Allison Transmission®

Mechanic's Tips

MD 3070PT Series Transmissions

MT2923EN

MT2923EN

Mechanic's Tips

Allison Transmission

MD 3070PT

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Allison Transmission, Inc.
P.O. Box 894 Indianapolis, Indiana 46206-0894
www.allisontransmission.com

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IMPORTANT SAFETY NOTICE

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions used in this manual. These warnings and cautions advise against using specific service procedures that can result in personal injury, damage to the equipment, or cause the equipment to become unsafe. **These warnings and cautions are not exhaustive.** Allison Transmission could not possibly know, evaluate, or advise the service trade of all conceivable procedures by which service might be performed or of the possible hazardous consequences of each procedure. 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 MUST** first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service procedures used.

Proper service and repair are important to the safe and reliable operation of the equipment. The service procedures recommended by Allison Transmission and described in this manual are effective methods for performing service operations. Some service procedures require using tools specially designed for the procedure. Use special tools when and as recommended.

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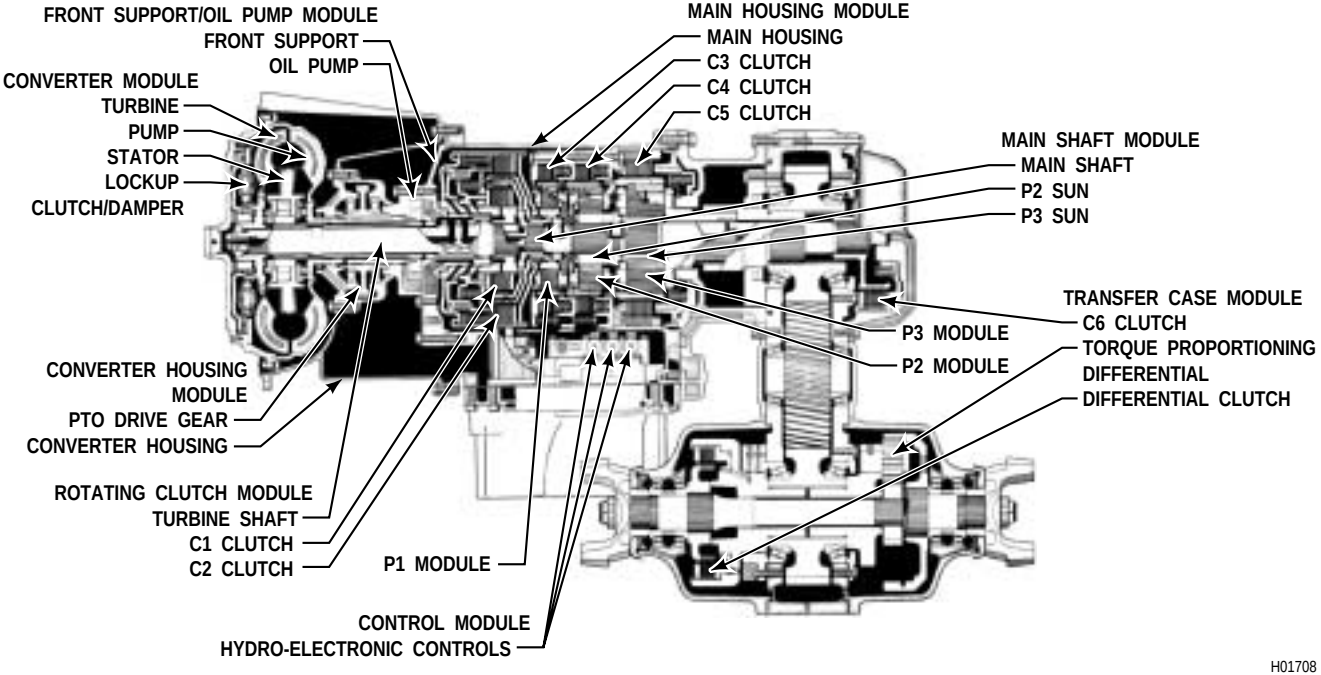
PREFACE

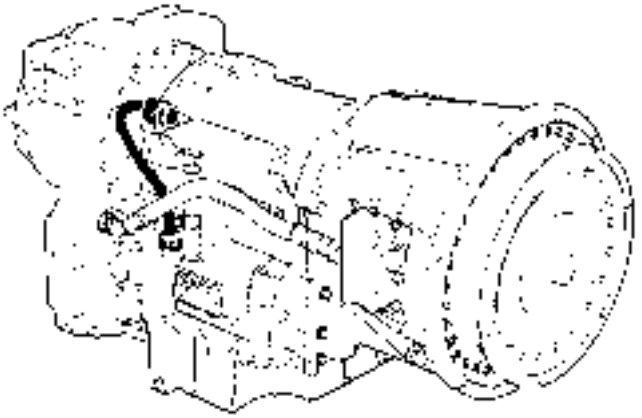
This handbook is a mechanic's reference for removing, installing, or maintaining an MD 3070PT Automatic Transmission. All features of the transmission and the vehicle involved in installation procedures are discussed. The information presented will help the mechanic remove, install, and maintain the 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.

TRADEMARKS USED

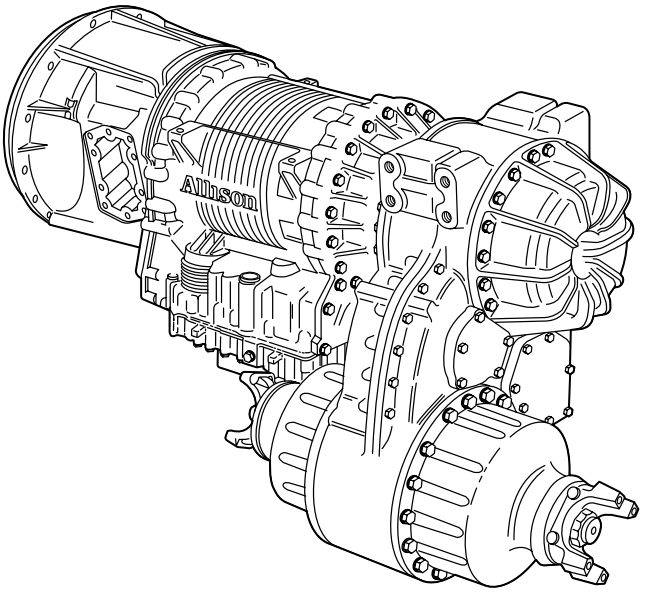
DEXRON® is a registered trademark of General Motors Corporation.
Pro-Link® is a registered trademark of Microprocessor Systems, Inc.

MD 3070PT
SEVEN-SPEED WITH TRANSFER CASE, CLOSE RATIO, POWER TAKEOFF





MD 3070PT TRANSMISSION RIGHT FRONT-VIEW



MD 3070PT TRANSMISSION LEFT REAR-VIEW

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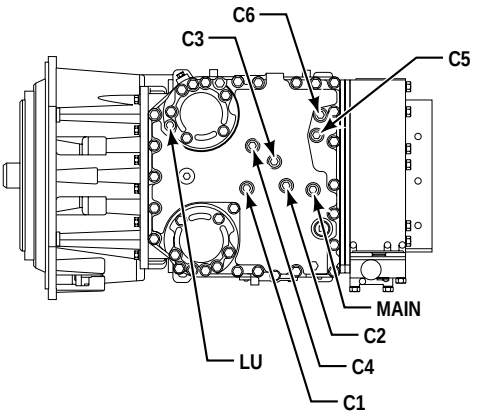
MD 3070PT TRANSMISSION BOTTOM-VIEW



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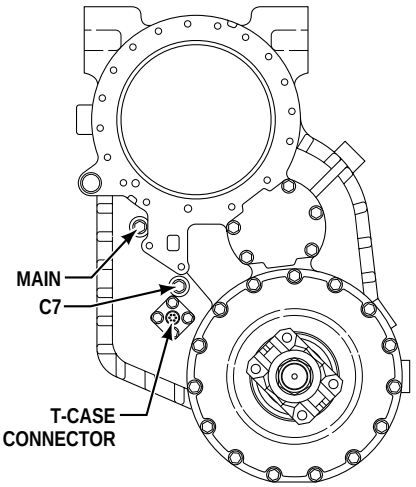
MD 3070PT TRANSFER CASE FRONT-VIEW



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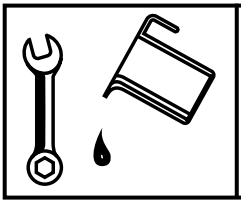


PREVENTIVE MAINTENANCE

SECTION I

1–1. PERIODIC INSPECTION AND CARE

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 linkage
- damaged or loose hoses
- worn, frayed, or improperly routed electrical harnesses
- worn or out-of-phase driveline U-joints and slip fittings

CAUTION: When welding on the vehicle:

- **DO NOT WELD** on the vehicle without disconnecting from the ECU all control system wiring harness connectors.
- **DO NOT WELD** on the vehicle without disconnecting ECU 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.

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

a. Electronic Fluid Check Procedure. If the transmission you are maintaining has an oil level sensor, fluid level information can be displayed on the shift selector. If the transmission does not have an oil level sensor, refer to Paragraph 1–3, Step **b**. Manual Fluid Check Procedure.

- Displaying Fluid Level Information. Use the following procedure to display fluid level information:

  — For a pushbutton shift selector:
  Simultaneously press the ↑ (Up) and ↓ (Down) arrow buttons.

  — For a lever shift selector:
  Press the MODE button.

- Oil (Fluid) Level Mode. A two minute countdown begins after entering oil level mode. The display flashes and an 8, 7,...1 count occurs during the two minute countdown. Oil level information displays after the countdown and when the following conditions are met:

  — Engine at idle

  — Sump oil at operating temperature

  — Transmission output shaft stopped

  — Transmission in neutral

  — Oil level sensor functioning properly

- Shift Selector Display. After two minutes the shift selector will display the fluid level data as in the following examples:

CODE	MEANING OF CODE
OL OK OK	Oil level is correct
OL LO 01	Oil level is one quart low — or as many quarts as needed
OL HI 01	Oil level is one quart high — or as many quarts as overfilled

The shift selector can only display two characters at a time. One character is displayed under the MONITOR label and one under the SELECT label. The oil level information is sequentially displayed as in the following examples:

If the oil level is correct —

Select	Monitor
O	L
O	K
O	K

If the oil level is low —

Select	Monitor
O	L
L	O
O	1

If the oil level is high —

Select	Monitor
O	L
H	I
O	1

NOTE:
Failure to meet any of the above conditions stops the two minute countdown. One of the following codes displays on the shift selector to show the reason for the countdown interruption. Once all conditions have been met, the countdown resumes where it stopped.

CODE	*CAUSE OF CODE*
50	Engine rpm too low
59	Engine rpm too high
65	Neutral not selected
70	Sump oil temperature too low
79	Sump oil temperature too high
89	Output shaft rotation
95	Oil level sensor failure

If oil level cannot be checked and a code is issued indicating the reason, the following type display appears:

Select	Monitor
O	L
–	–
5	9

NOTE:
Report sensor failure to a distributor or dealer in your area. Check the telephone directory for an Allison Transmission distributor or dealer near you.

- Exiting The Oil Level Display Mode
  - — For a pushbutton shift selector:
    Press any range selection button.
  - — For a lever shift selector:
    Press the DISPLAY MODE button, or select a range.

b. 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 record the level in your maintenance log.

WARNING: When checking the fluid level, be sure the transmission is in **N** (Neutral), the parking brake and/or emergency brake is set properly, and the wheels are chocked. Unexpected and possible sudden vehicle movement may occur if these precautions are not taken.

c. 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 RUN" band if the transmission fluid is below normal operating temperatures.

- Park the vehicle on a level surface. Apply the parking brake and chock the wheels.
- Run the engine for at least one minute. Shift to **D** (Drive), then to **N** (Neutral), and then shift to **R** (Reverse) to fill the hydraulic system. Finally, shift to **N** (Neutral) and allow the engine to idle (500–800 rpm).
- With the engine running, remove the dipstick from the tube and wipe 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 RUN" 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 RUN" band, add or drain as necessary to bring it to the middle of the "COLD RUN" band.
- Perform a hot check at the first opportunity after the normal operating temperature of 71°C–93°C (160°F–200°F) is reached.

d. Hot Check Procedure.

CAUTION: The fluid must be hot to ensure 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)
- Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake and chock the wheels. Allow the engine to idle (500–800 rpm).
- With the engine running, remove the dipstick from the tube and wipe 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, Figure 1–1. The "HOT RUN" band is between the "HOT FULL" and "HOT ADD" marks.

- 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.

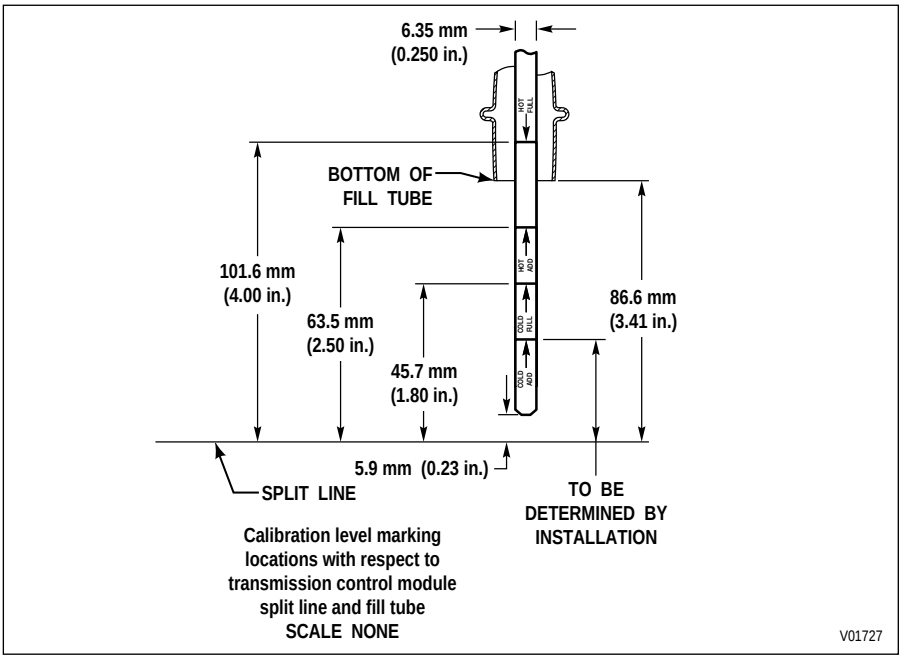


Figure 1–1. MD 3070PT Dipstick Markings

e. Consistency of Readings. Always check the fluid level at least twice and with the engine running. Consistency is important to maintaining accuracy of the reading. If inconsistent readings persist, check the transmission breather to be sure it is clean and unclogged.

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 fluid (oils) used in the transmission are important influences on transmission performance, reliability, and durability. DEXRON®-III fluid is recommended for on-highway applications. Type C-4 fluids are recommended for severe duty and off-highway applications.

DEXRON®-III fluid is also qualified as Type C-4 fluid. To ensure the fluid is qualified for use in Allison transmissions, check for a DEXRON®-III or C-4 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. Fluid types such as Type F and universal farm fluids may or may not be properly qualified for use in your Allison transmission.

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 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**
MIL-L-46167	–51	–60
MIL-L-2104D	–32	–25
SAE 0W-20	–30	–22
DEXRON®-III	–27	–17
SAE 10W	–20	–4
SAE 10W-30	–20	–4
SAE 15W-40	–15	5
SAE 30W	0	32
SAE 40W	10	50

1–6. TRANSMISSION FLUID AND FILTER CHANGE INTERVALS

a. Frequency. Transmission fluid and filter change frequency is determined by the severity of transmission service and the filter equipment installed. Table 1–2 is a general guide. More frequent changes may be necessary when operating conditions create high levels of contamination or overheating.

Table 1–2. Transmission Fluid and Filter Change Table

Transmission	Fluid and Filter Change Interval
MD3070PT (On-highway)	After the first 8000 km (5000 miles); thereafter 40 000 km (25,000 miles) or 18 months*
MD3070PT (Off-highway)	After first 500 hours; thereafter, 1000 hours max, or 18 months*
*Whichever comes first.	

b. Abnormal Conditions. 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 local telephone directory for fluid analysis firms. To ensure consistent and accurate fluid analysis, use only one fluid analysis firm. Refer to the Technician's Guide for Automatic Transmission Fluid, SA2055, for additional information.

Table 1–3. Fluid Oxidation Measurement Limits

Test	Limit
Viscosity	±25% change from new fluid
Carbonyl Absorbance	+0.3 A*/0.1 mm change from new fluid
Total Acid Number	+3.0 change from new fluid
Solids	2% by volume maximum
* A= Absorbance Units	

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 cooler (heat exchanger) water 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:
Cooler water can also be contaminated by engine oil; be sure to locate the correct source of cooler water contamination.

c. Engine Coolant. 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. Replace friction clutch plates contaminated with engine coolant (ethylene glycol).

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: If excessive metal contamination has occurred, replace the oil cooler and all bearings in the transmission.

1–8. TRANSMISSION FLUID AND FILTER CHANGE PROCEDURE

NOTE:
Do not drain the transmission fluid if only filters are being replaced.

a. Drain Fluid.

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

b. Replace Filters.

- Remove twelve bolts, two filter covers, two O-rings, two square cut seals, and two filters from the bottom of the control module (refer to Figure 1–2).

NOTE:
Lubricate the O-ring inside the filter cartridges.

- Pre-lube and install an O-ring on each cover assembly. Install a square cut seal on each cover assembly. Install the filters onto the cover assemblies.

CAUTION: Do not use the bolts to draw filter covers to the sump. This can damage the covers, seals, or sump.

- Install filter and cover assemblies into the filter compartment. Align each filter/cover assembly with the holes in the channel plate/sump. Push the cover assemblies in by hand to seat the seals.
- Install six bolts into each cover and tighten to 51–61 N·m (38–44 lb ft).
- Replace drain plug O-rings. Install the plugs and tighten to 25–32 N·m (18–24 lb ft).

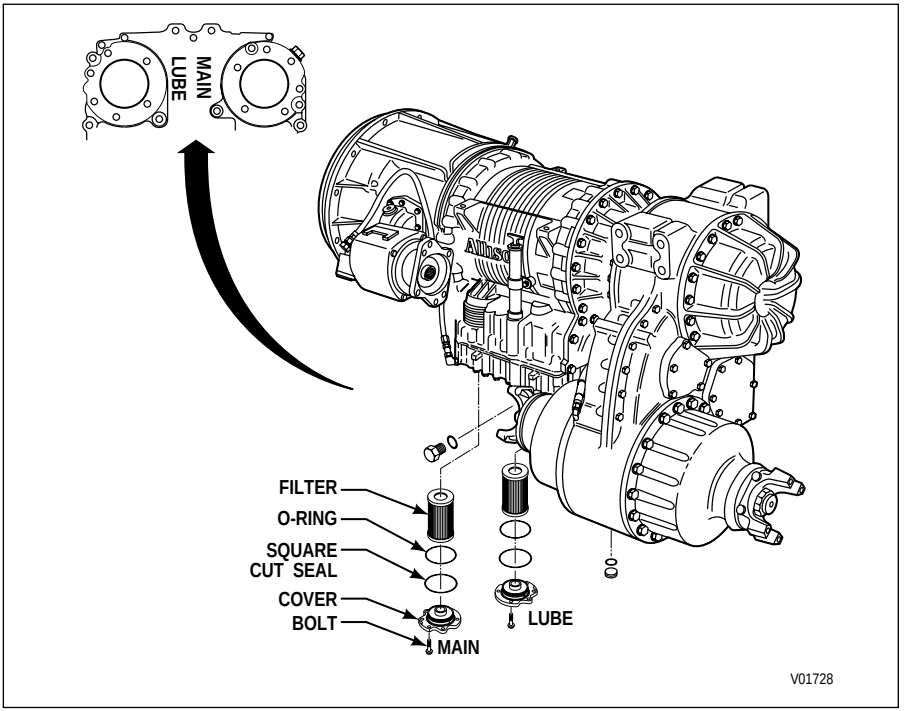


Figure 1–2. Location of Filters for Service

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*	
Transmission Type	**Oil Sump Description**	**PTO**	**Liters**	**Quarts**	**Liters**	**Quarts**
MD 3070PT	standard (7.00 in.)	yes	37	39	30	32
*Approximate quantity; does not include external lines and cooler hose.						

1–9. FLUID LEAK DIAGNOSIS

a. Finding the Leak.

(1) Identify the fluid. Determine whether it is engine oil, automatic transmission fluid, or hydraulic fluid from a specific vehicle system.

(2) Operate the vehicle to reach normal operating temperature and park the vehicle. Inspect the vehicle to identify the source of the leak. Refer to the following list for possible points of fluid leaks and their causes.

- Transmission mating surfaces:
  - — Attaching bolts not correctly tightened
  - — Improperly installed or damaged gasket
  - — Mounting face damaged
- Housing leak:
  - — Filler pipe or plug seal damaged or missing
  - — Filler pipe bracket dislocated
  - — Oil cooler connector fittings loose or damaged
  - — Output shaft seals worn-out or damaged
  - — Pressure port plugs loose
  - — Porous casting
- Leak at converter end:
  - — Converter seal damaged
  - — Seal lip cut (check converter hub for damage)
  - — Garter spring missing from seal
  - — Converter leak in weld area or O-ring seal
  - — Porous casting
- Fluid comes out of vent or fill tube:
  - — Overfilled — incorrect dipstick
  - — Plugged vent
  - — Water or coolant in fluid — fluid will appear milky
  - — Incorrect electronic fluid level indication
  - — Drain-back holes plugged

(3) Visually inspect the suspected area. Inspect all the gasket mating surfaces for leaks.

(4) If the leak still cannot be identified, then clean the suspected area with a degreaser, steam, or spray solvent. Clean and dry the area. Operate the vehicle for several miles at varying speeds. Inspect the vehicle for leaks. If the source of the leak is still not identified, use powder method or black light and dye method as explained below.

b. Powder Method.

- Clean the suspected area.
- Apply an aerosol-type white powder.
- Operate the vehicle under normal operating conditions.

- Visually inspect the suspected area and trace the leak path over the white powder surface to the source.

NOTE:
A dye and black light kit is available for finding leaks. Refer to the manufacturer's directions when using the kits. See kit directions for the color of the fluid and dye mix.

c. Black Light and Dye Method.

- Pour the specified amount of dye into the transmission fill tube.
- Operate the vehicle in normal operating conditions.
- Direct the black light toward the suspected area. The dyed fluid will appear as a brightly colored path leading to the source.

d. Repairing the Leak.

Once the leak has been traced back to its source, inspect the leaking part for the following conditions, and repair the leaking part.

- Gaskets:
  - — Fluid level/pressure is too high
  - — Plugged vent or drain-back holes
  - — Improperly tightened fasteners or dirty/damaged threads
  - — Warped flanges or sealing surfaces
  - — Scratches, burrs, or other damage to a sealing surface
  - — Damaged or worn-out gasket
  - — Cracked or porous casting
  - — Improper sealant used (where applicable)
- Seals:
  - — Fluid level/pressure is too high
  - — Plugged vent or drain-back holes
  - — Damaged seal bore
  - — Damaged or worn-out seal
  - — Improper installation
  - — Cracks in component
  - — Output shaft surface scratched, nicked, or damaged
  - — Loose or worn-out bearing causing excess seal wear
- Sealing Flange:
  - — Inspect the sealing flange for bends; replace the sealing flange if bent.

1–10. BREATHER

a. Location and Purpose. The breather is located on top of the transmission converter 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. **DO NOT SPRAY STEAM, WATER, OR CLEANING SOLUTION DIRECTLY AT THE BREATHER**. Spraying steam, water, or cleaning solution directly at the breather can force the water or cleaning solution into the transmission.

c. Replacement. Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench can crush or damage the stem and produce metal chips which could enter the transmission. Tighten the breather to 12–16 N·m (9–12 lb ft).

1–11. TROUBLESHOOTING

a. DO NOT SHIFT Light.

The DO NOT SHIFT light is usually located on the vehicle's instrument panel.

When the light is "ON" and accompanied by eight seconds of short beeps from the shift selector, shifts are being restricted by the ECU.

- This occurs when the ECU senses abnormal conditions.
- During this time, the "Select" digit on the shift selector is blank.
- The transmission may continue to operate with inhibited shifting.
- The ECU will not respond to shift selector requests.
- Direction changes and shifts to and from neutral will not occur. If the lever shift selector is moved while DO NOT SHIFT is indicated, a continuous alarm sounds. This alarm continues until the shifter is moved back to the position it was in when the light came on initially.
- If ignition is turned "OFF" and then "ON" while the DO NOT SHIFT light is displayed, the transmission will remain in neutral until the code is cleared.

Any time the DO NOT SHIFT light is displayed, the ECU logs a diagnostic code in memory. These diagnostic codes can be accessed through the shifter display or a diagnostic tool.

NOTE:

Diagnostic codes can be logged without illuminating the DO NOT SHIFT light. This occurs when the ECU senses a problem, but determines the problem won't cause immediate transmission damage or dangerous performance.

b. Diagnostic Codes Overview.

Table 1–5. Diagnostic Codes Overview

Code List Position	Main Code	Sub Code	Active Indicator	Ignition Cycle Counter	Event Counter
d1	21	12	YES	00	10
d2	41	12	YES	00	04
d3	23	12	NO	08	02
d4	34	12	NO	13	01
d5	56	11	NO	22	02
Displayed on shift selector.			YES = *MODE ON* Displayed	Accessible by Pro-Link® diagnostic tool only.	

Diagnostic codes are listed in memory. Up to five codes can be stored, with the most recent code listed first.

Diagnostic codes consist of a two-digit main code and a two-digit sub code.

- Main codes are listed first and provide the general condition or area of fault detected by the ECU.
- Sub codes are listed second and provide specific areas or conditions within the main code that caused the occurrence.
- Example — Code 13 12: 13 indicates a problem with ECU voltage; 12 indicates the problem was caused by low voltage.
- Example — Code 21 12: 21 indicates a problem with throttle position sensor signal; 12 indicates the throttle position sensor signal was low.

If the condition causing the diagnostic code still exists, it's identified by "YES" in the Active Indicator area. If the condition causing the diagnostic code is no longer present, it's identified by "NO" in the Active Indicator area.

When using the shift selector to retrieve trouble codes, the illumination of the MODE ON indicator on the shift selector indicates that the code displayed is currently active. If the MODE ON indicator is not illuminated with the displayed code, the code is inactive. In the normal operating mode, the MODE ON display indicates secondary mode operation.

- The Ignition Cycle Counter determines when inactive diagnostic codes are automatically cleared from the code list. The counter is incremented each time a normal ECU powerdown occurs (ignition turned off). Inactive codes are cleared from the code list after the counter reaches 25.

- The Event Counter counts the number of occurrences of a diagnostic code. If a code is already in the code list and the code is again detected, that code is moved to position D1, the active indicator is turned on and the Ignition Cycle Counter is cleared, and 1 is added to the Event Counter.
- You can access the ignition cycle counter and event counter information through Pro-Link® diagnostic tool only.

c. Clearing The Trouble Codes Using Shift Selector.

During installation, "false" codes can be recorded in the electronic control's memory. You must clear these codes prior to road testing the vehicle. Use the shift selector to clear the codes. Refer to Figure 1–3.

- Enter the diagnostic mode on pushbutton selectors by pressing the ↑ (Up) and ↓ (Down) arrow buttons simultaneously. (Press twice if there is an oil level sensor present.)
- Enter the diagnostic mode on lever selectors by momentarily pressing the DISPLAY button. (Press twice if there is an oil level sensor present.)
- To clear all active indicators, press and hold the MODE button approximately 3 seconds until a tone sounds.
- To remove all codes, press and hold the MODE button for approximately 10 seconds until the shift selector tone sounds twice.

d. Retrieving Troubleshooting Codes.

During installation, "false" diagnostic codes can be recorded in the electronic control's memory. Clear these codes before road testing the vehicle. After road testing the vehicle, check for the codes. Retrieve the codes by using the shift selector. Refer to Figure 1–3.

- Enter diagnostic mode.
- The display will list the code's logged position (d1, d2, d3, etc.), then follow with the main code and a sub code (this repeats every 2 seconds until the MODE button is pushed again).
- Momentarily push the MODE button to move to the next code stored in memory.
- When you have retrieved all the codes, the display will return to the first code listed and repeat the sequence. RECORD ALL THE CODES.

NOTE:
You can also use Pro-Link® diagnostic tool to clear and retrieve the troubleshooting codes. Refer to the Pro-Link® User's Manual or SA2828 for specific instructions.

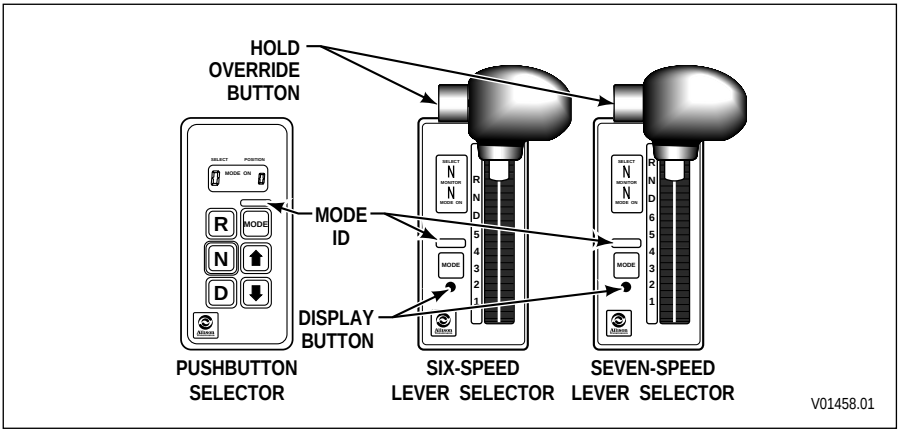


Figure 1–3. Shift Selector

e. Troubleshooting When No Diagnostic Codes Are Present.

- Always start with the basics:
  - — Make sure the shifter is in the appropriate range.
  - — Check the fluid level.
  - — Make sure batteries are properly connected and charged.
  - — Make sure electrical connections are properly made.
  - — Check support equipment for proper installation and operation.
- If the shifting process is rough, give the shifts time to “converge” before assuming there is a problem.
- Refer to the WT Troubleshooting Manual’s “General Troubleshooting of Performance Complaints” section.
  - — These troubleshooting charts list a variety of conditions that may or may not relate to the Electronic Control.
  - — Some conditions and suggested checks include mechanical and hydraulic items.
- If the troubleshooting charts refer you to an Electronic Control check, use the diagnostic code troubleshooting information that best applies to the situation.
- Use the WT’s individual clutch-apply circuit pressure taps when necessary.

f. Troubleshooting Intermittent Diagnostic Codes.

Intermittent codes are a result of conditions which are not always present.

When conditions causing the code exist, the code is logged in memory. The code stays in memory until it’s manually cleared or cycled out.

When intermittently occurring codes exist, check for the following items:

- Dirty, damaged harness connectors and terminals
- Terminals not fully seated in connectors
- Damaged harnesses (due to poor routing, chafing, excessive heat, tight bends, etc.)
- Improperly mounted Electronic Control components
- Poor connector seals (where applicable)
- Exposed harness wires
- EMI generating components and accessories

To help locate intermittents, it sometimes helps to place the appropriate tester on the suspect component or circuit and simulate operating conditions — wiggle, pull, bump, and bend while watching the tester.

g. Exiting The Diagnostic Mode.

- Do nothing; wait until the calibrated time has passed and the system automatically returns to normal operation.
- Using a **pushbutton** shift selector, simultaneously press the ↑ (Up) and ↓ (Down) arrow buttons.
- Using a **pushbutton** shift selector, press **D** (Drive), **N** (Neutral), or **R** (Reverse).
- Using a **lever** shift selector, press the DISPLAY MODE button.
- Using a **lever** shift selector, move the shift selector to any position other than the one it was in when the diagnostic display mode was activated.

1–12. TRANSMISSION STALL TEST AND NEUTRAL COOL-DOWN CHECK

a. Purpose. When a vehicle is performing unsatisfactorily, use the stall test to determine if the malfunction is in the engine or in the transmission. The neutral cool-down check uses a two-minute cooling period after the stall to gather fluid temperature data for troubleshooting.

b. Transmission Stall Test Procedure.

- The engine stall rpm under load is compared to the engine manufacturers' specified rpm for the stall test.

NOTE:
The engine manufacturer's test data must be available for the stall test. This data can be obtained from the engine manufacturer or from the equipment dealer or distributor. You must know the stall speed of the engine/torque converter combination. If you have complete engine information such as model, manufacturer, and the installed torque converter information, the Allison Transmission distributor or dealer can determine the stall speed of the engine/torque converter combination installed in your vehicle by using SCAAN.

NOTE:
The Pro-Link® diagnostic tool can read sump temperature to show when normal operating temperatures have been reached and the temperature has stabilized.

- Connect a tachometer (the Pro-Link® diagnostic tool can read engine rpm) of known accuracy to the engine and install a temperature probe into the converter-out (to cooler) hose. Bring the transmission to the normal operating temperature range of 71°C–93°C (160°F–200°F).

WARNING: Securely block the vehicle from moving — chock the vehicle wheels and apply the parking brake and service brake. Warn personnel to keep clear of the vehicle and its travel path. Failure to do so can cause serious injury.

CAUTION: DO NOT conduct a stall test in **R** (Reverse) range. The torque produced in reverse range can damage the vehicle driveline or axle.

- Shift to any forward range.

CAUTION: The stall condition causes a rapid rise in fluid temperature; never maintain the stall for more than 30 seconds at any one time. Do not let the converter-out fluid temperature exceed 149°C (300°F). During stall conditions, converter-out temperatures rise much faster than internal fluid temperature. Do not use internal fluid temperature to determine the length of the stall condition. If the stall test is repeated, do not let the engine overheat.

- With the vehicle blocked and wheels chocked, parking and service brakes applied, hold the engine at wide-open throttle. Record the maximum engine rpm. Do not allow converter-out fluid to exceed 149°C (300°F).

- Reduce engine rpm to idle and shift to **N** (Neutral).
- Raise engine speed between 1200 and 1500 rpm for 2–3 minutes to allow transmission to cool down.
- Monitor converter-out temperature. If transmission temperature doesn't decrease, refer to Section 1–12**d**.

c. Stall Test Results.

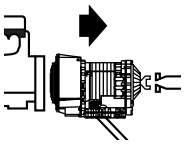
NOTE:
Environmental conditions, such as ambient temperature, altitude, engine accessory loss variations, etc., affect the power input to the converter. Under such conditions, stall speed can vary from specification by ±150 rpm and still be accepted as within normal range.

- If engine stall speed is more than 150 rpm below the stall speed specified by the engine manufacturer, an engine problem is indicated. If engine stall speed is more than 150 rpm above specification, a transmission problem is indicated, such as slipping clutches, cavitation, aeration, or torque converter failure.
- An extremely low stall speed (such as 33 percent of the specified engine stall rpm), during which the engine does not smoke, could indicate a freewheeling stator in the converter.
- Perform a neutral cool-down check if engine stall-speed tests meet specifications, but cause the transmission fluid to overheat.
- If the engine stall speed meets the specification and the cool-down check shows that transmission fluid cools properly, an electronic control problem may exist. Refer to the latest version of WT Troubleshooting Manual TS2470EN.

d. Neutral Cool-Down Check Procedure.

- The neutral cool-down check determines if the transmission fluid cools following an engine load condition. Perform this check immediately after the maximum engine rpm has been recorded in the stall test.
- Record the converter-out fluid temperature.
- Reduce the engine rpm to idle and shift to **N** (Neutral). Run the engine at 1200–1500 rpm for two minutes to cool the fluid.
- At the end of two minutes, record the converter-out fluid temperature. Converter-out fluid temperature should return to within the normal operating temperature range.
- If the fluid does not cool during the two minute cool-down check, a stuck stator may be the source of the problem.

NOTE:
You may use the Pro-Link® diagnostic tool to perform stall test and clutch test procedures. Refer to the Pro-Link® User's Manual for specific instructions.



REMOVING TRANSMISSION

SECTION II

2–1. DRAINING TRANSMISSION

Drain the transmission fluid before removing the transmission from the vehicle. The transmission should be warm and the fluid allowed to drain completely.

- Remove the drain plug from the control module and the transfer case. Examine the drained fluid for evidence of contamination — refer to Paragraph 1–7. Reinstall the drain plug.
- Remove transmission fill tube if it interferes with transmission removal.

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 or completely remove controls. If controls are not removed from the transmission, position them so that they do not interfere with transmission removal.
- Disconnect the external wiring harness at the feedthrough harness connector. On models prior to 1995, disconnect the external wiring harness at the transmission connector. Prevent dirt or moisture from entering a disconnected connector. Position the wiring harness so it does not interfere with transmission removal.
- Disconnect the engine and output speed sensors.

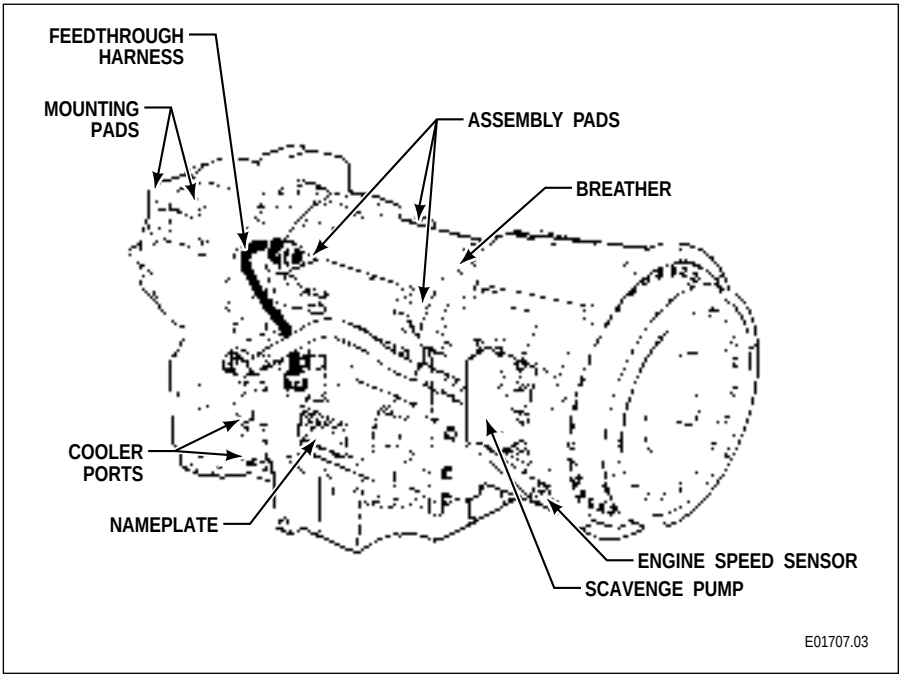


Figure 2–1. MD 3070PT Disconnect Locations

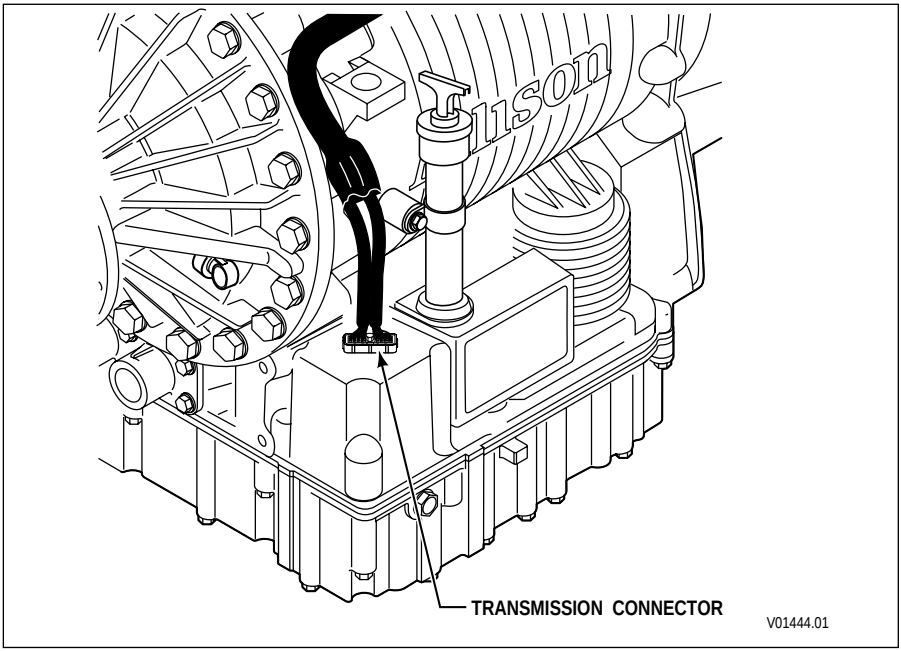


Figure 2–2. Transmission Connector (Prior to S/N 6510032369)

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

- Disconnect the vehicle drive shafts from the transmission output flanges or yokes. Position the disconnected shaft to avoid interference when removing the transmission.
- 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.

2–4. REMOVING THE TRANSMISSION

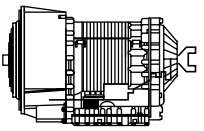
- Move the transmission away from the engine, approximately 110 mm (4.35 inches), until it is completely clear of the engine. If used, remove the adapter ring and/or gasket.
- Raise or lower the transmission as necessary to remove it from the vehicle.

2–5. REMOVING OUTPUT FLANGES OR YOKES

MD 3070PT outputs use two large self-locking nuts. A special procedure must be followed for removal and installation of the nut.

CAUTION: The use of an impact wrench on the MD 3070PT output nut requires a means to hold the flange. Failure to hold the flange can cause internal damage to the transmission.

- Remove dirt and burrs from the shaft threads. Then loosen the nut until there is about 1⁄16 inch gap between the nut and flange.
- Check the running torque as the nut is being removed. The running torque must be at least 19.5 N·m (14 lb ft). Discard the nut if it does not meet the running torque limit.

SECTION III	PREPARING THE TRANSMISSION FOR INSTALLATION	

3–1. CHECKING INPUT COMPONENTS

a. Bolt Holes. Check all bolt holes on the front of the flywheel/converter cover/flexplate adapter. 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 flywheel) for damage or raised metal that prevents free entry into the crankshaft hub (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 Seals. Check the output oil seals for leaks or damage. Replacement instructions are in the MD Series Service Manual SM2148EN. Lubricate the oil seal with high-temperature grease or transmission fluid.

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.

b. Check Yokes. 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 during installation to prevent damage to the oil seal lip.

c. Install Output Yokes. Install the rear output yoke on the rear output shaft. Tighten the nut to 610–815 N·m (450–600 lb ft). Follow the same procedure for the front output yoke.

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 MD Parts Catalog.

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

a. Install Guide Pins — included in the PTO installation kit. Determine the required position of the guide pins in relation to the mounted position of the PTO. The guide pins must align with the two blind holes in 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. Mount the PTO on the guide pins, meshing the PTO driven gear with the transmission's PTO drive gear. Retain the PTO by installing a bolt in the top bolt hole. Install the remaining bolts. Tighten all bolts to 51–61 N·m (38–45 lb ft).

3–4. INSTALLING SCAVENGE PUMP

Determine whether the scavenge pump should be installed before or after the transmission has been installed.

a. Install the Guide Pins — included in the scavenge pump installation kit. Determine the required position of the guide pins in relation to the mounted position of the scavenge pump. The guide pins must align with the two blind holes in the scavenge pump. Install two headless guide pins into the converter housing scavenge pump pad. Tighten the pins.

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

c. Mount the Scavenge Pump. Mount the scavenge pump on the guide pins, meshing the scavenge pump with the transmission's PTO drive gear. Retain the scavenge pump by installing a bolt in the top bolt hole. Install the remaining eight bolts, and tighten the bolts to 51–61 N·m (38–45 lb ft).

3–5. 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 an expansion plug in the fill tube opening.

CAUTION: Install the fill tube brackets with the correct length bolt. Too long a bolt may cause cracks and leaks in the main housing. Refer to the MD 3070PT Catalog for the correct bolt.

b. Installation. Install the fill tube seal into the main housing. Insert the fill tube through the seal. Align the tube bracket with its bolt location. Install the fill tube bolt and tighten to 24–29 N·m (18–21 lb ft). Install the expansion plug in the unused fill tube hole. Tighten the plug to 1–3 N·m (9–26 lb in.).

3–6. CHECKING PLUGS AND OPENINGS

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

a. Pressure Plugs. Check that .4375–20 UNF-2A pressure plugs are 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. 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.

SECTION IV	PREPARING VEHICLE FOR TRANSMISSION INSTALLATION	

4–1. ENGINE, TRANSMISSION ADAPTATION REQUIREMENTS

You must ensure a new transmission installation can be adapted to the vehicle's engine. The measurements described in this section ensure correct transmission-to-engine adaptation. Refer to Figure 4–1 or 4–2.

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

- 600 mm (24 inches) precision caliper
- 50–100 mm (2–4 inches) telescoping gauge
- 25–75 mm (1–3 inches) outside micrometer
- Dial indicator and mounting attachments — base, posts, and clamps
- 0–150 mm (0–6 inches) depth micrometer

b. Flywheel Housing Pilot Bore Diameter. The flywheel housing pilot bore diameter must measure from 447.68–447.81 mm (17.625–17.630 inches)

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 50.94–50.99 mm (2.006–2.008 inches).

f. Crankshaft Hub Pilot or Adapter Squareness. The crankshaft hub or hub adapter cannot be out-of-square more than 0.13 mm (0.005 inch) TIR.

g. Crankshaft Hub Pilot or Adapter Concentricity. The crankshaft hub pilot or the hub adapter pilot concentricity cannot exceed 0.13 mm (0.005 inch) TIR.

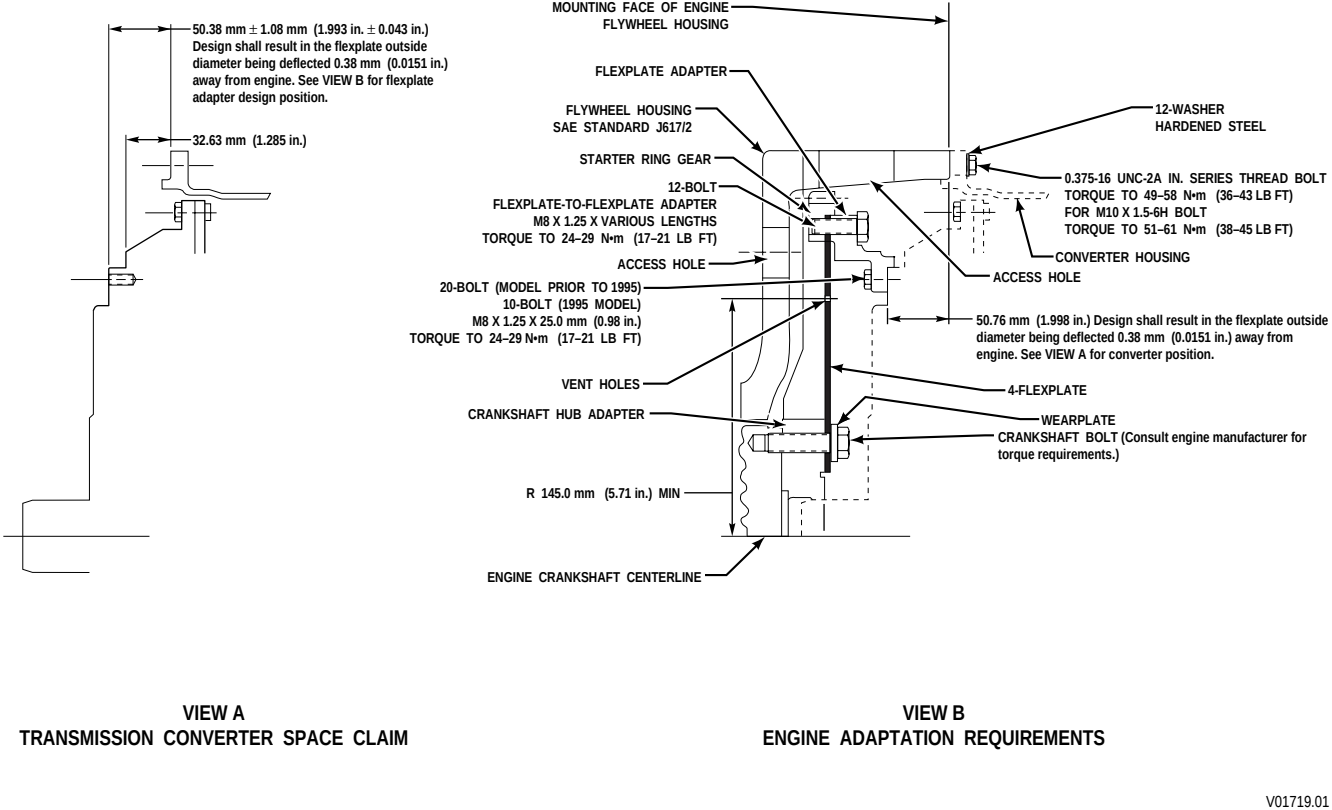


Figure 4–1. MD 3070PT Engine Adaptation

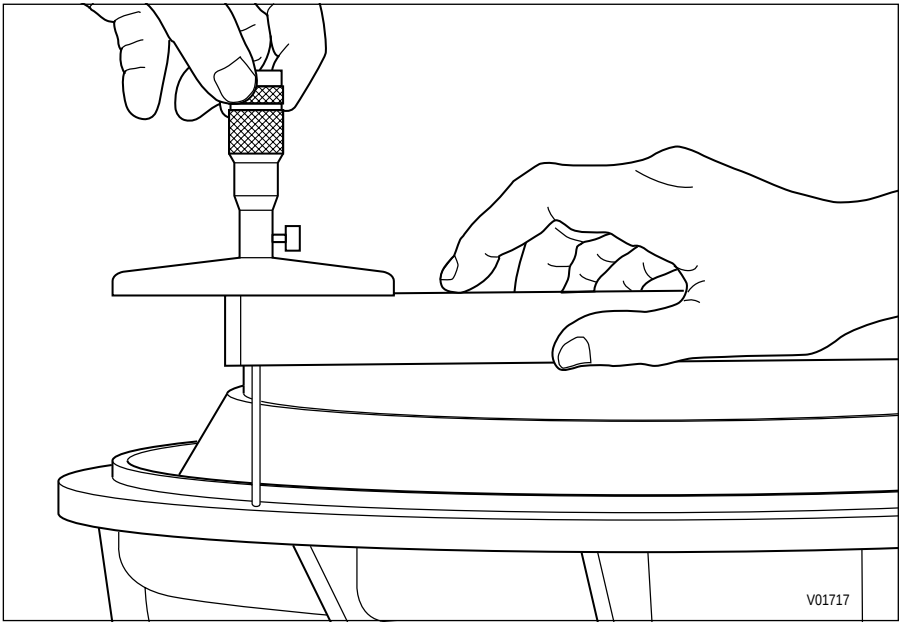


Figure 4–2. Converter Axial Location Measurement

h. Flexplate Bolt Hole Flatness. Flexplate flatness in the area of the bolt holes is not a measurement required for the MD 3070PT transmission.

i. Torque Converter Axial Location. Refer to Figure 4–2. Using depth gauge, measure from the torque converter housing to the torque converter's flexplate adapter mounting face.

The torque converter axial location should measure 50.76 mm (1.998 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. Ensure engine crankshaft end play is within the engine manufacturer's specifications.

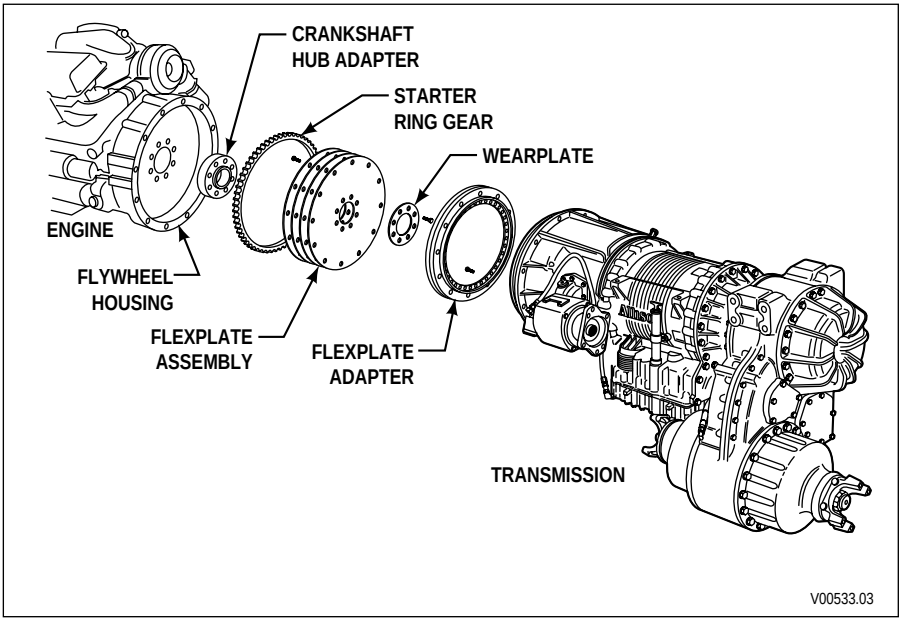


Figure 4–3. Arrangement of Adaptation Components

NOTE:
When assembling the flexplate to the crankshaft hub or hub adapter, ensure 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 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, balance, or offsets which do 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. Repeated cleaning and flushing may not remove all debris from the transmission fluid cooler system. Replace the transmission "from cooler" (lube) filter after 8000 km (5000 miles). Refill the transmission to the correct fluid level — refer to Paragraph 1–3.

4–5. CHECKING CONTROLS

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

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

b. Throttle Position Sensor (TPS) Adjustment — Using Diagnostic Tool. When properly installed by the equipment manufacturer, the TPS should not need adjustment. If TPS adjustment is necessary, confirm that it has been installed to ATD specification (refer to Figure 4–5). The TPS is self-calibrating and therefore has no optimum closed throttle or full throttle count value. Idle count should be 50 or higher and full throttle count 200 or lower. As long as the counts are in the 50 and 200 range with a difference of 85 to 130 counts between closed and full throttle the TPS is set correctly.

The Pro-Link® diagnostic tool can read TPS counts. Watch the TPS movements as the controls move it through a full stroke. Be sure the following conditions do not exist:

- misalignment or obstruction to smooth movement through the full stroke
- idle and full throttle positions are not within an error zone (refer to Figure 4–4)

Error codes occur if the idle position is less than 14 counts or when the full throttle position is more than 233 counts.

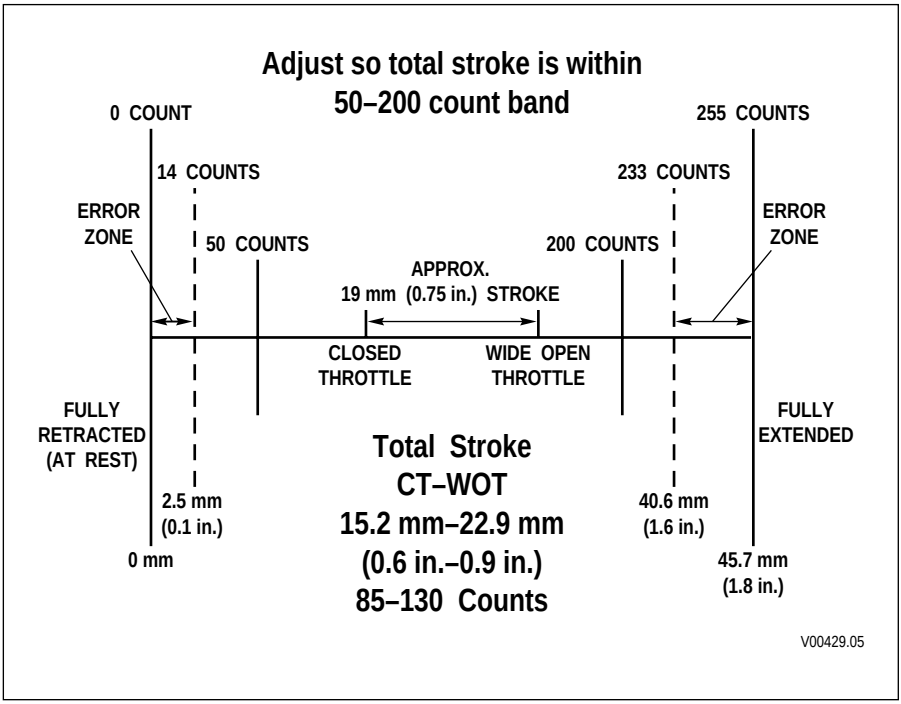


Figure 4–4. Throttle Position Determination Diagram

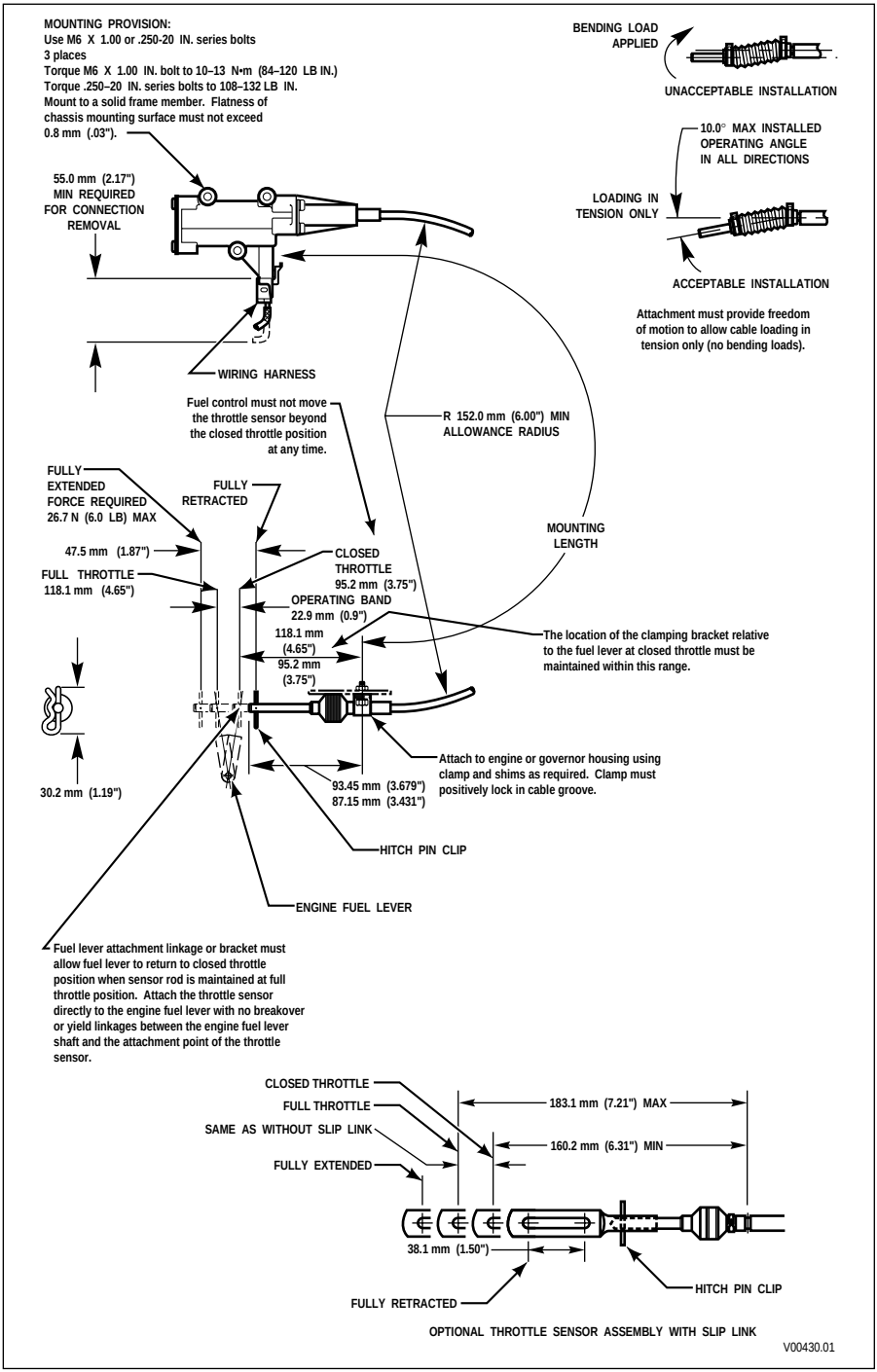
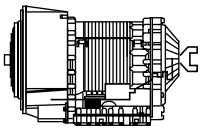


Figure 4–5. Hitch Pin Throttle Position Sensor Installation Diagram

c. Hitch Pin Throttle Position Sensor Installation.

- Install the throttle sensor body as follows:
  - — Clamp cable end using clamp and shims (refer to Figure 4–5).
  - — 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 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 15–22.9 mm (0.60–0.90 inch) from the idle position.
  - — Check the stroke distance of the throttle sensor, from closed to wide open. Stroke distance must be from 15–22.9 mm (0.60–0.90 inch).
  - — Recheck for zero clearance at the fuel lever. Make sure that the 15–22.9 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.



INSTALLING TRANSMISSION INTO VEHICLE

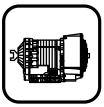
SECTION V

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:

- Align one of the flexplate's bolt holes with the access opening at the front of the engine flywheel housing.
- Lubricate the center pilot boss with molybdenum disulfide grease (Molycote G, or equivalent).
- Install a headless guide bolt into one of the flex disk bolt holes in the flexplate adapter (refer to Figure 4–3). Align the guide bolt with the flexplate hole at the access opening.
- Push the transmission toward the engine while guiding the pilot boss on the flywheel into the flexplate hub (adapter), and the guide bolt into the hole on the flexplate.
- 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 finger tight.

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 90 degree intervals around the converter housing bolt circle. Use the torque specified by the engine or vehicle manufacturer — usually M10 x 1.5-6H bolts tightened to 51–61 N·m (38–45 lb ft) or 7⁄16-14 bolts tightened to 73–88 N·m (54–65 lb ft).
- Remove the 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 self-locking bolts into the flexplate adapter. After all bolts have been installed finger tight, tighten them to 24–29 N·m (18–21 lb ft).
- Install the flywheel housing access cover.

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 3–3.

- 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.

- Couple the PTO output to its driven equipment. Check couplings or universal joints for correct assembly and alignment.

5–6. CONNECTING COOLER

Figure 5–1 shows typical cooler line installation.

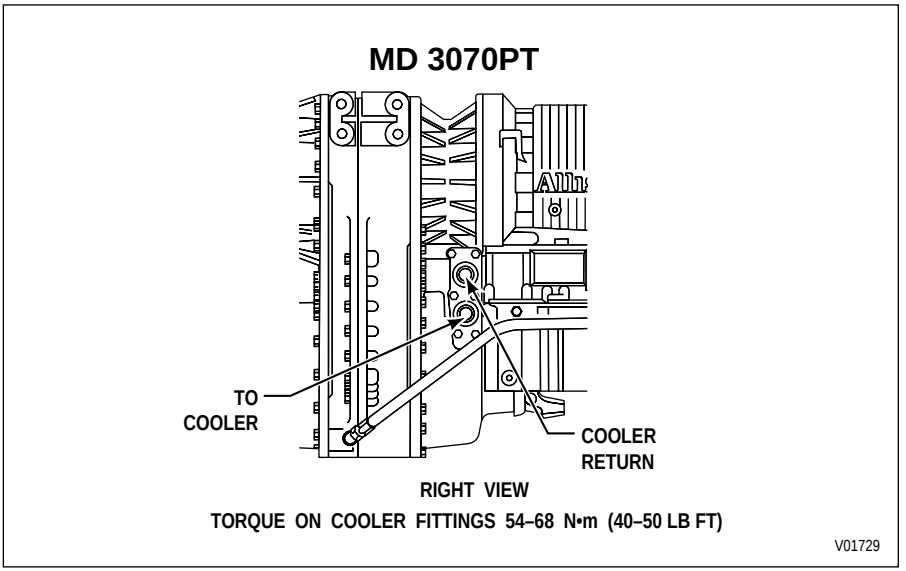


Figure 5–1. Torque Values of Typical Fluid Cooler Lines

5–7. CONNECTING SPEEDOMETER DRIVE

The ECU, through the VIM, provides an electronic speedometer speed signal. If used, consult the OEM for connection procedure.

5–8. CONNECTING ELECTRICAL COMPONENTS

NOTE:
Allison World Transmission electronic control systems are designed and manufactured to comply with all FCC and other guidelines regarding radio frequency interference/electromagnetic interference (RFI/EMI) for transportation electronics. Manufacturers, assemblers, and installers of radio-telephone or other two-way communication radios have the sole responsibility to correctly install and integrate those devices into Allison World Transmission-equipped vehicles to customer satisfaction. For further information, refer to the Electronic Controls Troubleshooting Manual, TS2470EN.

a. Procedure.

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

  — Connect the engine speed sensor and transfer case connector.
- Connect the PTO(s) connector(s). The PTO connector is NOT part of the Allison Transmission external wiring harness.
- Tighten the transmission wiring harness external connector bolt to 2–3 N·m (18–25 lb in.).
- Ensure 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 temperature sensor on the internal harness. Actual temperature readings can be made with the 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.

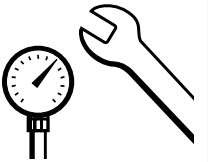
- Install and connect other electrical components such as — heaters, winterization equipment, and pressure sensors.
- If equipped, install the pressure gauge tube or line.
- Check that all unused hydraulic openings are plugged.

5–9. FILLING HYDRAULIC SYSTEM

- Select a transmission fluid — refer to Paragraph 1–5.
- Fill the transmission with the required amount of fluid — refer to Paragraph 1–8.
- Run the engine for about one minute and check the fluid level — refer to Paragraph 1–3.

5–10. INSTALLATION CHECKLIST

Complete the Installation Checklist in Section VI.

SECTION VI	CHECKS AND ADJUSTMENTS	

6–1. INSTALLATION CHECKLIST

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

- **Torque Values:**
  - ❑ All control module bolts — 51–61 N·m (38–44 lb ft)
  - ❑ Breather — 12–16 N·m (9–12 lb ft)
  - ❑ Control module pressure taps — 10–13 N·m (7–10 lb ft)
  - ❑ Cooler fittings — #12, 34–47 N·m (25–35 lb ft)
    #16, 54–68 N·m (40–50 lb ft)
    #20, 68–81 N·m (50–60 lb ft)
  - ❑ Cooler port cover bolts — 51–61 N·m (38–44 lb ft)
  - ❑ Expansion plug — 1–2 N·m (9–18 lb in.)
  - ❑ External harness-to-transmission connector bolt — 1–2 N·m (9–18 lb in.)
  - ❑ Flexplate adapter-to-converter cover bolts — 24–29 N·m (18–21 lb ft)
  - ❑ Flexplate-to-crankshaft hub bolts — Consult Engine Manufacturer Specifications
  - ❑ Flexplate-to-flexplate adapter bolts —
    12-bolt design — 24–29 N·m (18–21 lb ft)
    6-bolt design — 51–61 N·m (38–44 lb ft)
  - ❑ Fluid drain plug — 25–32 N·m (18–24 lb ft)
  - ❑ Fluid fill tube bracket — 24–29 N·m (18–21 lb ft)
  - ❑ Speed sensor bolts — 24–29 N·m (18–21 lb ft)
  - ❑ Output flange bolts — 30–35 N·m (22–26 lb ft)
  - ❑ PTO cover bolts — 51–61 N·m (38–44 lb ft)
  - ❑ PTO mounting bolts — 51–61 N·m (38–44 lb ft)
  - ❑ PTO pressure hose to transmission — 10–13 N·m (7–10 lb ft)

- ❑ Rear cover bolts — 90–110 N·m (66–81 lb ft)
- ❑ TPS to transmission bracket — 108–122 N·m (80–90 lb ft)
- ❑ Transmission electronic connector bolts — 5–7 N·m (48–62 lb in.)

- **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 — DEXRON®-III or C-4 fluid
  - ❑ 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 DO NOT SHIFT light is off
  - ❑ Fluid temperature gauge
- **Power Takeoff for:**
  - ❑ Controls connected and operative
  - ❑ Correctly coupled to driven equipment
  - ❑ Lubrication line correctly installed and routed — if used

6-2. ROAD TEST AND VEHICLE OPERATION CHECKLIST

NOTE:
Refer to MD 3070PT Transmission Operator's Handbook for operating instructions.

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 the appropriate fluid.
- Start the Vehicle — check for proper system response during start-up.
  - — Turn on the vehicle's master/ignition switch.
  - — The DO NOT SHIFT light should come on.
  - — Start the engine.
  - — The DO NOT SHIFT light should go off.
  - — "N N" should appear on the shift selector display.
- Clear Trouble Codes — during installation, it's common for "false" codes to be stored in the electronic control's ECU. These codes must be cleared prior to road testing the vehicle.
- 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 Pro-Link® or shift selector to determine if codes were set during the road test.
- Troubleshoot— if codes exist after the road test, problems must be found and corrected. Refer to WT Troubleshooting Manual TS2470EN.

b. Service and Maintenance. Refer to a current issue of the MD Series Service Manual for detailed transmission service and maintenance instructions. Refer to a current issue of the MD Series Troubleshooting Manual for detailed electronic control system troubleshooting. Refer to Section 7–2 for the latest publication number.

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

- **Neutral Start Circuit:**
  - ❑ Starts only in neutral

- **Instruments:**
  - ❑ DO NOT SHIFT light and shift selector display
  - ❑ Transmission fluid pressure gauge — if used
  - ❑ Speedometer
  - ❑ Temperature gauge — if used
  - ❑ Reverse warning system — if used
- **Transmission Fluid:**
  - ❑ Fluid level meet 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:**
  - ❑ PTO operation — refer to MD 3070PT Operator's Manual or to the vehicle manufacturer's specific instructions.
- **Shift Sequence:**
  - ❑ Transmission upshifts and downshifts smoothly through all ranges
- **Other Checks:**
  - ❑ Stall test
  - ❑ Shift quality
- **Comments:**

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SECTION VII

CUSTOMER SERVICE

7–1. 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.

Refer to the North American Parts and Service Directory SA2229 or the International Parts and Service Directory SA2338 for a current listing of Allison Transmission authorized distributors and service dealers.

7–2. SERVICE LITERATURE

This service literature provides fully illustrated instructions for operation, maintenance, service, overhaul, and parts support for your transmission. To ensure 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 7–1. MD 3070PT Service Literature

Publication Title	Publication Number
Service Manual	SM2148EN
Parts Catalog	PC2150EN
Troubleshooting Manual	TS2470EN
Principles of Operation	PO2454EN
Operator's Manual	OM2683EN
Job-Aid Card	JA2506EN

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