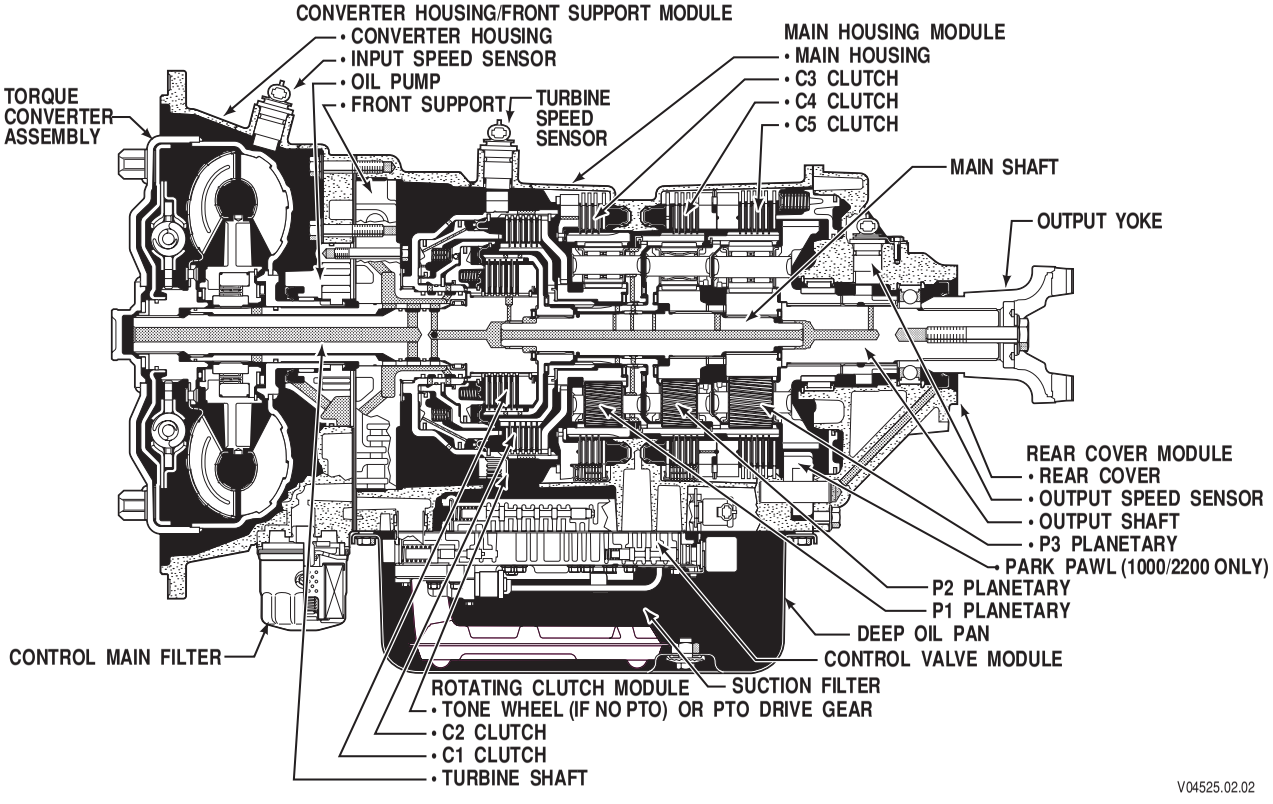
PREFACE

This handbook is a mechanic's reference for maintaining, removing, or installing 1000 and 2000 Product Families transmissions. All features of the transmission and the vehicle involved in installation procedures are discussed. The information presented will help the mechanic maintain, remove, or install the transmission in a manner that assures satisfactory operation and long service life. For additional detailed information, refer to the appropriate transmission service manual and electronic controls troubleshooting manual.

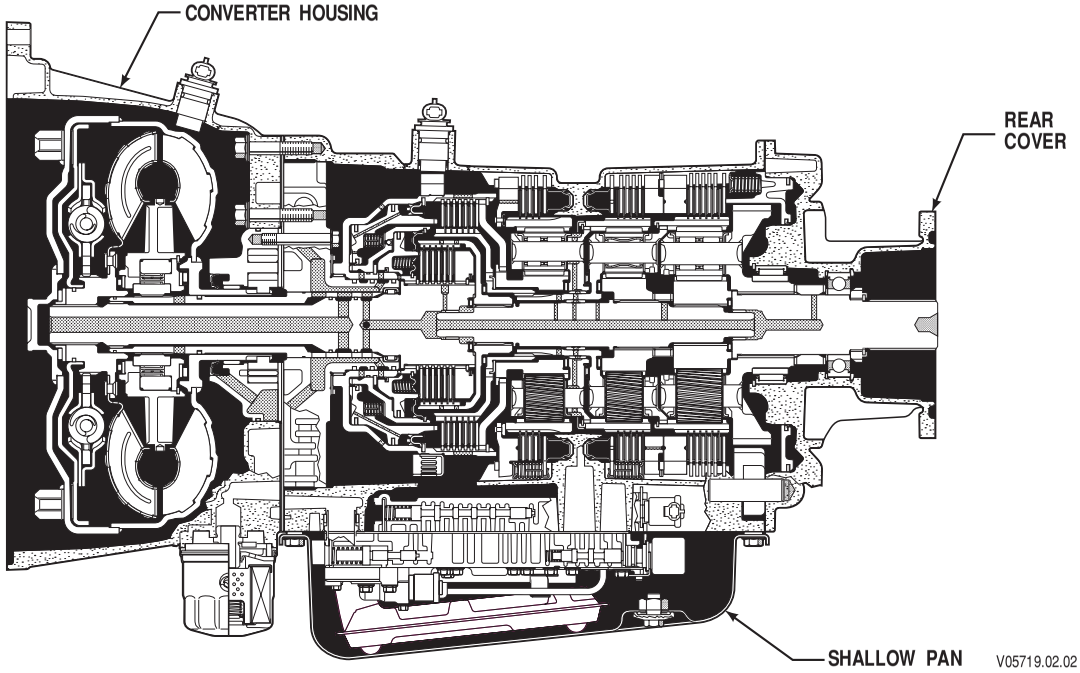
Unless specifically indicated otherwise, this handbook refers to all 1000 and 2000 Product Families transmissions. The differences between the various transmissions are explained as required.

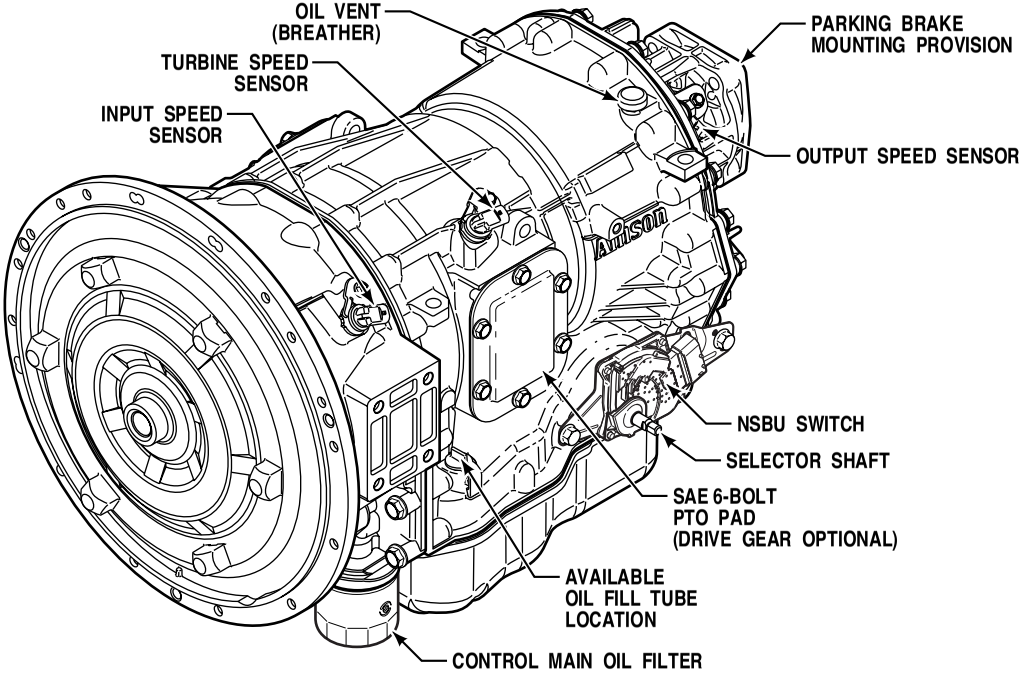
1000 AND 2000 PRODUCT FAMILIES — CROSS SECTION



1000 AND 2000 PRODUCT FAMILIES — CROSS SECTION

with Optional Converter Housing, Rear Cover, and Shallow pan





1000 AND 2000 PRODUCT FAMILIES TRANSMISSION – LEFT-FRONT VIEW

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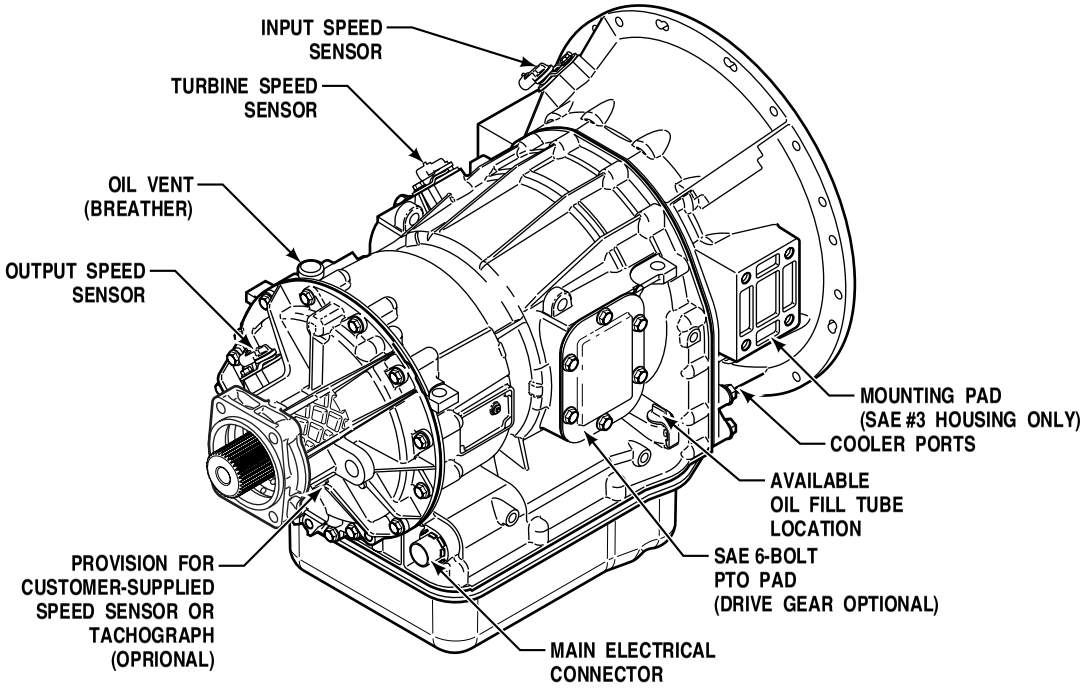

1000 AND 2000 PRODUCT FAMILIES TRANSMISSION – RIGHT-REAR VIEW V04780.01.05

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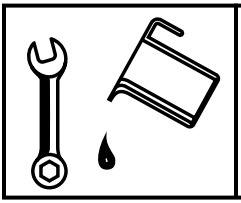


PREVENTIVE MAINTENANCE

SECTION I

1–1. PERIODIC INSPECTIONS AND CARE

Transmission Product Families

Beginning January 2004, Allison Transmission began shipping new 1000 and 2000 Product Families vocation specific transmission models for North America. 1000 and 2000 Product Families vocational models are:

- Emergency Vehicle Series—1000 EVS, 2100 EVS, 2200 EVS, 2500 EVS
- Highway Series—1000 HS, 2100 HS, 2200 HS, 2500 HS
- Motorhome Series—1000 MH, 2100 MH, 2200 MH, 2500 MH
- Pupil Transportation/Shuttle Series—1000 PTS, 2100 PTS, 2200 PTS, 2500 PTS
- Rugged Duty Series—1000 RDS, 2100 RDS, 2200 RDS, 2500 RDS
- Specialty Series—1000 SP, 2100 SP, 2200 SP, 2500 SP
- Bus Series—B 210, B 220

The 1000 and 2000 Product Families include the 1000/2000/2400 Series transmissions. Refer to WATCH 309 for detailed descriptions of the vocational models and their correlation to the existing 1000/2000/2400 Series.

Transmission Inspection

CAUTION: When cleaning the transmission, do not spray steam, water, or cleaning solution directly at the breather (oil vent). Spraying steam, water, or cleaning solution at the breather can force the water or cleaning solution into the transmission and contaminate the transmission fluid.

Clean and inspect the exterior of the transmission at regular intervals. Severity of service and operating conditions determine the frequency of these inspections. Inspect the transmission for:

- loose bolts—transmission and mounting components
- fluid leaks—repair immediately
- loose, dirty, or improperly adjusted throttle sensor or shift selector linkage
- damaged or loose hoses
- worn, frayed, or improperly routed electrical harnesses
- worn or frayed electrical connections
- worn or out-of-phase driveline U-joints and slip fittings
- clogged or dirty oil vent (breather)

Vehicle Inspection

Check the vehicle cooling system occasionally for evidence of transmission fluid which would indicate a faulty oil cooler.

Welding

CAUTION: When welding on the vehicle:

- DO NOT WELD on the vehicle without disconnecting from the TCM all control system wiring harness connectors.
- DO NOT WELD on the vehicle without disconnecting TCM battery power and ground leads.
- DO NOT WELD on any control components.
- DO NOT CONNECT welding cables to any control components.

A label describing on-vehicle welding precautions is available from your authorized Allison service dealer and should be installed in a conspicuous place. A vehicle used in a vocation that requires frequent modifications or repairs involving welding **must** have an on-vehicle welding label (SA2607).

1–2. IMPORTANCE OF PROPER TRANSMISSION FLUID LEVEL

Transmission fluid cools, lubricates, and transmits hydraulic power. Always maintain proper fluid level. If fluid level is too low, the torque converter and clutches do not receive an adequate supply of fluid and the transmission overheats. If the level is too high, the fluid aerates—causing the transmission to shift erratically and overheat. Fluid may be expelled through the breather or dipstick tube when the fluid level is too high.

1–3. TRANSMISSION FLUID CHECK

WARNING: For vehicles containing 1000 or 2200 models, each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Make sure that the engine is at low idle rpm.
- Put the transmission in **P** (Park).
- Engage the **P** (Park) range by slowly releasing the service brake.
- Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

WARNING: For vehicles containing 2100 or 2500 models with auto-apply parking brakes, each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Make sure that the engine is at low idle rpm.
- Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
- Apply the emergency brake, if present, and make sure it is properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

WARNING: For vehicles containing 2100 or 2500 models without auto-apply parking brakes, each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Make sure that the engine is at low idle rpm.
- Put the transmission in **N** (Neutral).
- Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

NOTE: For accurate fluid level checks, be sure that the fill tube and dipstick meet Allison Transmission specifications. Requirements for the standard oil pan are shown in Figure 1–1 and requirements for the shallow oil pan are shown in Figure 1–2.

When checking a long dipstick calibration:

- Be sure the dipstick contacts the oil pan surface as shown in Figures 1–1 and 1–2.
- Take measurements from the end of the dipstick.

When checking a short dipstick calibration:

- Remove the oil pan.
- Take measurements from the oil pan splitline.

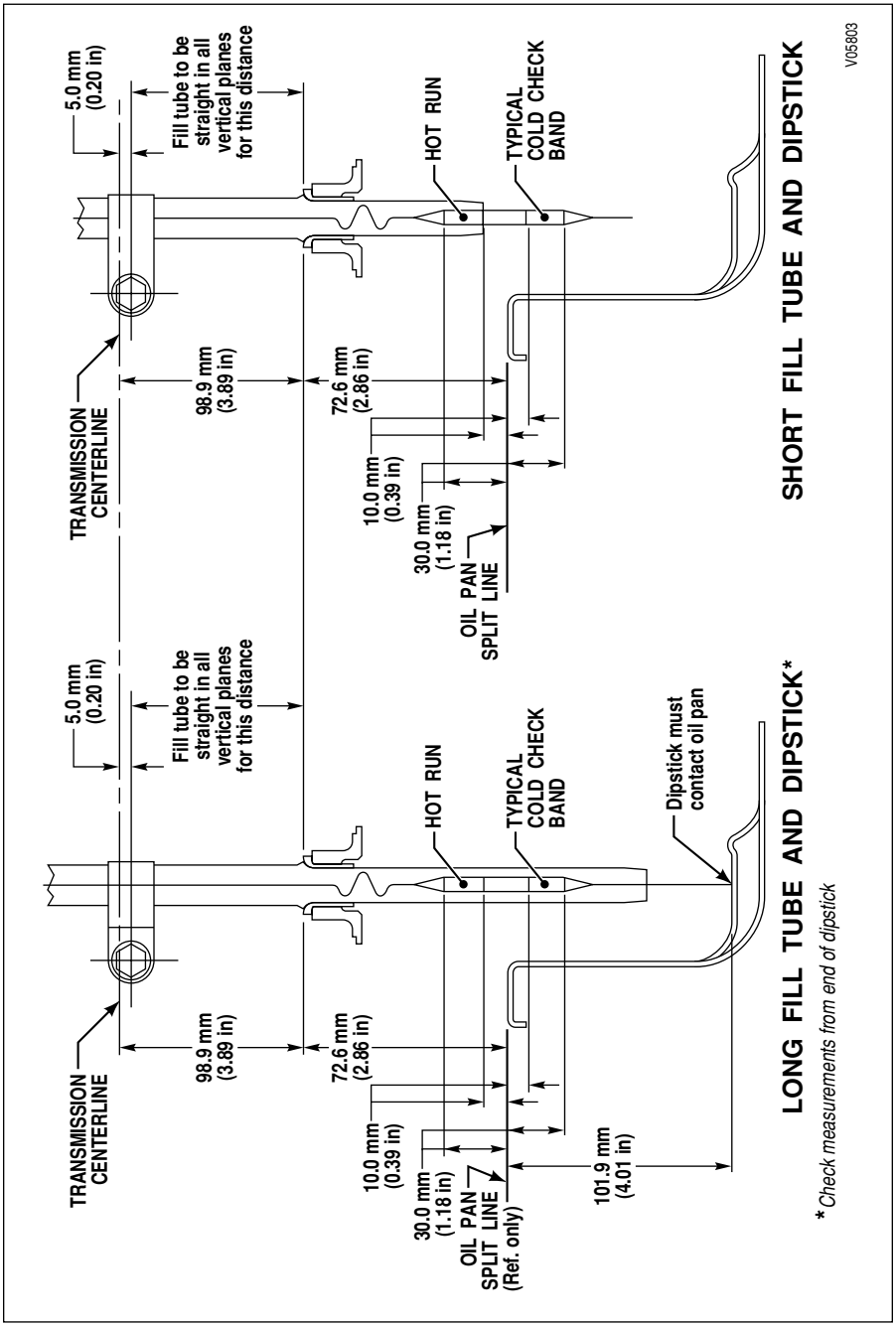


Figure 1–1. Fill Tube And Dipstick Requirements (Standard Oil Pan)

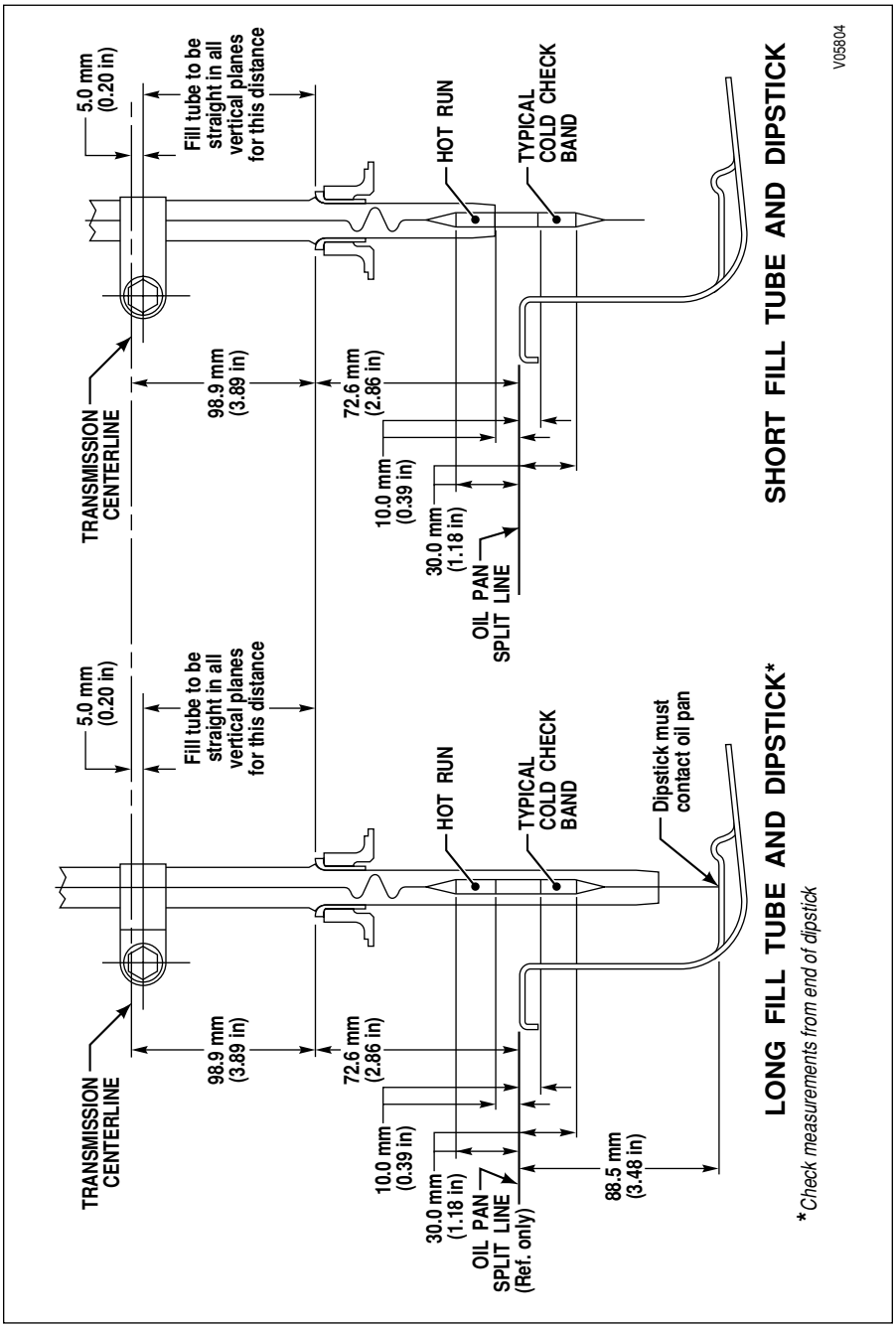


Figure 1–2. Fill Tube And Dipstick Requirements (Shallow Oil Pan)

a. Manual Fluid Check Procedure. Clean all dirt from around the end of the fluid fill tube before removing the dipstick. Do not allow dirt or foreign matter to enter the transmission. Dirt or foreign matter in the hydraulic system may cause undue wear of transmission parts, make valves stick, and clog passages. Check the fluid level using the following procedure and report any abnormal fluid levels to your maintenance persons.

b. Cold Check Procedure. The purpose of the cold check is to determine if the transmission has enough fluid to be operated safely until a hot check can be made.

CAUTION: The fluid level rises as fluid temperature increases. DO NOT fill above the "COLD CHECK" band if the transmission fluid is below normal operating temperatures.

- Park vehicles containing 1000 or 2200 models as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **P** (Park).
  - — Engage the **P** (Park) range by slowly releasing the service brake.
  - — Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.
- Park vehicles containing 2100 or 2500 models with auto-apply parking brakes as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
  - — Apply the emergency brake, if present, and make sure it is properly engaged.

- Park vehicles containing 2100 or 2500 models without auto-apply parking brakes as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **N** (Neutral).
  - — Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.
- Run the engine for at least one minute. Apply the service brakes and shift to **D** (Drive), then to **N** (Neutral), and then shift to **R** (Reverse) to fill the hydraulic system. Finally, shift to **P** (Park) or **PB** (Auto-Apply Parking Brake), if available, or **N** (Neutral) and allow the engine to idle (500–800 rpm). Slowly release the service brakes.
- With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
- Insert the dipstick into the tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.
- If the fluid level is within the "COLD CHECK" band, the transmission may be operated until the fluid is hot enough to perform a "HOT RUN" check. If the fluid level is not within the "COLD CHECK" band, add or drain as necessary to bring it to the middle of the "COLD CHECK" band.
- Perform a hot check at the first opportunity after the normal operating sump temperature of 71˚C–93˚C (160˚F–200˚F) is reached.

c. Hot Check Procedure.

CAUTION: The fluid must be hot to provide an accurate check. The fluid level rises as temperature increases.

- Operate the transmission in **D** (Drive) range until normal operating temperature is reached:
  - — sump temperature 71˚C–93˚C (160˚F–200˚F)
  - — converter-out temperature 82˚C–104˚C (180˚F–220˚F)
  - — If a transmission temperature gauge is not present, check fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under load for at least one hour.

- Park vehicles containing 1000 or 2200 models as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **P** (Park).
  - — Engage the **P** (Park) range by slowly releasing the service brake.
  - — Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.
- Park vehicles containing 2100 or 2500 models with auto-apply parking brakes as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
  - — Apply the emergency brake, if present, and make sure it is properly engaged.
- Park vehicles containing 2100 or 2500 models without auto-apply parking brakes as follows:
  - — Bring the vehicle to a complete stop on a level surface using the service brake.
  - — Make sure that the engine is at low idle rpm.
  - — Put the transmission in **N** (Neutral).
  - — Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.
- With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
- Insert the dipstick into the tube and remove. Check fluid level reading. Repeat the check procedure to verify the reading.

NOTE: Safe operating level is within the "HOT RUN" band on the dipstick. See Figures 1–1 and 1–2. The width of the "HOT RUN" band represents approximately 1.0 liter (1.06 quart) of fluid at normal operating sump temperature.

- If the fluid level is not within the "HOT RUN" band, add or drain as necessary to bring the fluid level to within the "HOT RUN" band.

d. Consistency of Readings. Always check the fluid level at least twice using the procedure described above. Consistency (repeatable readings) is important to maintaining proper fluid level. If inconsistent readings persist, check the transmission breather to be sure it is clean and unclogged. If readings are still inconsistent, contact your nearest Allison distribution or dealer.

1–4. KEEPING FLUID CLEAN

Prevent foreign material from entering the transmission by using clean containers, fillers, etc. Lay the dipstick in a clean place while filling the transmission.

CAUTION: Containers or fillers that have been used for antifreeze solution or engine coolant must NEVER be used for transmission fluid. Antifreeze and coolant solutions contain ethylene glycol which, if put into the transmission, can cause the clutch plates to fail.

1–5. FLUID RECOMMENDATIONS

Hydraulic fluids (oils) used in the transmission are important influences on transmission performance, reliability, and durability. Only fluids meeting TES-295 (TranSynd™) or DEXRON®-III specifications are acceptable for use in the 1000 and 2000 Product Families transmissions.

To make sure the fluid is qualified for use in Allison transmissions, check for a TES-295 or a DEXRON®-III fluid license or approval numbers on the container, or consult the lubricant manufacturer. Consult your Allison Transmission dealer or distributor before using other fluid types.

CAUTION: Disregarding minimum fluid temperature limits can result in transmission malfunction or reduced transmission life.

When choosing the optimum viscosity grade of fluid to use, duty cycle, preheat capabilities, and/or geographical location must be taken into consideration. Table 1–1 lists the minimum fluid temperatures at which the transmission may be safely operated without preheating the fluid. Preheat with auxiliary heating equipment or by running the equipment or vehicle with the transmission in **P** (Park)

or **PB** (Auto-Apply Parking Brake), if available, or **N** (Neutral) for a minimum of 20 minutes before attempting range operation.

Table 1–1. Transmission Fluid Operating Temperature Requirements

	Ambient Temperature Below Which Preheat is Required	
Viscosity Grade	**Celsius**	**Fahrenheit**
DEXRON®-III	–27	–17
TranSynd™	–33	–22
		(Ref. SIL 13-TR-90)

1–6. TRANSMISSION FLUID AND FILTER CHANGE INTERVALS

CAUTION: Transmission fluid and filter change frequency is determined by the severity of transmission service. More frequent changes may be necessary than recommended in the general guidelines when operating conditions create high levels of contamination or overheating.

a. Frequency. Change the control main filter at or before the initial 8000 km (5000 miles) then follow the schedule in Table 1–2. Table 1–2 is given only as a general guide for fluid and filter change interval.

Table 1–2. 1000 and 2000 Product Families Transmission Fluid and Filter Change

SEVERE VOCATION				GENERAL VOCATION			
	Filters				Filters		
Fluid	**Control Main**	**Internal**	**Lube/Auxiliary**	**Fluid**	**Control Main**	**Internal**	**Lube/Auxiliary**
Schedule 1. Recommended Fluid and Filter Change Intervals (Non-TranSynd™ /Non-TES 295 Fluid)							
25,000 Miles (40 000 km) 12 Months	25,000 Miles (40 000 km) 12 Months	Overhaul	25,000 Miles (40 000 km) 12 Months	50,000 Miles (80 000 km) 24 Months	50,000 Miles (80 000 km) 24 Months	Overhaul	50,000 Miles (80 000 km) 24 Months
NOTE: The following recommendations in Schedule 2 are based upon the transmission containing 100 percent of TranSynd™ fluid. For transmissions that contain a mixture of TranSynd™ and non-TranSynd™ fluids, refer to Schedule 3. Flushing Machines are not recommended or recognized due to variation and inconsistencies with ensuring removal of 100 percent of the used fluid. Recommendations in Schedule 2 are based upon standard Allison fluid change procedures.							
Schedule 2. Recommended Fluid and Filter Change Intervals (TranSynd™/TES 295 Fluid)							
50,000 Miles (80 000 km) 24 Months	50,000 Miles (80 000 km) 24 Months	Overhaul	50,000 Miles (80 000 km) 24 Months	100,000 Miles (160 000 km) 48 Months	50,000 Miles (80 000 km) 24 Months	Overhaul	50,000 Miles (80 000 km) 24 Months
Schedule 3. Modified Fluid and Filter Change Intervals With a Mixture* of TranSynd™ and Non-TranSynd™ Fluids							
25,000 Miles (40 000 km) 12 Months	25,000 Miles (40 000 km) 12 Months	Overhaul	25,000 Miles (40 000 km) 12 Months	50,000 Miles (80 000 km) 24 Months	50,000 Miles (80 000 km) 24 Months	Overhaul	50,000 Miles (80 000 km) 24 Months

* Mixture is defined as the quantity of oil remaining in the transmission after a standard fluid change combined with the quantity of TranSynd™ that is required to fill the transmission to the proper level. A mixture of TranSynd™ or TES 295 equivalent vs. non-TranSynd™ other than as defined in this paragraph does not meet the requirements that permit the eligibility for the recommendations given in Schedule 3.

NOTE: Change fluid/filters after recommended mileage, months, or hours have elapsed, whichever occurs first.

Severe Vocation: On/Off Highway, Refuse, City Transit, Shuttle Transit, and MH models.

General Vocation: All other vocations.

Local conditions, severity of operation or duty cycle may require more or less frequent fluid change intervals that differ from the published recommended fluid change intervals of Allison Transmission. Transmission protection and fluid change intervals can be optimized by the use of fluid analysis. **Filters must be changed at or before recommended intervals.**

b. Abnormal Conditions. Transmissions used in high cycle rate applications should use fluid analysis to be certain that a proper fluid change interval is established. Transmission fluid must be changed whenever there is evidence of dirt or a high temperature condition. A high temperature condition is indicated by the transmission fluid being discolored or having a strong odor, or by fluid analysis. Local conditions, severity of operation, or duty cycle may require more or less frequent fluid or filter change intervals.

c. Fluid Analysis. Transmission protection and fluid change intervals can be optimized by monitoring fluid oxidation according to the tests and limits shown in Table 1–3. Consult your Distributor/Dealer for an Oil Analysis Kit (refer to SIL 17-TR-96, Rev A). To be sure of consistent and accurate fluid analysis, use only one fluid analysis firm. Refer to the Technician's Guide for Automatic Transmission Fluid, GN2055EN, for additional information.

Table 1–3. Fluid Oxidation Measurement Limits

Test	Limit
Viscosity	±25% change from new fluid
Total Acid Number	+3.0 change from new fluid

1–7. TRANSMISSION FLUID CONTAMINATION

a. Fluid Examination. At each fluid change, examine the drained fluid for evidence of dirt or water. A normal amount of condensation will appear in the fluid during operation.

b. Water. Obvious water contamination of the transmission fluid or transmission fluid in the heat exchanger coolant indicates a leak between the water and fluid areas of the cooler. Inspect and pressure test the cooler to confirm the leak. Replace leaking coolers.

NOTE: Coolant can also be contaminated by engine oil; be sure to locate the correct source of coolant contamination.

c. Engine Coolant.

CAUTION: Engine coolant in the transmission hydraulic system requires immediate action to prevent malfunction and possible serious damage. Completely disassemble, inspect, and clean the transmission. Remove all traces of the coolant, and varnish deposits resulting from engine coolant contamination. Refer to SIL 18-TR-98 for more information.

d. Metal. Metal particles in the fluid (except for the minute particles normally trapped in the oil filter) indicate internal transmission damage. If these particles are found in the sump, the transmission must be disassembled and closely inspected to find their source. Metal contamination requires complete transmission disassembly. Clean all internal and external hydraulic circuits, cooler, and all other areas where the particles could lodge.

CAUTION: After flushing the cooler with Kwik-Flush Cart J 46550, be sure to check the external cooler circuit restriction. If circuit pressure drop is above specification, the cooler has excessive trapped particles and must be replaced.

NOTE: When equipment to flush the oil cooler is not available, install a filter in the cooler line between the oil cooler and the transmission "from cooler" port. The cooler circuit pressure drop specifications must still be met (see AS64–071 or AS 64–072 in the Allison Sales Tech Data book). Frequent initial changes of this filter element may be required as debris is flushed out of the oil cooler circuit. Closely monitoring change in cooler circuit pressure drop will indicate when a filter change is needed.

1–8. TRANSMISSION FLUID AND FILTER CHANGE PROCEDURE

a. Drain Fluid.

NOTE: Do not drain the transmission fluid if changing the control main filter only.

- Drain the fluid when the transmission is at normal operating sump temperature—71˚C–93˚C (160˚F–200˚F). Hot fluid flows quicker and drains more completely.
- Remove the drain plug from the oil pan and allow the fluid to drain into a suitable container.
- Examine the fluid as described in Paragraph 1–7.

b. Replace Control-Main Filter. (Figure 1–3)

1. Using J 45023 filter wrench or a strap filter wrench, remove the control-main filter by rotating it in the counterclockwise direction. Use a standard strap-type filter wrench.

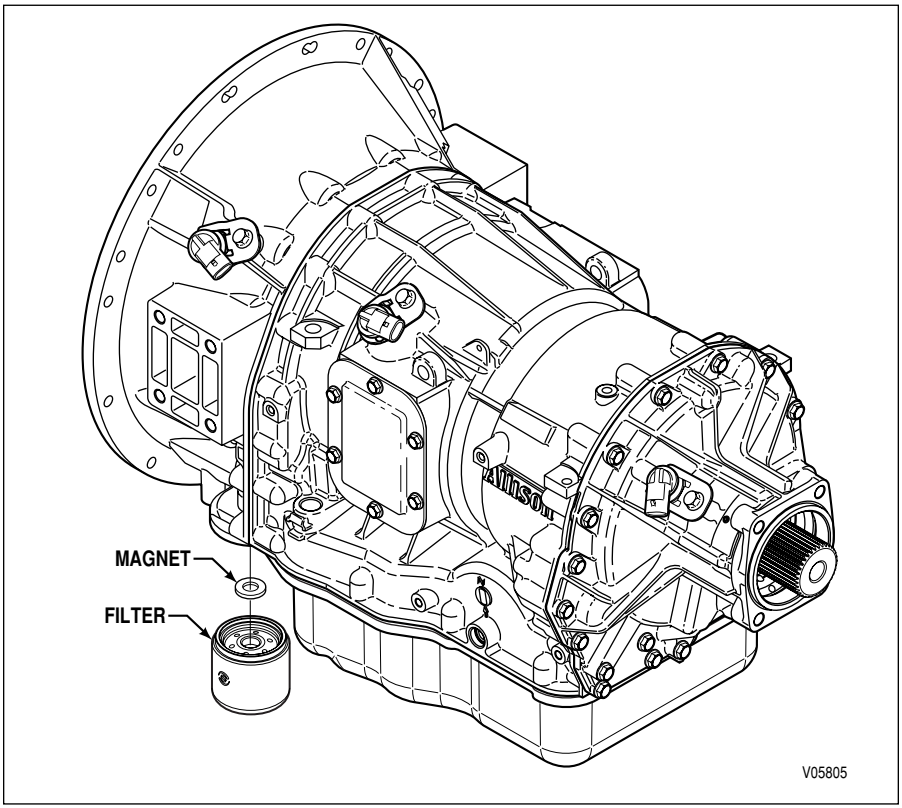


Figure 1–3.

2. Remove the magnet from the filter attachment tube or from the top of the filter element.
3. Clean any metal debris from the magnet. Report any metal pieces larger than dust to your maintenance personnel.
4. Reinstall the magnet onto the filter attachment tube.
5. Lubricate the gasket on the control-main filter with transmission fluid.
6. Install, by hand, the control-main filter until the gasket on the control-main filter touches the converter housing or cooler manifold.

CAUTION: Turning the control-main filter more than ONE FULL TURN after gasket contact will damage the filter.

7. Turn the filter ONE FULL TURN ONLY after gasket contact.
8. Reinstall the drain plug and sealing washer. Tighten the drain plug to 30–40 N·m (22–30 lb ft).

c. Refill Transmission. The amount of refill fluid is less than the amount used for the initial fill. Fluid remains in the external circuits and transmission cavities after draining the transmission.

After refill, check the fluid level using the procedure described in Paragraph 1–3.

Table 1–4. Transmission Fluid Capacity

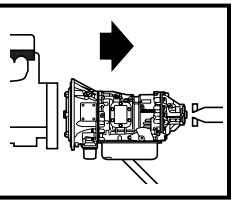
	Initial Fill*		Refill*	
Sump	**Liters**	**Quarts**	**Liters**	**Quarts**
Standard	14	14.8	10	10.6
Shallow	12	12.7	7	7.4
* Approximate quantities, do not include external lines and cooler hose.				

1–9. OIL VENT (BREATHER)

a. Location and Purpose. The breather is located at the top left-rear of the transmission main housing. The breather prevents air pressure buildup within the transmission and its passage must be kept clean and open.

b. Maintenance. The amount of dust and dirt encountered will determine the frequency of breather cleaning. Use care when cleaning the transmission.

CAUTION: When cleaning the transmission, do not spray steam, water, or cleaning solution directly at the breather (oil vent). Spraying steam, water, or cleaning solution at the breather can force the water or cleaning solution into the transmission and contaminate the transmission fluid.

SECTION II	REMOVING TRANSMISSION	

2–1. DRAINING TRANSMISSION

Drain the transmission fluid before removing the transmission from the vehicle.

- Remove the drain plug from the oil pan. Examine the drained fluid for evidence of contamination—refer to Paragraph 1–7. Reinstall the drain plug.
- Remove the transmission fill tube if it interferes with transmission removal. Plug the fill tube hole in the main housing to keep dirt from entering the transmission.

NOTE: A significant amount of fluid may drain from the hydraulic lines when they are disconnected from the transmission.

- Disconnect all hydraulic lines from the transmission. Remove the lines from the vehicle if they interfere with transmission removal. Plug all openings to keep dirt from entering the hydraulic system.

2–2. DISCONNECTING CONTROLS

- Disconnect the external wiring harness from the main electrical connector, three speed sensors and the NSBU switch (refer to Pages viii and ix). Prevent dirt or moisture from entering a disconnected connector. Position the wiring harness so it does not interfere with transmission removal.
- Disconnect linkage from the customer-furnished transmission shift lever. Position the disconnected linkage so it does not interfere with transmission removal. Leave the shift lever and NSBU switch on the transmission.
- If PTO(s) is (are) used, disconnect the PTO(s) wiring harness(es).
- If parking brake is present, disconnect linkage.

2–3. UNCOUPLING FROM DRIVELINE, ENGINE, AND VEHICLE

WARNING: Chock wheels to prevent vehicle from moving when driveline is disconnected. This is not necessary if vehicle is on a lift or jackstands.

- Disconnect the vehicle drive shaft from the transmission output flange or yoke. Position the disconnected shaft to avoid interference when removing the transmission.
- If PTO equipped, disconnect PTO connections such as:
  - — PTO hydraulic hoses
  - — PTO-powered equipment drive shaft
- If transmission mountings support the rear of the engine, place a jack or other support under the engine.
- Securely support the transmission with a hoist, jack, or other suitable removal equipment.
- Remove all bolts, nuts, washers, spacers, and supports that attach the transmission to the vehicle and the engine.

NOTE: It may be necessary to remove an engine flywheel housing access cover to remove flexplate or flexplate adapter bolts. This is the engine to transmission connection.

2–4. REMOVING THE TRANSMISSION

CAUTION: Do not pull the transmission away from the torque converter assembly. The torque converter drive cover must be entirely free of any restraint by the flexplate drive or crankshaft pilot when the transmission separates from the engine.

WARNING: Be sure the torque converter is moving rearward with the transmission as it is removed. Do not allow the torque converter to become disengaged from the oil pump or to fall and injure yourself or others.

- Move the transmission away from the engine, approximately 34.6 mm (1.36 inch) for a number 2 flywheel housing or 44.2 mm (1.74 inch) for a number 3 flywheel housing, until it is completely clear of the engine. If used, remove the adapter ring and/or gasket.
- Raise or lower the transmission as necessary to remove it from the vehicle.

2–5. REMOVING THE FLEXPLATE ADAPTER

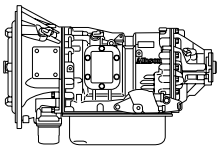
- Remove the flexplate adapter, if present, from the front of the torque converter. This part will be needed for transfer if a replacement transmission is being installed.

WARNING: Handle the transmission carefully whenever the torque converter retaining bracket is not present. NEVER tilt the converter end down or the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing damage and/or personal injury.

- Attach a torque converter retaining bracket at the earliest opportunity. The bracket keeps the torque converter from sliding out of engagement with the oil pump or from falling off completely and being damaged or causing personal injury.

2–6. REMOVING OUTPUT FLANGE OR YOKE

If replacing the transmission, you may need to transfer the output flange or yoke to the replacement transmission. The output flange or yoke is retained by one ½-20 x 2¾ inch flanged-head bolt.



PREPARING THE TRANSMISSION FOR INSTALLATION

SECTION
III

3–1. CHECKING INPUT COMPONENTS

a. Bolt Holes. Check all bolt holes on the front of the transmission and rear of the engine that are used in connecting the transmission to the engine. The threads must be undamaged and the holes free of chips or foreign material.

b. Pilot Boss. Check the pilot boss (at the center of the torque converter) for damage or raised metal that prevents free entry into the crankshaft hub (or adapter).

c. Starter Ring Gear. Check the starter ring gear for excessive wear or damage.

d. Transmission Mounting Flange. Check the transmission mounting flange for raised metal, dirt, or if used, pieces of gasket material.

e. Transmission-to-Engine Mounting Flange. Inspect the transmission-to-engine mounting flange for raised metal, burrs, or pieces of gasket material (if used). Remove any of these defects. Inspect the threaded holes for damaged threads.

3–2. INSTALLING OUTPUT FLANGE OR YOKE

a. Output Oil Seal. Check the output oil seal for leaks or damage. Refer to JA3664EN, In-Chassis Maintenance, for replacement instructions. If not replacing the oil seal, lubricate it with high-temperature grease or transmission fluid.

b. Check Flange or Yoke.

CAUTION: DO NOT attempt to polish the oil seal contact surface on the flange or yoke. Scratches or machine-type lead can cause the seal to leak. Replace the output flange/yoke if light scoring cannot be removed using crocus cloth.

Check each flange or yoke for damage or wear. The oil seal contact surface must be smooth and regular to prevent oil leaking past the seal. Rotate the flange after installation to check for binding.

c. Install Output Flange or Yoke.

CAUTION: Be sure that the flange, output shaft and retaining hardware are clean.

Care must be exercised to avoid transmission output seal or journal damage. Check to be sure that the seal is free of tears and cuts. Nicks and scratches must not exist on the lead-in chamfer or seal journal section of the output flange or yoke.

Lubricate the splines of the output shaft and the oil seal assembly with transmission fluid or oil-soluble grease.

CAUTION: Do not use a hammer or other similar tool to force the flange/yoke onto the shaft. Forcing the flange/yoke onto the shaft may result in transmission damage.

Start the yoke/flange assembly onto the output shaft, being sure that the splines are properly engaged and slide freely. Push the yoke/flange assembly into the rear cover module.

Install a new output shaft sealing washer and the output shaft bolt.

CAUTION: Use of an impact wrench requires the retention of the yoke/flange to prevent internal transmission damage.

Tighten the output shaft bolt to 110–135 N·m (80–100 lb ft).

Rotate the yoke/flange assembly by hand to check for binding, interference, and runout.

3–3. INSTALLING PTO

Access to the PTO mounting pads and the space available to maneuver the transmission determine whether the PTO should be installed before or after the transmission is installed.

CAUTION: DO NOT use cork or other soft gaskets to install the PTO. Use only the shims/gaskets listed in the 1000 and 2000 Product Families Tech Data Book.

NOTE: DO NOT use sealing compounds—they are usually incompatible with automatic transmission fluid.

a. Install Guide Pins— included in the PTO manufacturers installation kit. Determine the required position of the guide pins in relation to the mounted position of the PTO. Install two headless guide pins into the converter-housing PTO pad. Tighten the pins.

b. Install Gasket. Install the special gasket over the guide pins—ribbed surface away from the transmission.

c. Mount the PTO.

CAUTION: M10 bolts MUST be used to attach the PTO to the transmission. Inch series threads (.375-16 UNC) will damage the transmission main housing.

Mount the PTO on the guide pins or studs provided in PTO kit. Mesh the PTO driven gear with the transmission PTO drive gear. Retain the PTO by installing a bolt in the top bolt hole. Install the remaining bolts and nuts, if used. When nuts are not used, two bolts replace the guide pins. Tighten all bolts to 57–68 N·m (42–50 lb ft). Tighten nuts to manufacturers specifications. Be sure that the PTO backlash meets manufacturers requirements.

d. Connect PTO Lube, if required. Some PTOs require pressure lubrication. When needed, tap into the cooler return fitting or line at the transmission converter housing (see Figure 3–1). An orifice of 0.81 mm (0.031 inch) must be present in the line to control the amount of fluid diverted from the transmission. Some PTO assemblies contain internal restrictions equivalent to the required orifice (check the PTO manufacturer for lubrication needs and the orifice installation). This connection can be made later if the lube line will interfere with transmission installation. See Figure 3–2 which shows this connection schematically.

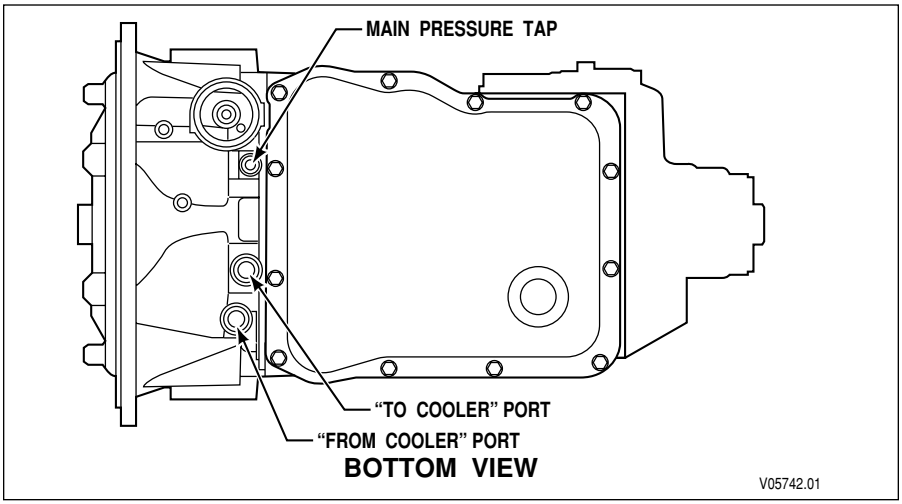


Figure 3–1. Cooler Port and Main Pressure Tap Location

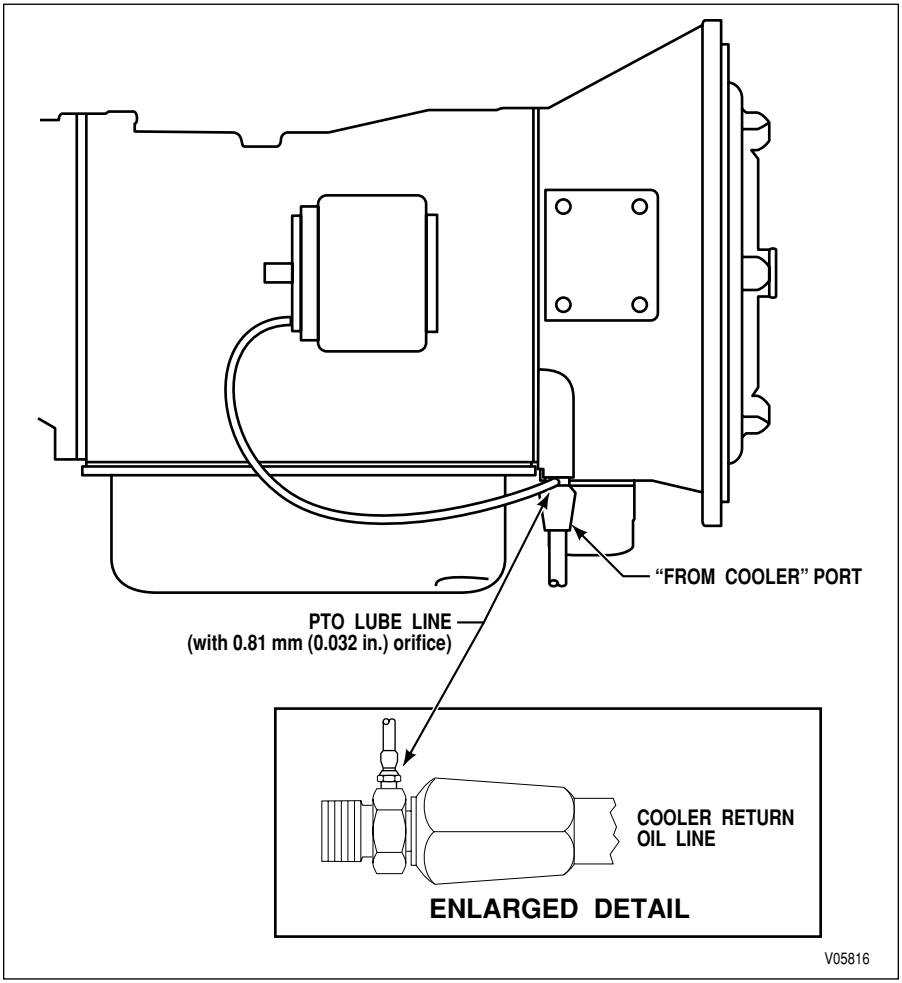


Figure 3–2. PTO Lube Plumbing Schematic

e. Connect PTO Clutch Feed, if required. Some PTOs are clutch-applied. Use transmission main pressure from the main pressure tap for applying the PTO clutch. See Figure 3–1 for the location of the main pressure tap and Figure 3–3 for a typical plumbing schematic when this feature is needed. This connection can be made later if the clutch apply line will interfere with transmission installation.

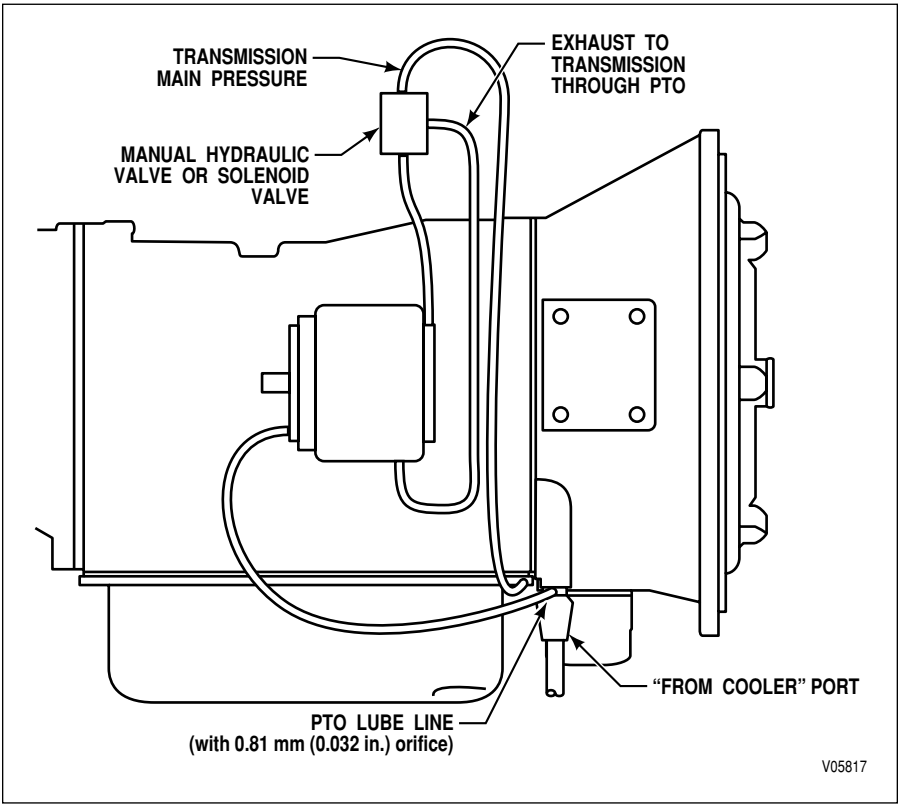


Figure 3–3. PTO Clutch Pressure Plumbing Schematic

3–4. INSTALLING FILL TUBE AND SEAL

a. Location. The fill tube may be mounted on either the right or left side. The unused fill tube provision must have a plug in the fill tube opening.

CAUTION: Install a fill tube bracket using the correct length M8 self-tapping screw which is 24.0 mm (0.95 inch). A screw that is too long may cause cracks and leaks in the main housing. Refer to AS64-065 in the Allison Sales Tech Data book for the correct screw specifications.

b. Installation. If the fill tube will interfere with the installation of the transmission, delay this step until after the transmission is in the vehicle. Install the fill tube seal into the main housing. Insert the fill tube through the seal until the shoulder at the bottom of the fill tube contacts the seal. Align the tube bracket with its bolt location. Install the fill tube bolt and tighten until it is firmly seated against the bracket.

3–5. CHECKING PLUGS AND OPENINGS

Carefully check all sides and the bottom of the transmission for loose or missing plugs.

a. Main Pressure Tap Plug. Check that 0.4375–20 UNF-2A pressure plug is tightened to 10–13 N·m (7–10 lb ft).

b. Fluid Drain Plug. Check that the drain plug is tightened to 25–32 N·m (18–24 lb ft).

c. Tachograph Plug. If present, tighten to 60–67 N·m (44–49 lb ft).

d. Cleanliness. Check the openings into which the cooler lines connect for deformities or obstructions. Check the transmission electrical connectors for cleanliness. Clean electrical connections with an LPS cleaner only (refer to Service Information Letter 17-TR-94).

PREPARING VEHICLE FOR TRANSMISSION INSTALLATION

SECTION IV

4–1. ENGINE, TRANSMISSION ADAPTATION REQUIREMENTS

You must make sure a new transmission installation can be adapted to the vehicle's engine. Using the measurements described in this section assures correct transmission-to-engine adaptation. Refer to Figure 4–1, 4–2, or installation drawings AS64-022 and/or AS64-023 in the Allison Sales Tech Data book. Typical arrangement of adaptation components is shown in Figure 4–3.

a. Measuring Equipment. The following measuring equipment is required:

- 600 mm (24 inch) precision caliper
- 50–100 mm (2–4 inch) telescoping gauge
- 25–76 mm (1–3 inch) outside micrometer
- Dial indicator and mounting attachments—base, posts, and clamps
- 0–150 mm (0–6 inch) depth micrometer

b. Flywheel Housing Pilot Bore Diameter. The flywheel housing pilot bore diameter must measure:

- No. 3 Housing—409.58–409.70 mm (16.125–16.130 inch)
- No. 2 Housing—447.68–447.80 mm (17.625–17.630 inch)

c. Flywheel Housing Bore Runout. Flywheel housing bore runout cannot exceed 0.51 mm (0.020 inch) TIR.

d. Flywheel Housing Face Squareness. The flywheel housing face cannot be out-of-square more than 0.51 mm (0.020 inch) TIR.

e. Crankshaft Hub Pilot or Adapter Diameter. The crankshaft hub pilot or hub adapter pilot diameter must measure between 43.26–43.31 mm (1.703–1.705 inch).

f. Crankshaft Hub Pilot or Adapter Squareness. The crankshaft hub or hub adapter cannot be out-of-square more than 0.013 mm (0.0005 inch) TIR per inch of diameter.

g. Crankshaft Hub Pilot or Adapter Concentricity. The crankshaft hub pilot or the hub adapter pilot concentricity cannot exceed 0.25 mm (0.010 inch) TIR.

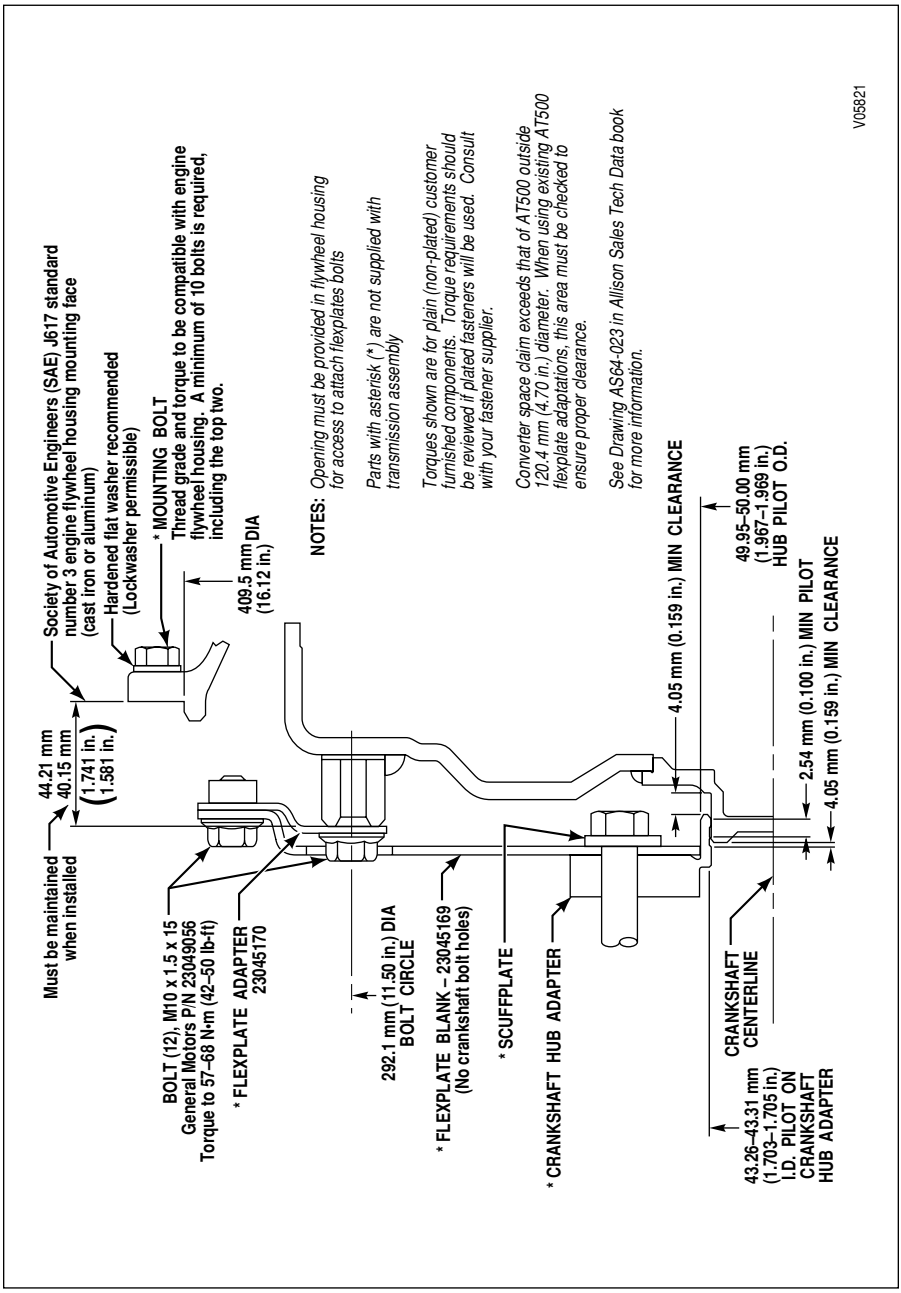


Figure 4–1. 1000 and 2000 Product Families Engine Adaptation (No. 3 Housing)

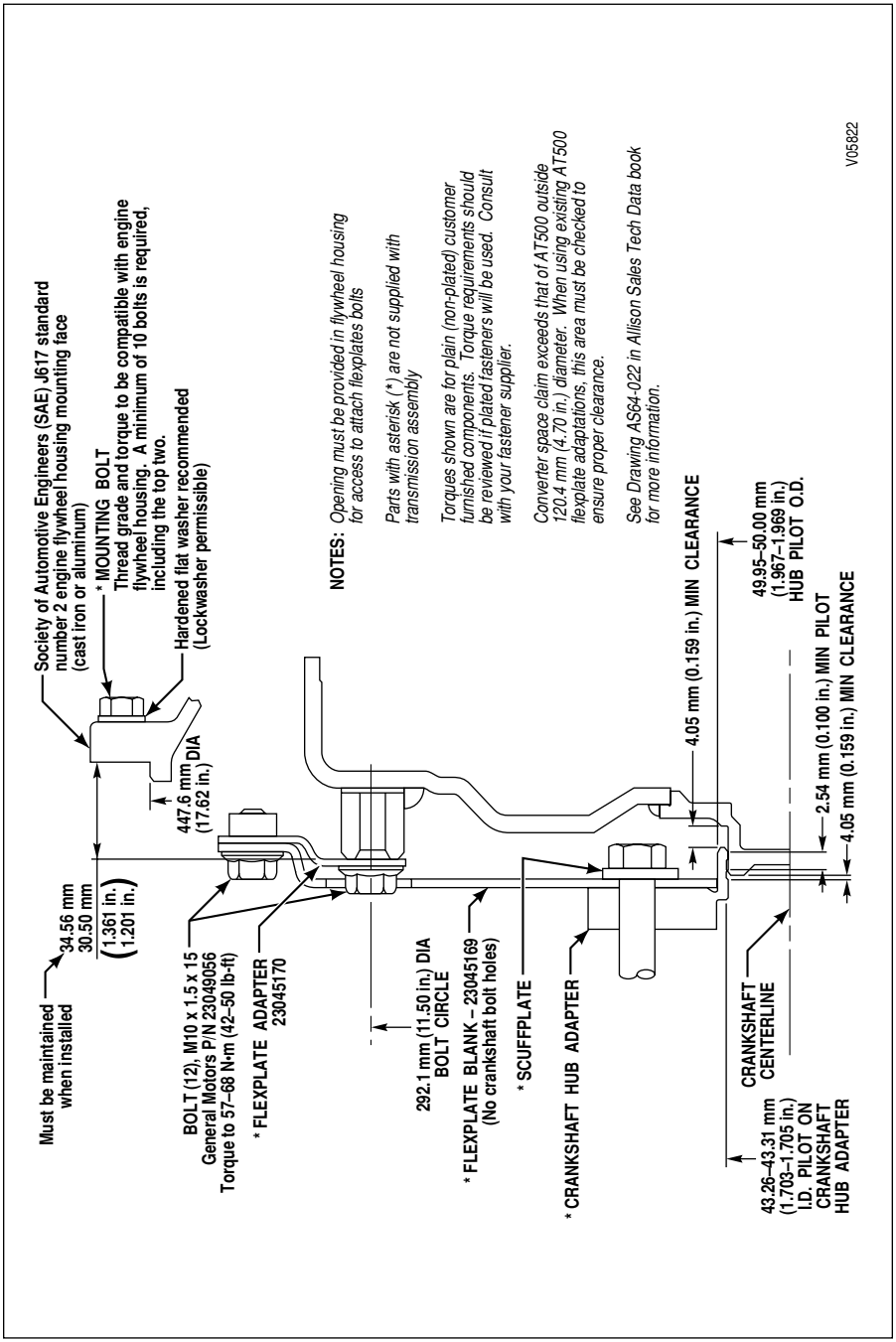


Figure 4–2. 1000 and 2000 Product Families Engine Adaptation (No. 2 Housing)

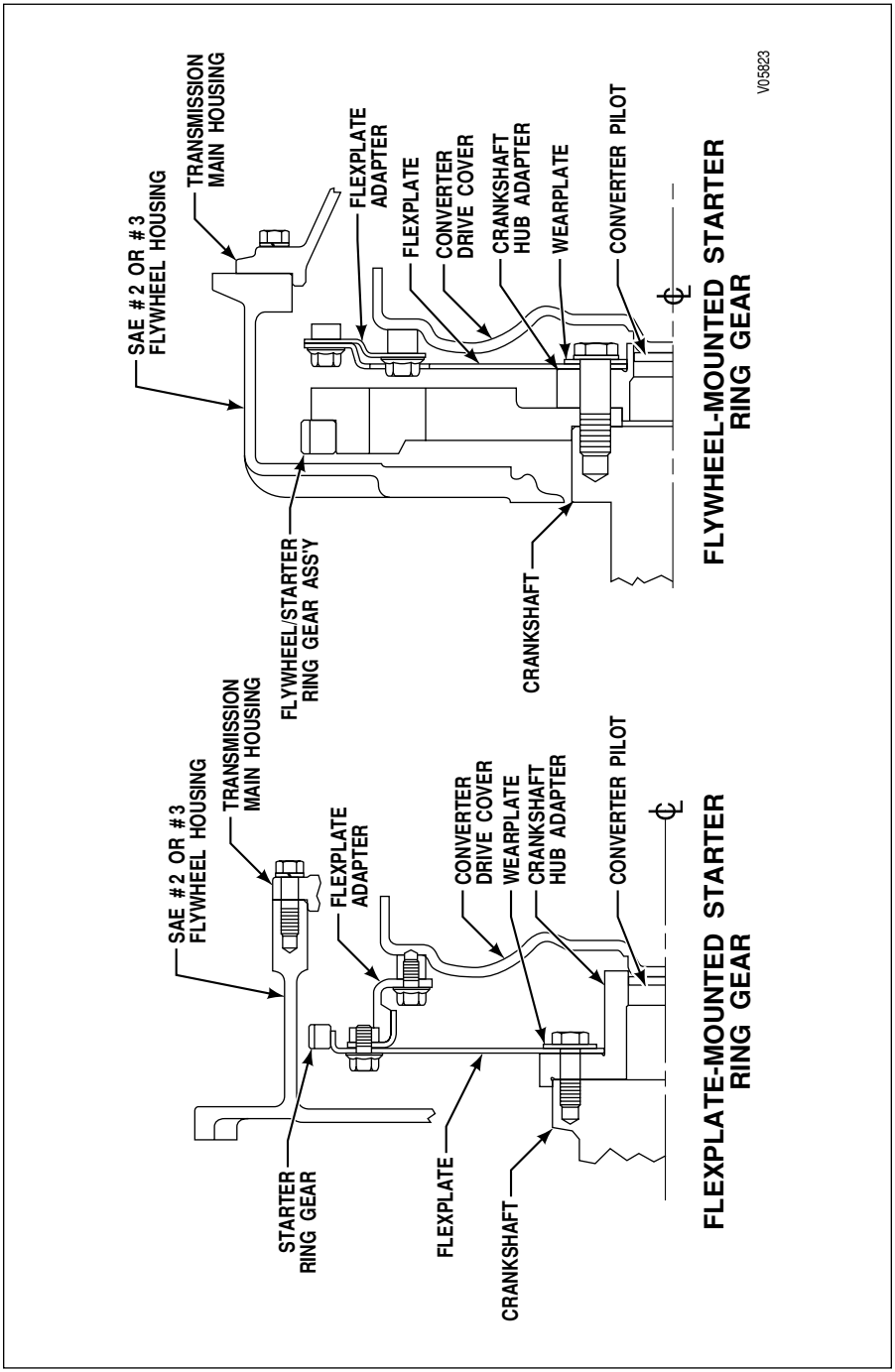


Figure 4–3. Typical Arrangement Of Adaptation Components

h. Flexplate Flatness. Flexplate flatness must be 0.76 mm (0.030 inch) TIR, or less, when measured at 292 mm (11.5 inch) diameter.

i. Torque Converter Axial Location. This is controlled by the engine physical adaptation. Using a depth gauge, measure from the face of the engine flywheel housing to the face at the 292.1 mm (11.50 inch) diameter. The torque converter axial location should measure:

- No. 3 Housing—40.15–44.21 mm (1.581–1.741 inch)
- No. 2 Housing—30.50–34.56 mm (1.201–1.361 inch)

4–2. CHECKING FLEXPLATE DRIVE ASSEMBLY

a. Flexplate Inspection. Check the flexplate for cracks, distortion, or elongated bolt holes. Replace a worn or damaged flexplate.

b. Engine Crankshaft End Play. Make sure engine crankshaft end play is within the engine manufacturer's specifications.

NOTE: When assembling the flexplate to the crankshaft hub or hub adapter, make sure the outer flexplate bolt holes are aligned.

c. Flexplate Assembly Installation. Install the flexplate onto the engine crankshaft hub using the bolts and torque values specified for that engine. Refer to Figure 4–1 or 4–2 for the proper position of an installed flexplate.

4–3. CHASSIS AND DRIVELINE INSPECTION

Inspect the chassis and driveline components for the following conditions, and correct them as appropriate.

- Transmission mounts—broken or worn-out
- Bolts and other hardware—damaged, missing, or incorrect
- Isolators (rubber mounts)—damaged or missing
- Driveline angles—runout, or balance which does not conform to the manufacturer's recommendations
- Driveline yoke slip joints:
  - — freedom of movement
  - — damaged or worn-out
  - — correctly lubricated
  - — correctly indexed

- Driveline midship or hanger bearings—damaged or misaligned
- Universal joints:
  - — freedom of movement
  - — damaged or worn-out
  - — correctly lubricated
  - — correctly indexed
- Vehicle differential backlash—manufacturer's specification
- Universal joint coupling—alignment and differential damage
- Cross-frame members and rear support members—condition and location
- PTO-driven equipment shafts and couplings—damaged or misaligned
- Auxiliary transmission:
  - — shaft alignment
  - — alignment of yoke or flange
  - — backlash
  - — fluid leaks

4–4. COOLER, FILTER, AND LINES

a. Inspection. Perform the following and correct any faulty conditions:

- Transmission fluid cooler and related coolant lines:
  - — Check for contamination—clean and flush as necessary
  - — Inspect for deterioration
  - — Inspect for faulty connectors or kinks
  - — Clean and flush transmission fluid cooler, both coolant and oil sides. Pressure check both sides using a 276 kPa (40 psi) air supply.
- Hydraulic lines:
  - — Check for contamination—clean and flush as necessary
  - — Inspect for deterioration
  - — Inspect for faulty connectors or kinks

b. After Overhaul. A complete cleanup of the transmission system after an overhaul cannot be assumed. See JA3664EN, In-Chassis Maintenance, for cooler flushing procedure.

NOTE: When equipment to flush the oil cooler is not available, install a filter in the cooler line between the oil cooler and the transmission "from cooler" port. The cooler circuit pressure drop specifications must still be met (see AS64–071 or AS 64–072 in the Allison Sales Tech Data book). Frequent initial changes of this filter element may be required as debris is flushed out of the oil cooler circuit. Closely monitoring change in cooler circuit pressure drop will indicate when a filter change is needed.

4–5. CHECKING CONTROLS

a. Inspection. Inspect the following and correct any faulty conditions:

- Shift selector:
  - — improper operation
  - — improper cable routing
- Cab and chassis wiring harness:
  - — poor connections
  - — frayed insulation
  - — wiring damage
- Throttle sensor components, if present:
  - — freedom of movement
  - — improper routing
  - — bellows damage
  - — improper or loose cable mounting
- PTO controls, if present:
  - — damage
  - — wear
  - — improper operation
  - — lubrication
  - — electrical harness connections and wiring damage
- Temperature gauge:
  - — capillary tube damage (if used)
  - — sensor damage

- Fluid pressure gauge tubing:
  - — damage
  - — kinks
  - — improper routing

b. Throttle Position Sensor (TPS) Adjustment. When properly installed by the equipment manufacturer, the TPS, if used, should not need adjustment. If TPS adjustment is necessary, confirm that it has been installed to ATD specification (refer to Figure 4–4). The TPS is self-calibrating and therefore has no optimum closed throttle or full throttle value. Be sure there is no misalignment or obstruction to smooth movement through the full stroke of the TPS.

The Allison DOC™ for PC diagnostic tool can be used to check the TPS adjustment. See the users manual that comes with the diagnostic tool for details. Also, be sure to check for diagnostic codes (DTCs) associated with TPS function.

c. Hitch-Pin Throttle Position Sensor Installation.

- Install the throttle sensor body as follows:
  - — Clamp cable end using clamp and shims (refer to Figure 4–4).
  - — Secure the sensor body using the mounting holes provided.
  - — Install a heat shield if any part of the throttle sensor is near the exhaust manifold, turbochargers, or any other heat source.
- Adjust the throttle sensor as follows:
  - — The engine fuel lever must be at the closed throttle position.
  - — Install the hitch pin cable end of the sensor to the engine fuel lever with brackets so that at the idle position the cable end is 11–17 mm (0.44–0.67 inch) from its fully retracted position, and at wide open throttle the cable end is pulled an additional 15–22.9 mm (0.60–0.90 inch) from the idle position.
  - — Recheck the stroke distance of the throttle sensor, from closed to wide open after installation is completed. Stroke distance must be from 15.2–22.9 mm (0.60–0.90 inch).
  - — Recheck for zero clearance at the fuel lever. Make sure that the 15.2–22.9 mm (0.60–0.90 inch) dimension has not changed.
  - — Design throttle sensor linkage brackets and levers to nominal dimensions so that the system stays within tolerance bands throughout its operating life.

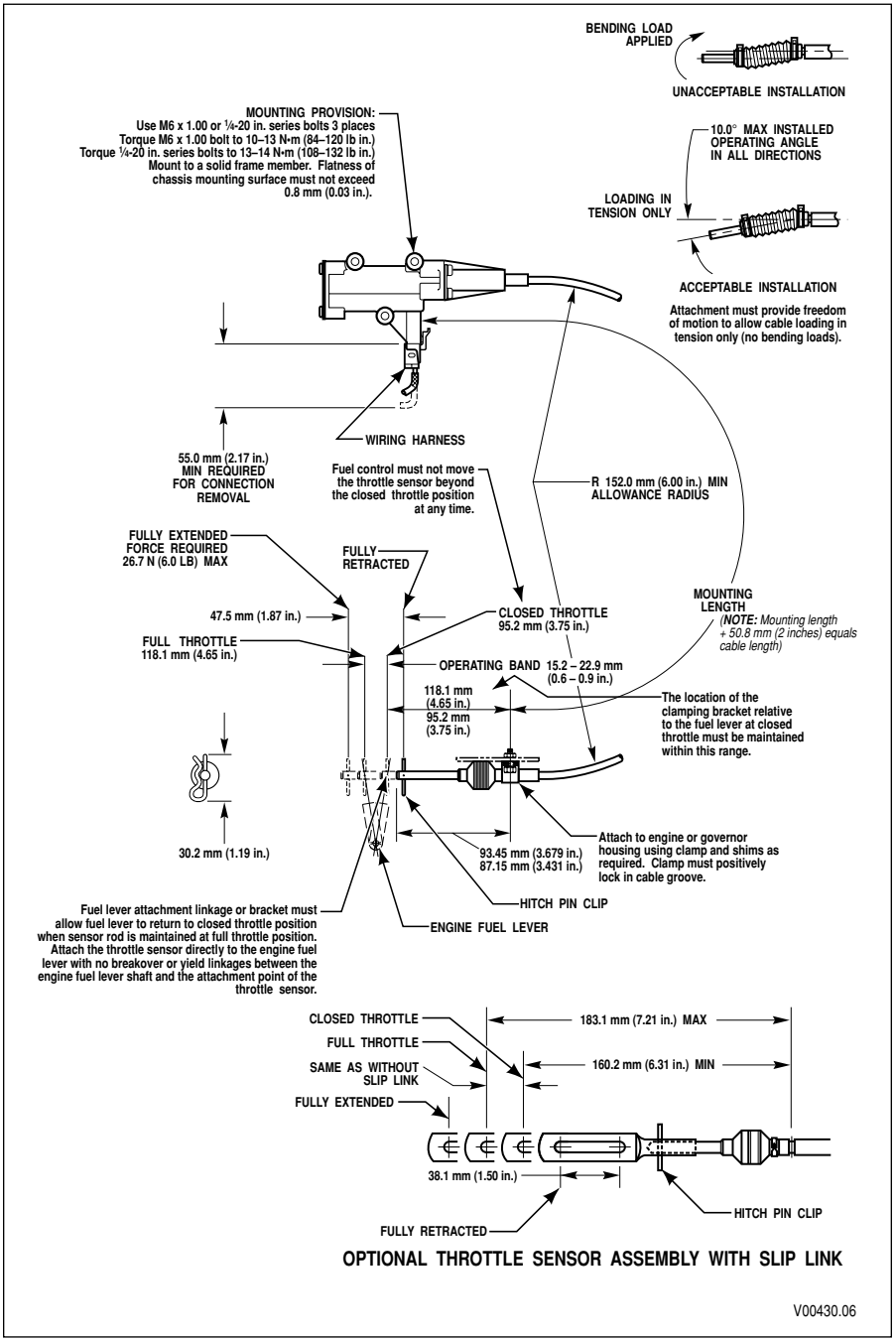
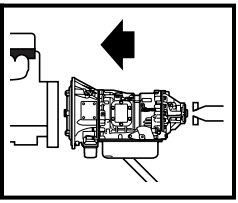


Figure 4–4. Hitch-Pin Throttle Position Sensor Installation Diagram

SECTION V	INSTALLING TRANSMISSION INTO VEHICLE	

5–1. HANDLING

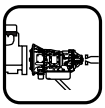
a. Preventing Damage. Carefully handle the transmission to prevent damage to components in the installation path.

b. Control of Transmission Movements. Use a hoist or transmission jack that allows precise control of transmission movements during installation.

5–2. MOUNTING TO ENGINE

Use the following procedure to mount the transmission to the engine:

WARNING: Handle the transmission carefully whenever the torque converter retaining bracket is not present. NEVER tilt the converter end down or the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing damage and/or personal injury.



- Inspect the flexplate adapter, if used, for cracks or other damage and replace it when these conditions are found.
- Remove the torque converter retaining bracket just before the transmission is ready to be installed in the vehicle.

- Attach the flexplate adapter to the front of the torque converter or to the flexplate using six new adhesive-coated M10 x 1.5 x 15 bolts. Tighten each bolt to 57–68 N·m (42–50 lb ft).
- Align one of the flexplate's bolt holes with the access opening in the engine flywheel housing.
- Lubricate the center pilot boss with molybdenum disulfide grease (Molycote G, or equivalent).
- Install an M10 x 1.5 headless guide bolt into one of the flexplate bolt holes in the flexplate adapter or torque converter mounting lug (see Figure 5–1). Align the guide bolt with the flexplate hole at the access opening.

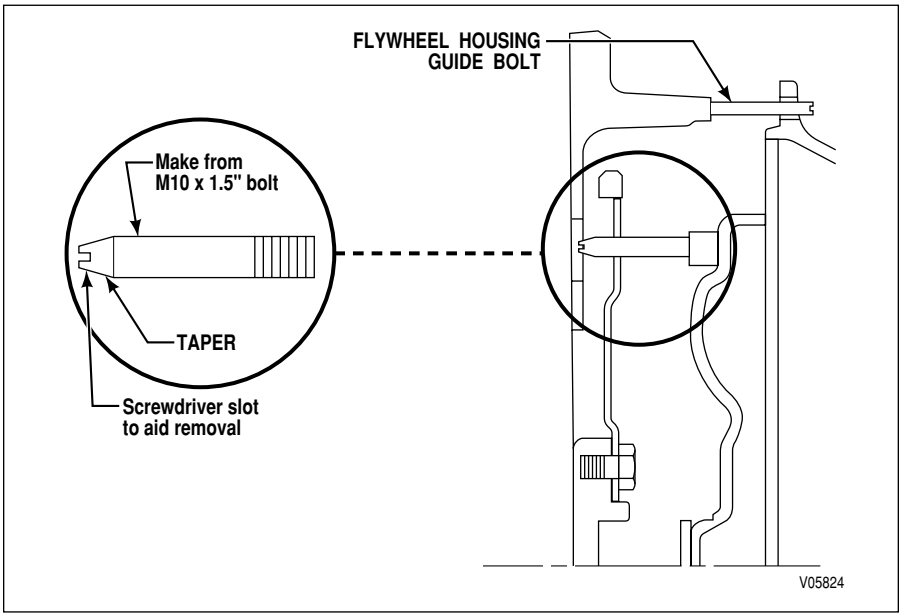


Figure 5–1. Pilot Tool For Transmission-To-Engine Alignment

- Push the transmission toward the engine while guiding the pilot boss on the torque converter into the flexplate hub adapter or flywheel, and the guide bolt into the hole on the flexplate (a headless guide bolt in the engine flywheel housing may also aid in the transmission installation).
- Seat the transmission squarely against the engine flywheel housing—no force is required. If interference is encountered, move the transmission away from the engine and investigate the cause.
- Align the bolts holes in the converter housing with those in the engine flywheel housing.
- Install all transmission-to-engine bolts and washers finger tight (a minimum of 10 bolts is required and must include the top two).

CAUTION: The entire converter housing circumference must be flush against the engine flywheel housing before tightening any bolts. DO NOT use the bolts to seat the housing.

- Tighten four bolts at equally-spaced intervals around the converter housing bolt circle. Use the torque specified by the engine or vehicle manufacturer.
- Remove the flexplate guide bolt through the engine flywheel housing access opening. Replace it with a self-locking bolt. Tighten the bolt finger tight.

NOTE: DO NOT tighten any flexplate-to-flexplate adapter bolts until all of the bolts have been installed and tightened finger tight.

- Rotate the engine crankshaft to install the remaining new adhesive-coated bolts into the flexplate adapter. After all bolts have been installed finger tight, tighten the bolts to 57–68 N·m (42–50 lb ft).
- Install the flywheel housing access cover, if used.

5–3. INSTALLING TRANSMISSION MOUNTING COMPONENTS

CAUTION: Use the type and grade of mounting bolts recommended by the vehicle manufacturer.

- Install all bolts, washers, spacer, isolators, or supports required to support the transmission in the vehicle frame.
- Tighten the bolts to the torque values recommended by the vehicle manufacturer.

5–4. COUPLING TO DRIVELINE

- Couple the driveline companion flange or universal joint yoke to the flange or yoke on the transmission. Use the bolts and torque values recommended by the vehicle manufacturer.
- Check the universal joint angularity of all U-joints in the driveline. Determine if they are within specification.

5–5. CONNECTING POWER TAKEOFF CONTROLS

If not already mounted, mount the PTO(s) onto the transmission—refer to Paragraph 4–3.

- Check the PTO harness routing for kinks and sharp bends. Avoid routing the cable close to exhaust pipes or manifold. The PTO harness must not rub or interfere with adjacent parts.
- Connect controls to the PTO.
- Check for proper PTO control operation.

CAUTION: PTO units using transmission main pressure to engage the PTO gear must have a positive main pressure shut-off at the solenoid valve when the PTO is not engaged. Failure to provide this feature may cause inadvertent clutch apply and PTO damage.

- Couple the PTO output to its driven equipment. Check couplings or universal joints for correct assembly and alignment. If the driven component is not a direct mount arrangement, check the PTO drivelines for angularity, phasing, and offsets.

5–6. CONNECTING PARKING BRAKE CONTROL

- Connect and properly adjust the parking brake.
- If present, adjust the brake shoe-to-drum clearance as specified by the manufacturer.

5–7. CONNECTING COOLER

Figure 5–2 shows typical cooler port locations on the transmission. Consult AS64-071 (in Allison Sales Tech Data book) for cooler fitting torque values.

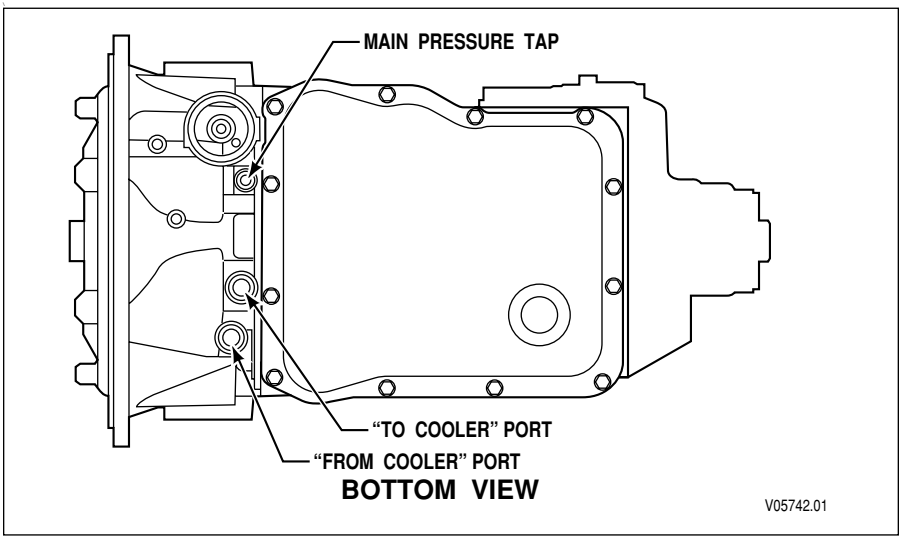


Figure 5–2. Cooler Port Location

- Remove the cover from the main transmission electrical connector and carefully connect the transmission external wiring harness. Keep dirt and debris out of the connector.

- Connect the external wiring harness to the engine, turbine, and output speed sensors.
- If used, connect the PTO(s) connector(s). The PTO connector is NOT part of the Allison Transmission external wiring harness.
- If used, connect wire(s) to electric tachograph.
- Make sure the speed sensors, the PTO connector, and all other connectors are securely seated and latched. A connector can be heard or felt to latch, but confirm the latching by pulling on the connector—NOT THE WIRES.
- The transmission has a sump fluid thermistor on the pressure switch manifold. Actual temperature readings may be made using the PC-based diagnostic tool. Consult the users manual furnished with the Allison DOC™ diagnostic tool.
- A temperature gauge may be installed in the "To Cooler" line. If equipped for them, install a temperature probe—capillary tube and bulb or a thermocouple.

  If equipped with a capillary tube and bulb:
  - — Tighten the adapter tight enough to prevent leakage.
  - — Install the bulb into the adapter and tighten the nut.
  - — Check the capillary tube for interference with other parts that might chafe or damage the tube. Long tubes may require support clips or brackets.

  If equipped with a thermocouple:
  - — Install the thermocouple and connect the leads.

5–8. CONNECTING CONTROLS

- Remove any protective covering from the wiring harness connectors. Connect the external wiring harness to the main electrical connector, the three speed sensors and the NSBU switch (refer to Pages viii and ix).
- Connect linkage to the transmission shift lever. For information on adjusting the NSBU switch or the shift linkage, see JA3664EN, In-Chassis Maintenance.
- If PTO(s) is (are) used, connect the PTO(s) wiring harness(es).
- If parking brake is present, connect linkage.

5–9. FILLING HYDRAULIC SYSTEM

- Check that all unused hydraulic openings are plugged.
- Fill the transmission with the required amount of Allison-approved DEXRON®-III fluid—refer to Paragraph 1–5 and 1–8.
- Run the engine for about one minute and check the fluid level—refer to Paragraph 1–3.

5–10. INSTALLATION CHECKLIST

Use this list after transmission installation. As items are checked, mark them off this list.

- **Torque Values:**
  - ❑ All oil pan bolts—24–29 N·m (18–21 lb ft)
  - ❑ Main pressure tap—10–13 N·m (7–10 lb ft)
  - ❑ Cooler fittings —
    0.750-16 (inch series), 20–30 N·m (15–22 lb ft)
    1.0625-12 (inch series), 34–47 N·m (25–35 lb ft)
  - ❑ Cooler manifold bolts—20–34 N·m (15–25 lb ft)
  - ❑ Flexplate adapter-to-converter cover bolts—57–68 N·m (42–50 lb ft)
  - ❑ Flexplate-to-crankshaft hub bolts—Consult Engine Manufacturer Specifications
  - ❑ Flexplate-to-flexplate adapter bolts—57–68 N·m (42–50 lb ft)
  - ❑ Fluid drain plug—30–40 N·m (22–30 lb ft)
  - ❑ Fluid fill tube bracket bolt—Firmly seated against bracket
  - ❑ Speed sensor bolts—10–13 N·m (7–10 lb ft)
  - ❑ Output flange bolt—108–136 N·m (80–100 lb ft)
  - ❑ PTO cover bolts—51–61 N·m (38–45 lb ft)
  - ❑ PTO mounting bolts—51–61 N·m (38–45 lb ft)
  - ❑ NSBU switch to main housing—24–29 N·m (18–21 lb ft)
  - ❑ Selector lever nut (customer-supplied)—20–27 N·m (15–20 lb ft)
  - ❑ PTO pressure hose to transmission—10–13 N·m (7–10 lb ft)
  - ❑ Rear cover bolts—51–61 N·m (38–45 lb ft)
  - ❑ TPS to engine bracket
    (M6 bolts)—10–13 N·m (7–10 lb ft)
    (0.250-20 bolts)—12–15 N·m (9–11 lb ft)
- **Cooler Fluid Lines and Air Hose for:**
  - ❑ No leaks
  - ❑ Connection tightness
  - ❑ Correct routing
- **Throttle Sensor for:**
  - ❑ Proper adjustment
  - ❑ Correct routing of cable and harness

- **Driveline for:**
  - ❑ Proper indexing of universal joints
  - ❑ Proper drive shaft angles
  - ❑ Driveline backlash
  - ❑ Lubricated universals and slip-joints
- **Hydraulic System for:**
  - ❑ Recommended fluid—TranSynd™
  - ❑ Correct fluid level in transmission
  - ❑ Dipstick correctly calibrated—refer to Figure 1–1
  - ❑ Fill tube tight
  - ❑ Fill tube cap tight
  - ❑ Breather clean and free of restrictions
  - ❑ No fluid leaks during operation
- **Instruments and Electrical Equipment for:**
  - ❑ Proper wiring and electrical connections
  - ❑ Instruments, gauges, and lights work correctly
  - ❑ Shift selector display is on and CHECK TRANS light is off
  - ❑ Fluid temperature gauge
- **Power Takeoff—if installed—for:**
  - ❑ Controls connected and operative
  - ❑ Correctly coupled to driven equipment
  - ❑ Lubrication line correctly installed and routed—if used
  - ❑ Clutch apply line correctly installed and routed—if used

5–11. ROAD TEST AND VEHICLE OPERATION CHECKLIST

NOTE: Refer to the latest edition of the 1000 and 2000 Product Families transmission Operator's Handbook for operating instructions. Refer to Section VI for the latest publication number.

a. Driveability Drive-away checks are performed to verify proper transmission and support equipment installation and operation. The following steps outline drive-away check procedures:

- Check Fluid—fill the transmission with appropriate fluid.
- Start the Vehicle—check for proper system response during start-up
  - — Turn on the vehicle's master/ignition switch.
  - — The **CHECK TRANS** light should come on.
  - — Start the engine.
  - — The **CHECK TRANS** light should go off.
- Clear Trouble Codes—during installation, it is common for "false" codes to be stored in the electronic control's TCM. These codes must be cleared prior to road testing the vehicle. Refer to Allison DOC™ users manual for details.
- Road Test the Vehicle—allow the electronic control time to "converge" shifts.
- Check for Proper Operation—check all components for proper mounting and operation, and check for transmission fluid leaks at gasket surfaces, lines, and hoses.
- Re-check for Trouble Codes—use the Allison DOC™ diagnostic tool to determine if codes were set during the road test. See Allison DOC™ users manual for details.
- Troubleshoot—if codes exist after the road test, problems must be found and corrected. Refer to TS3192EN, 1000 and 2000 Product Families Electronic Troubleshooting Manual.

b. Service and Maintenance. Following an initial unit-exchange program, refer to the 1000 and 2000 Product Families Service Manual (SM3191EN) for detailed transmission service and maintenance instructions (available late 1999).

c. Road Test Checklist. Complete the following check list.

- **Neutral Start Circuit:**
  - ❑ Starts only in **N** (Neutral) or **P** (Park)
- **Instruments:**
  - ❑ CHECK TRANS light
  - ❑ Transmission fluid pressure gauge—if used
  - ❑ Speedometer
  - ❑ Temperature gauge—if used
  - ❑ Reverse warning system—if used
- **Transmission Fluid:**
  - ❑ Fluid level meets specifications—cold, neutral, level
  - ❑ No leaks
  - ❑ Warm-up and check fluid level—hot, neutral, level
- **No-Load Governed Engine Speed:**
  - ❑ No-load governed speed of engine
  - ❑ Adjust governor as necessary—refer to the manufacturer's specifications for the engine-transmission being tested.
- **PTO—if installed:**
  - ❑ PTO operation—Refer to the 1000 or 2000 vocational model specific operator's manual (see Section VI for the latest publication number).
- **Shift Sequence:**
  - ❑ Transmission upshifts and downshifts smoothly through all ranges
- **Other Checks:**
  - ❑ Stall test (must only be performed by qualified service technician)
  - ❑ Shift quality
- **Comments:**

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CUSTOMER SERVICE

SECTION VI

6–1. OWNER ASSISTANCE

There are distributors and dealers around the world ready to stand behind every Allison Transmission product. Any situation that arises in connection with the sale, operation, or service of your transmission will be handled by the distributor or dealer in your area. Technical support is available from the Technical Assistance Center (TAC) by telephone at 1-800-252-5283.

Refer to the Allison Transmission website **www.allisontransmission.com** or to the Worldwide Sales and Service Directory SA2229EN for a current listing of Allison Transmission authorized distributors and service dealers.

6–2. SERVICE LITERATURE

This service literature provides fully illustrated instructions for operation, maintenance, service, overhaul, and parts support for your transmission. For maximum performance and service life from your unit, see your dealer or distributor for the following publications. Check the telephone directory for the Allison Transmission service outlet nearest you.

Table 6–1. 1000 and 2000 Product Families Service Literature

Service Manual	SM3191EN
*Parts Catalog	PC3062EN CD3062EN
Electronic Troubleshooting Manual	TS3192EN
Principles of Operation	PO3065EN
*EVS Operator's Manual	OM3761EN
*HS Operator's Manual	OM3757EN
*RDS Operator's Manual	OM3759EN
*MHS Operator's Manual	OM3364EN
*PTS Operator's Manual	OM3758EN
*BUS Operator's Manual	OM3765EN
*In-Chassis Maintenance	JA3664EN
*1000, 2000, 2400 Operator's Manual	OM3063EN
* Also Available On The Internet At *www.allisontransmission.com*	

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MT3190EN 200403 www.allisontransmission.com Printed in USA 200405