



# TRANSMISSION PRODUCT DESCRIPTION

## ALLISON ON-HIGHWAY TRANSMISSIONS

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**APPLICABLE MODELS:** 1000 Product Family  
2000 Product Family  
2900 Product Family  
3000 Product Family  
4000 Product Family

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# **TRANSMISSION PRODUCT DESCRIPTION**

## **1.0 INTRODUCTION**

The purpose of this document is to provide an overview of Allison's on-highway transmissions.

## **2.0 REFERENCED DOCUMENTS**

Unless otherwise noted, all documents referenced in this document may be found in the Allison HUB website at <https://hub.allisontransmission.com/login>. To locate the referenced documents look for Tech Data under the Engineering heading on the Allison HUB home page. In this document, these references are identified by italic font. Contact your Allison Transmission representative if you do not have access to the Allison HUB. A list of all items referenced in this document can be found at the end of this document.

## **3.0 ALLISON ON-HIGHWAY TRANSMISSIONS – GENERAL**

The Allison on-highway transmission product line consists of three basic product families, which reflect three distinct sizes of hardware and operating capacities:

- the 1000/2000 family for class 3-7 vehicles
- the 2900 family for class 3-7 vehicles
- the mid-range 3000 family for class 6-8 vehicles
- the 4000 family for large class 8 vehicles

Figure 1 shows examples from each product family. Refer to the [\*Transmission Families and Models\*](#) for a description of Allison's naming convention for specific transmission models.

All Allison on-highway commercial transmission models have the following features:

- fully automatic
- electronically controlled
- a torque converter for smooth vehicle launch from a stop
- a lockup clutch for efficient power transfer once the vehicle is moving

These transmission models are designed for use in on-highway and on/off-highway vehicle applications. A few specific models in the 3000 and 4000 Product Families may be used in limited off-highway vehicle applications, as described in the [\*Transmission Families and Models\*](#) document.

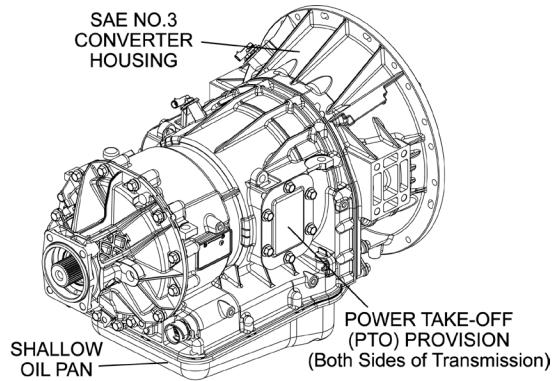
Not all features and options are available with all transmission models. To determine if a feature or option is available for a specific transmission model, refer to [\*Features and Options\*](#) for the [\*1000/2000\*](#), the [\*2900\*](#) the [\*3000\*](#) or the [\*4000\*](#) Product Family.

## **4.0 BASIC DESIGN FEATURES**

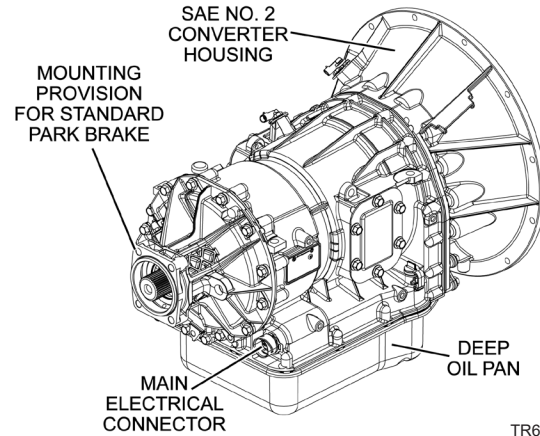
The base transmission models can provide up to six forward speeds, although availability of fifth and sixth gears are sometimes limited in specific applications. These four/five/six-speed transmission models in each product family are fully-automatic in all available forward ranges.

Seven-speed models, which are available in the 3000 and 4000 product families only, are fully-automatic in gear ranges 2–7 and have a manually-selectable low gear. The 3000 seven-speed model, the 3700, includes an integral transfer case. The 4000 seven speed models have the output on the same center line as the input. Additional information relating to 4000 family seven-speed models is included in this document. For detailed information regarding the 3700 model, refer to the [\*3700 Model Installation Manual\*](#).

### 1000 and 2000 Product Family Transmissions

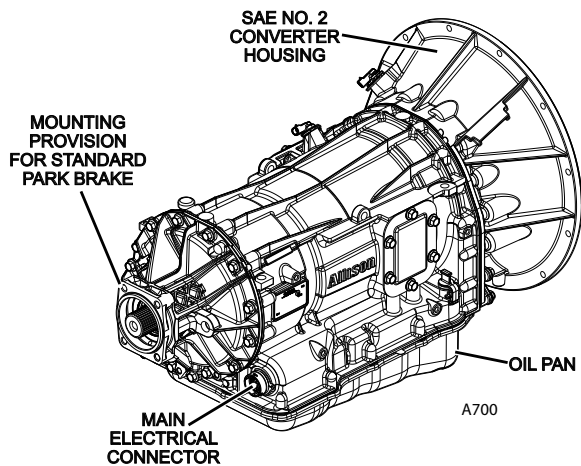
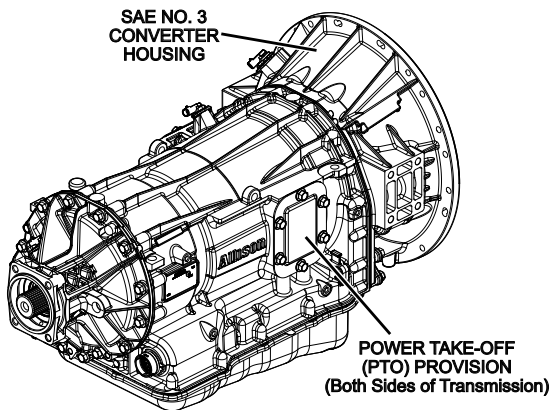


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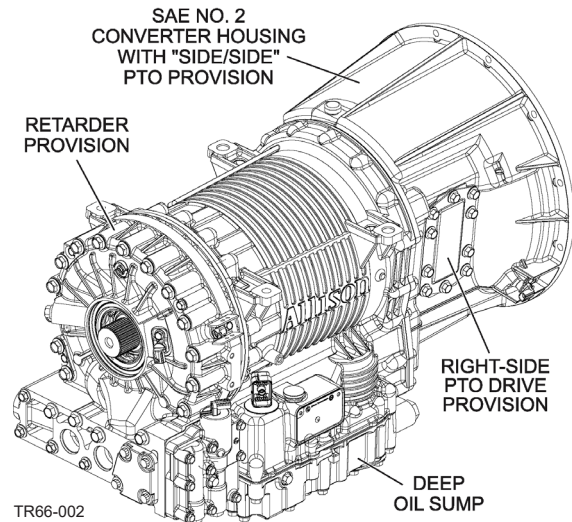
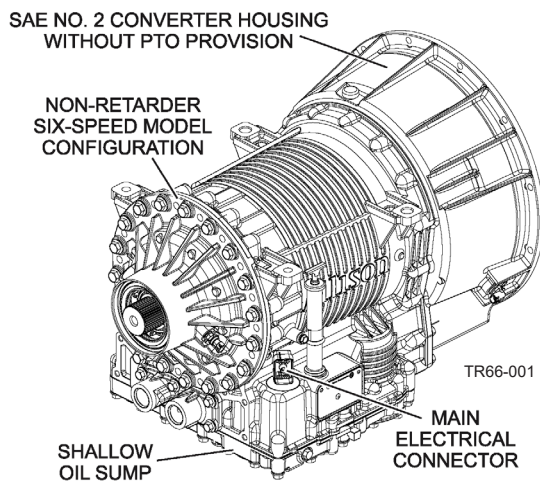


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### 2900 Product Family Transmissions

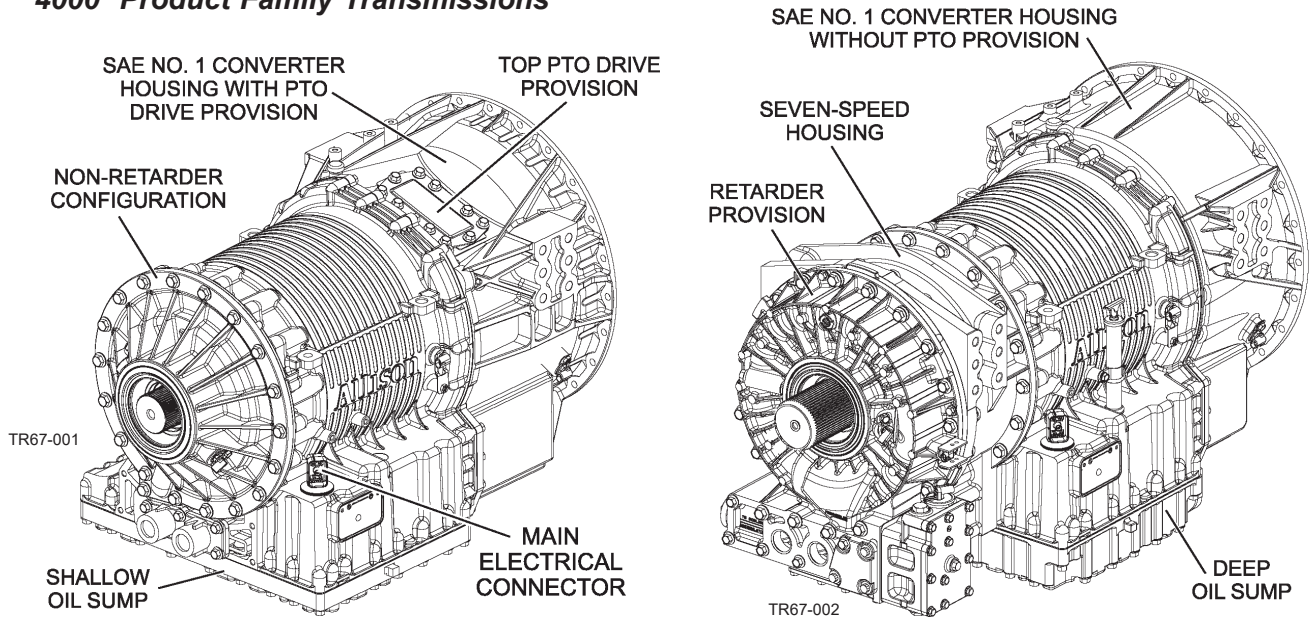


### 3000 Product Family Transmissions



**Figure 1: Representative Configuration Variants of the Transmission Product Families**

## 4000 Product Family Transmissions



**Figure 1: Representative Configuration Variants of the Transmission Product Families**

### 4.1 GEARBOX AND CLUTCHES

The basic design of all models includes three planetary sets of constant-mesh helical gears and five clutches which direct the flow of torque through the transmission. By engaging various combinations of clutches, the planetaries act singly or in combination to produce up to six forward ranges, neutral, and reverse. Different sets of gear packs are available in each product family, yielding close ratio models, xFE™ close ratio models, and wide ratio models. The wide ratio models have a lower numerical first gear ratio and wider ratio steps than the close ratio models. For gear ratio availability, refer to the [Transmission Data](#) section of Tech Data.

The seven-speed gear scheme is created by adding a deep first gear ratio to the close-ratio gear pack. Seven-speed models are available only in the 3000 and 4000 Product Families. An optional deeper reverse gear, 2nd Reverse, is available with selected seven-speed models in the 4000 Product Family. Refer to [Technical Document \(TD\) 188, Application and Installation Requirements for 2nd Reverse](#).

The gear ratios shown in Figure 2 are for 4000 Product Family models and are typical of the three types of gear schemes. For a tabulation of the specific gear ratios for each model, refer to [Transmission Data](#) for the [1000/2000](#), the [2900](#) the [3000](#) and

	TRANSMISSION MODEL GEAR SCHEME		
	CLOSE-RATIO MODELS	WIDE-RATIO MODELS	SEVEN-SPEED MODELS
<b>GEAR RANGE</b>			
<u>Forward</u>			
First	3.51	4.70	7.63
Second	1.91	2.21	3.51
Third	1.43	1.53	1.91
Fourth	1.00	1.00	1.43
Fifth	0.74	0.76	1.00
Sixth	0.64	0.67	0.74
Seventh	—	—	0.64
<u>Reverse</u>			
R1	— 4.80	— 5.55	— 4.80
R2	—	—	— 17.12

**Figure 2: Typical Gear Ratio Scheme - 4000 Product Family Shown**



the [4000](#) Product Families. These values do not include the additional torque multiplication capabilities of the torque converter. Refer to paragraph 4.2 for torque converter information.

All clutches are hydraulically-actuated, spring-released, and have automatic compensation for wear. Electronic controls provide automatic gear selection in each drive range, automatic engagement of the torque converter lockup clutch (see paragraph 4.3), and the control of additional transmission functions based on the selected gear range and a combination of speeds and input power.

## **4.2 TORQUE CONVERTER**

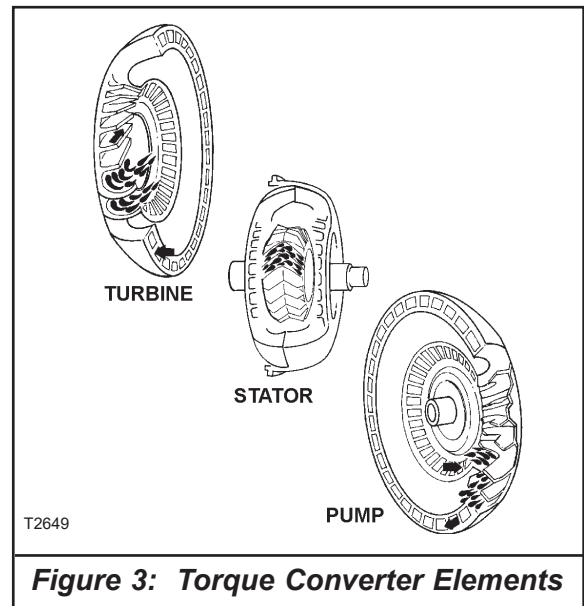
The torque converter consists of three primary elements: pump, turbine, and stator (Figure 3). The converter pump acts as a centrifugal pump, absorbing power from the engine and forcing the transmission fluid to circulate as a function of its rotational speed. The circulating fluid transmits power to the turbine, causing it to rotate. As the fluid leaves the turbine, the stator redirects the fluid from the turbine back to the pump in the same direction as the pump rotation, resulting in the multiplication of torque. Torque multiplication characteristics at converter stall condition for the available torque converters are listed in [Transmission Data](#) for the [1000/2000](#), the [2900](#), the [3000](#) and the [4000](#) Product Families.

Several torque converters are available for each transmission model. The converter selections differ in power absorption characteristics, which facilitate matching the transmission to a wide variety of engines based on their respective power, torque, and governed speed characteristics. A detailed discussion regarding the process for matching torque converters and engines may be found in [TD-148, Engine-Converter Matching](#).

## **4.3 LOCKUP CLUTCH AND DAMPER**

A torque converter clutch is included as a standard feature of all transmission models. This clutch engages at higher engine speeds, causing the torque converter pump and turbine to be locked together. Once this occurs, the entire torque converter assembly rotates at engine speed. This condition, commonly referred to as "lockup operation", thus provides direct drive through the transmission gearbox. Lockup operation maximizes engine braking and enhances fuel economy. The torque converter lockup clutch is regulated by the shift controls to engage and disengage automatically, typically in the higher gear ranges, per the shift calibration programmed into the Transmission Control Module (see Shift Controls, paragraph 4.16)

Each lockup clutch assembly contains a damping mechanism to reduce the amplitude and frequency of vibrations generated by most types of engines used with these transmission models. The purpose of the damper is to reduce the transmittal of engine-induced torsional vibrations into the transmission and driveline when the transmission is in lockup.



#### 4.4 OIL SUMPS / PANS

Two terms are commonly used when referring to the component at the bottom of the transmission:

- "oil pan" on the 1000/2000 models, Figure 4,
- "oil pan" on the 2900 models
- "oil sump" on the 3000/4000 models, Figure 5

This component provides the enclosure for the bottom of the transmission, houses the components which control transmission operation, contains provisions for servicing the transmission fluid, and acts as the primary transmission fluid reservoir.

Two sump or pan configurations are available for most transmission models:

- the "deep" configuration retains a larger volume of fluid. The deep configuration is recommended for all applications.
- the optional "shallow" configuration is primarily for installations which require extra ground clearance. The shallow configuration is not available with all models.

Both configurations are illustrated in Figures 4 and 5. To determine availability of pan or sump selections by transmission model, refer to *Features and Options* for the [1000/2000](#), the [3000](#) or the [4000](#) Product Family. The 2900 Product has one pan selection.

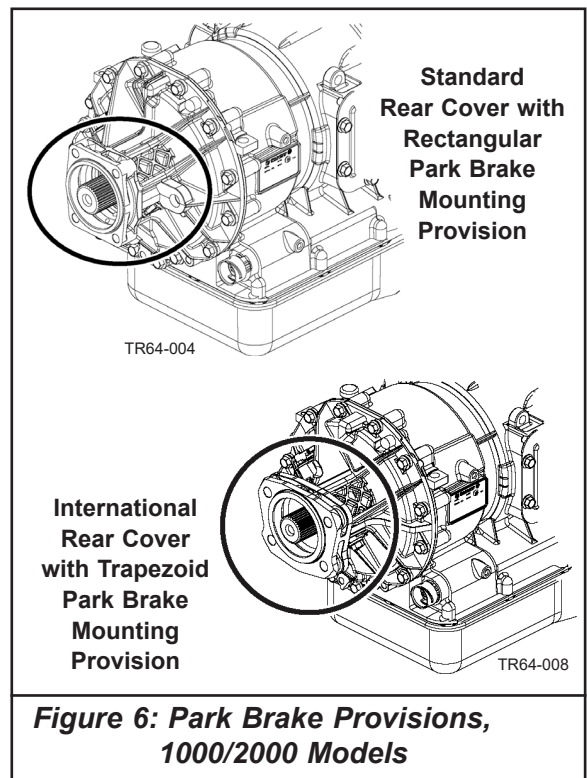
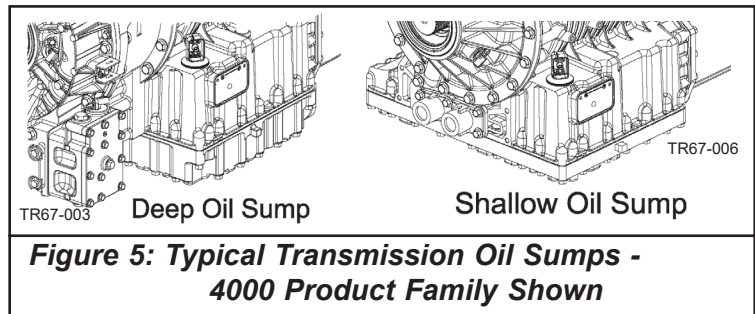
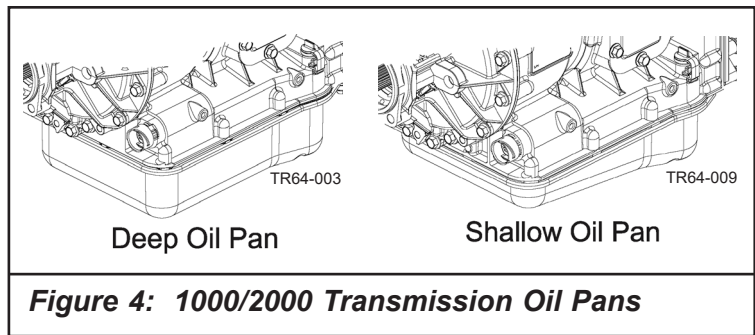
In addition to the functions noted above, oil sumps for the 3000 and 4000 models include clutch pressure taps for use in service troubleshooting, and contain provisions for servicing the internal transmission fluid filters. Fluid filtration for all models is discussed in paragraph 4.13.

#### 4.5 PARKING PROVISIONS

Transmission parking provisions, which assist in holding the vehicle stationary, vary by product family.

##### 4.5.1 PARK PAWL

This feature is available only with selected transmission models in the 1000/2000 and 2900 Product Families. When equipped with this feature, the transmission includes a set of internal components which are engaged by selection of PARK on the shift selector. When engaged, the components effectively ground the transmission output shaft, thereby preventing rotation of the driveline. To determine which models include the park pawl, refer to [1000/2000 Product Family Features and Options](#) or [2900 Product family Features and Options](#). For installation requirements, refer to [Park Pawl System Design](#).



#### **4.5.2 TRANSMISSION-MOUNTED PARK BRAKE**

The 1000/2000, 2900, and the 3000 Product Families offer transmission-mounted park brake provisions.

##### **1000/2000 and 2900 Product Families**

All 1000/2000 and 2900 transmissions include a provision to mount a park brake to the transmission rear cover. Two types of park brake mounting pads are available, as shown in Figure 6.

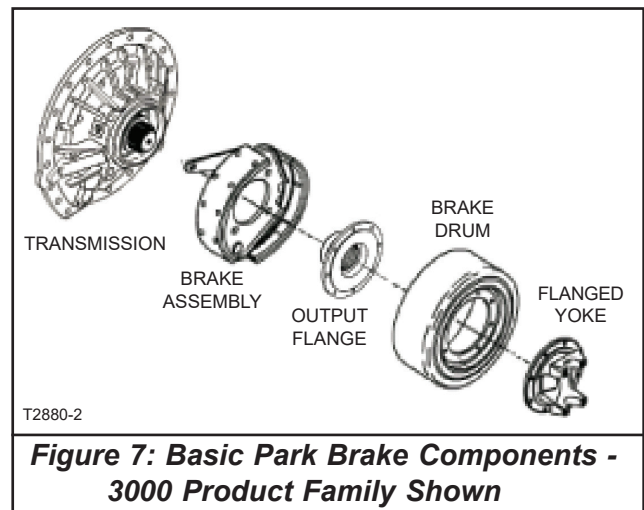
- a rectangular, four-hole mounting pad for attaching park brakes commonly used in North America. This provision also includes the support bore for a brake apply lever and cam assembly which are typically included with 9" x 3" park brake assemblies.
- a trapezoidal, four-hole mounting pad for attaching park brakes which are commonly available outside North America.

All park brakes, brake controls and linkages for 1000/2000 models are supplied and installed by the vehicle builder. For installation requirements, refer to [Park Brake Provisions – System Design for the 1000/2000 and 2900 Product Families](#).

##### **3000 Product Family**

In order to mount a park brake assembly to the transmission, the transmission must be equipped with the optional rear cover with the park brake mounting provision. Refer to Figure 7. This provision is not available with all transmission models. It is also not available on transmissions equipped with the retarder.

Allison offers a transmission-mounted park brake assembly for these transmission models. The park brake assembly is available from the Allison Parts Distribution Center (P.D.C.) and may be installed by the vehicle builder. The brake assembly also can be ordered as part of a new transmission assembly as shipped from the Allison factory.



**Figure 7: Basic Park Brake Components - 3000 Product Family Shown**

The park brake assembly, whether provided on the transmission from Allison or obtained separately, includes the brake pad assembly, drum, and brake actuation mechanism which is normally a lever. The cable or linkage which interfaces the operator with the actuation mechanism is supplied and installed by the vehicle builder. For installation requirements, refer to [Parking Provisions – System Design for the 3000/4000 Product Families](#).

##### **4000 Product Family**

The 4000 Product Family is used in class 8 vehicles which have spring-apply / air-release wheel-mounted park brake assemblies. Therefore, 4000 Product Family models do **not** have provisions for the installation of a transmission-mounted park brake.

#### **4.6 PROVISION FOR NON-ALLISON TRANSFER CASE**

The integral transfer case of the 3700 transmission models, which is included as a standard feature of those models, is the only transfer case offered by Allison Transmission. Because the 3700 models have limited applicability, Allison offers an optional provision to adapt a non-Allison transfer case directly to the rear of the following transmissions:

- most 1000/2000 Product Family transmissions
- most 2900 Product Family transmissions

- most non-retarder 3000 Product Family transmissions
- most non-retarder 4000 Product Family transmissions

To determine if this provision is available with your transmission model, refer to [Features and Options](#) for the [1000/2000](#), the [2900](#), the [3000](#) or the [4000](#) Product Family.

The transmission configuration for this feature includes a rear cover that has been modified with a pilot, sealing surface, and provision to mount the transfer case or adapter directly to the rear cover of the transmission. A drive coupling replaces the typical flange or yoke on the output shaft and provides the drive mechanism to the transfer case. For installation requirements, refer to [Provision for Non-Allison Transfer Case – Design](#) for the [1000/2000 and 2900](#) or for the [3000/4000](#) Product Families.

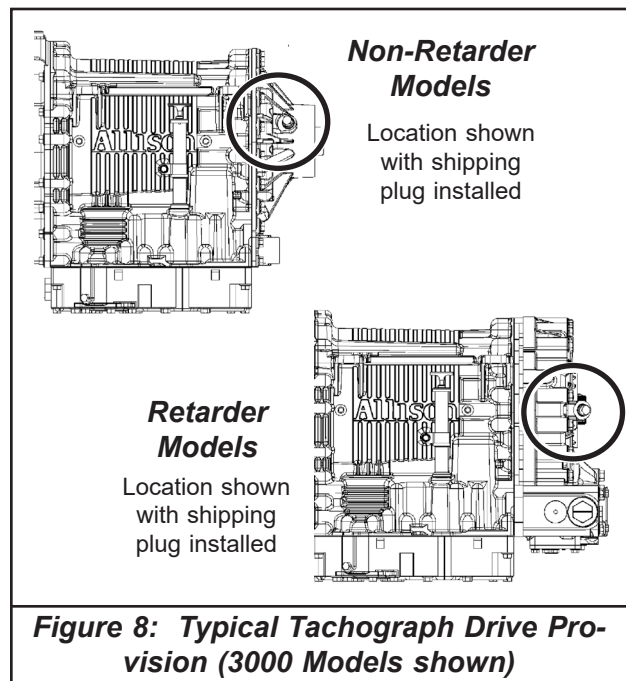
#### 4.7 TACHOGRAPH DRIVE PROVISION

Allison offers transmissions with an optional provision for a tachograph drive as shown in Figure 8. The tachograph drive provision consists of the following:

- an internal tonewheel on the transmission output shaft
- an access hole in the transmission rear cover or retarder housing for a sending unit

When combined with an appropriate signal generator, this option provides an input signal for a vehicle tachograph. Tonewheels are available for either four or six pulses per revolution of the transmission output shaft. The tachograph drive provision and the desired tonewheel are specified when the transmission is ordered. Signal generators and tachographs are supplied and installed by the vehicle builder.

For installation requirements, refer to [Tachograph Drive Provision](#).



#### 4.8 GROUND-DRIVEN PUMP PROVISION

Allison offers a ground-driven pump provision (Figure 9) on the 4000 International Series of transmissions. The ground-driven pump provision consists of the following:

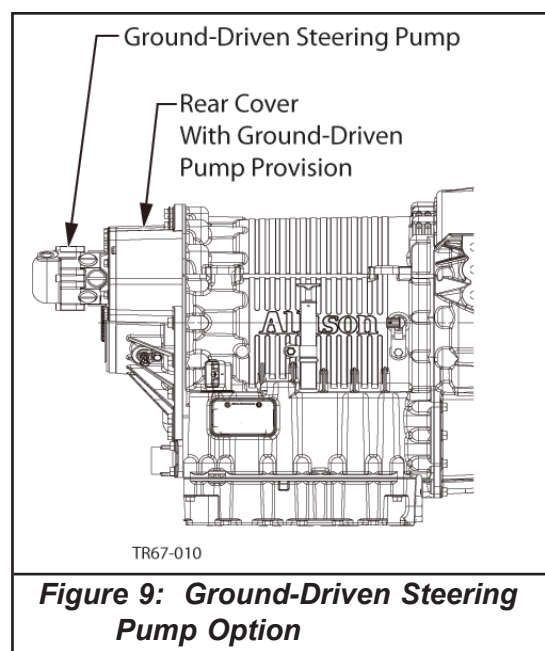
- a special rear cover with a provision to drive an emergency steering pump off of the transmission output shaft
- an emergency steering pump attached to the provision on the special rear cover

Refer to [Ground-Driven Pump Provision](#).

Availability of the ground-driven pump option is limited:

- to specific geographical regions
- to non-retarder 4000 and 4500 International Series transmissions

Consult your Allison Representative for availability.





## 4.9 CONVERTER HOUSINGS

The converter housing is the component at the front of the transmission which attaches directly to the engine. Refer again to Figure 1. This housing provides enclosure for the following components:

- the torque converter
- the integral damper and lockup clutch assemblies
- the flexplate-drive adaptation components which transfer torque from the engine to the transmission.

Other features of the converter housings vary by product family as noted below.

### 4.9.1 1000/2000 AND 2900 MODELS

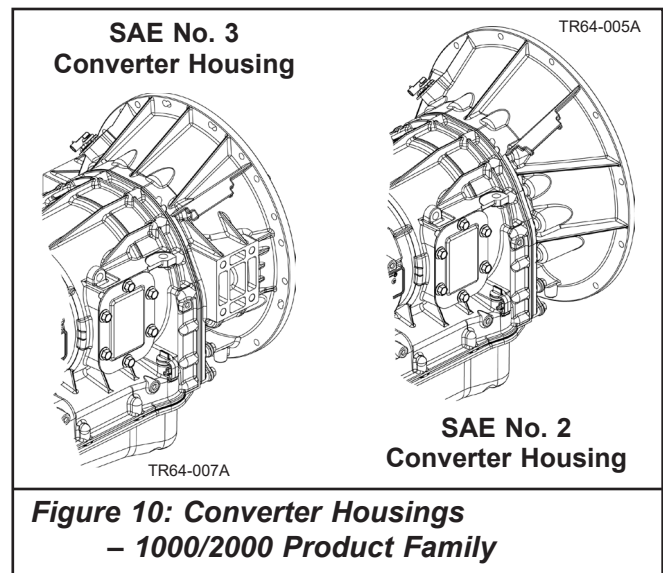
Two housings are available for the 1000/2000 models (Figure 10). These converter housings are shared with the 2900 models. Refer to [1000/2000 Product Family Features and Options](#) or [2900 Product Family Features and Options](#) to determine converter housing availability by model.

#### SAE No. 3 Housing

- Mates directly to SAE No. 3 engine flywheel housings
- Includes cooler ports, integral to the bottom surface of the housing. For further definition, refer to paragraph 4.15.1.
- Includes a four-bolt mounting pad on each side of the housing which may be used for power-pack mounting

#### SAE No. 2 Housing

- Mates directly to SAE No. 2 engine flywheel housings. In addition to being larger diameter, this housing is also approximately 10 mm (0.4 inch) longer than the SAE No. 3 housing
- Includes cooler ports, integral to the bottom surface of the housing. For further definition, refer to paragraph 4.15.1.
- This housing has no mounting pads for mounting the powerpack in the vehicle



#### **4.9.2 3000 MODELS (FIGURE 11)**

Three SAE No. 2 housings are available for the 3000 Product Family.

##### **With no PTO drive provision**

- Shortest of the converter housings
- No mounting pad provisions

##### **With side/side PTO drive provisions**

- Includes two engine-driven PTO drive provisions at approximately 4:00 and 8:00 o'clock, as viewed from the rear
- Approximately 107 mm (4.2 inch) longer than the non-PTO housing.
- No mounting pad provisions

##### **With top/side PTO drive provisions**

- Includes two engine-driven PTO drive provisions at approximately 1:00 and 8:00 o'clock, as viewed from the rear
- Approximately 107 mm (4.2 inch) longer than the non-PTO housing.
- This housing includes a provision for side mounting pads. There is a six-bolt pad on the left-side of the transmission, as viewed from the rear. Two two-bolt pads are on the right side of the transmission. In some geographical regions, the housing may be available with unfinished mounting pads. Consult your Allison Representative for availability.

#### **4.9.3 4000 MODELS (FIGURE 12)**

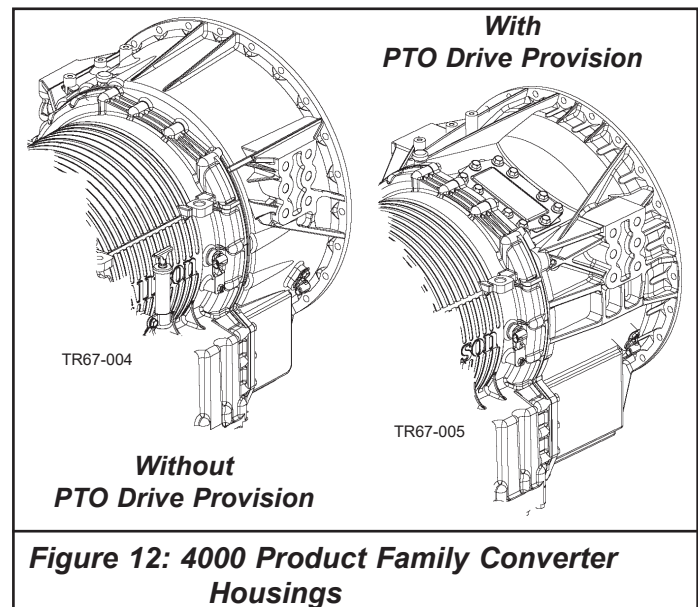
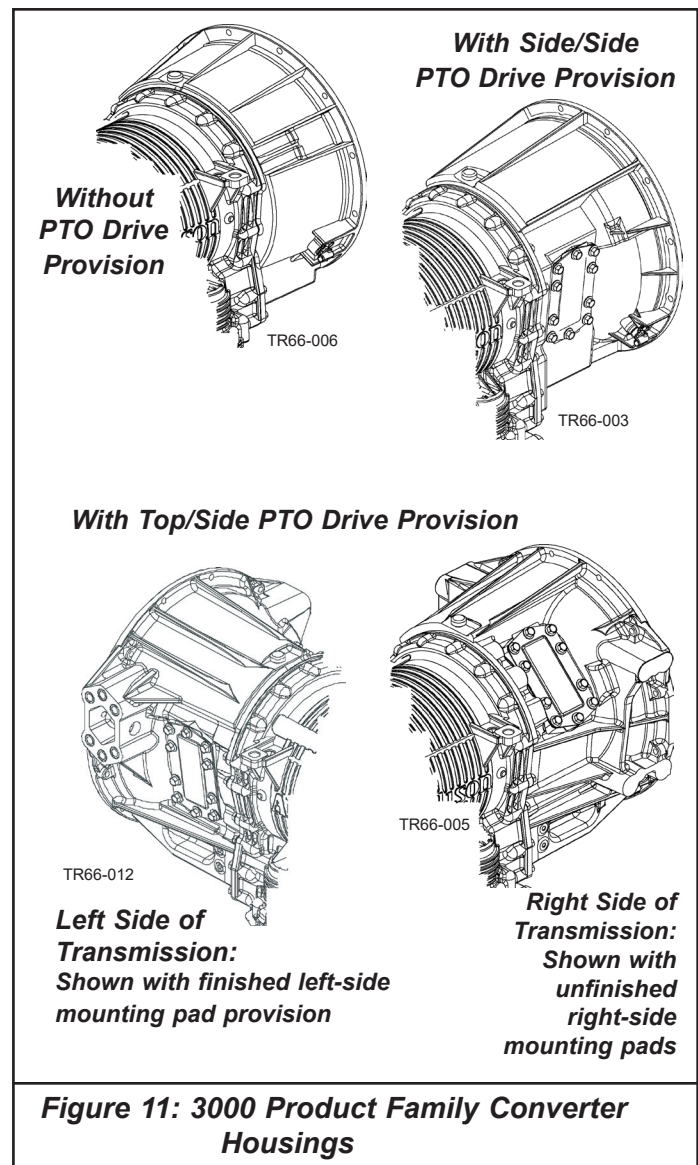
Two SAE No. 1 housings are available for the 4000 Product Family.

##### **With no PTO drive provision**

- Shorter of the converter housings
- Includes a six-bolt mounting pad on each side of the housing which may be used for powerpack mounting

##### **With PTO drive provisions**

- Includes two engine-driven PTO drive provisions at approximately 1:00 and 8:00 o'clock as viewed from the rear
- Approximately 73 mm (2.9 inch) longer than the non-PTO housing
- Includes a six-bolt mounting pad on each side of the housing which may be used for powerpack mounting



## **4.10 ENGINE ADAPTATIONS / INPUT DRIVE**

### **4.10.1 DIRECT-MOUNT**

All transmissions utilize a flexplate-type design to transfer torque from the engine to the input of the transmission. For transmissions mounted directly to the engine, the flexplate assembly is driven directly by the engine crankshaft. For detailed information, refer to [Engine-Transmission Adaptation Design](#) for the [1000/2000](#) , [2900](#), or the [3000/4000](#) Product Families.

### **4.10.2 REMOTE-MOUNT**

This feature is available only for 4000 Product Family transmission models. The remote-mount provision includes a front cover for the transmission converter housing, an input shaft, and flexplate drive from the input shaft to the converter input. The flange or yoke for the transmission input shaft and the driveshaft between the engine and transmission are supplied and installed by the vehicle builder. For more information, refer to [Transmission Mounting Design – Remote from Engine](#).

## **4.11 OUTPUT RETARDER OPTION**

The output retarder is available only with specific models in the 3000 and 4000 Product Families. To determine if the retarder is available with your model, refer to [Features and Options](#) for the [3000](#) or the [4000](#) Product Family. When available, the retarder is self-contained in the output section of the transmission, replacing the standard rear cover. It does not change the overall length of the transmission. This provision is illustrated as a feature of a 3000 transmission model in Figure 13.

The retarder consists of a vaned rotor which rotates in a vaned stator cavity. Driveline braking occurs when the retarder cavity is pressurized with transmission fluid, impeding rotation of the rotor and the transmission output shaft. A volume of transmission fluid, stored in an external accumulator, is released upon the initial activation of the retarder to assist in charging the retarder cavity, enhancing response time of the system. When the retarder is not in use, the retarder cavity is evacuated of fluid and the accumulator is refilled in preparation for the next apply cycle.

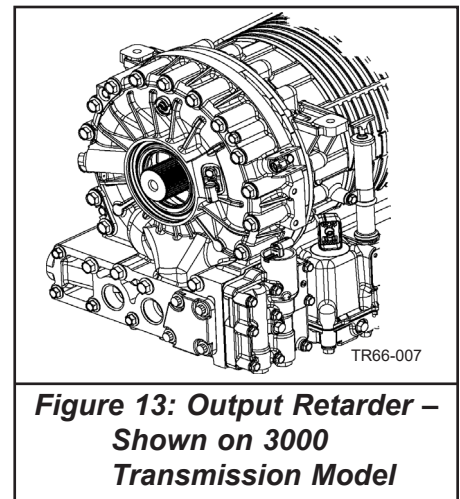
Several configurations of retarder controls are available. Some controls allow the vehicle operator to modulate the amount of retardation. Other controls allow the retarder to be applied automatically in conjunction with the vehicle brakes. The vehicle manufacturer selects and installs retarder controls that are appropriate to the vehicle design and for the intended use of the vehicle.

For a more detailed description and installation requirements, refer to [Retarder Option](#).

## **4.12 POWER TAKE-OFF (PTO) DRIVE PROVISIONS**

Allison transmissions are available with PTO drive provisions as shown in Figure 1. Depending upon the transmission family, the PTO provision may be either converter-driven or engine-driven, as described below:

- **Converter-Driven PTO** – The drive gear for the PTO is driven by the output of the transmission torque converter. When the transmission is in converter mode, converter-driven PTOs have an infinitely variable drive ratio and a protective hydraulic cushion against abrupt loading and unloading. When the transmission is in lockup mode, the PTO drive gear turns at engine speed.



**Figure 13: Output Retarder –  
Shown on 3000  
Transmission Model**

- **Engine-Driven PTO** – The drive gear for the PTO is driven directly by the engine and turns at engine speed whenever the engine is running.

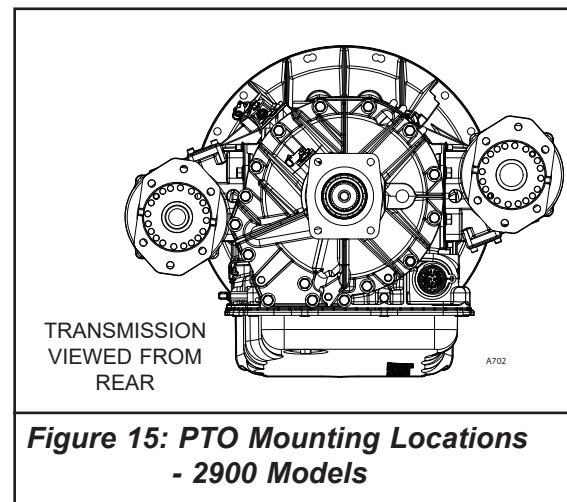
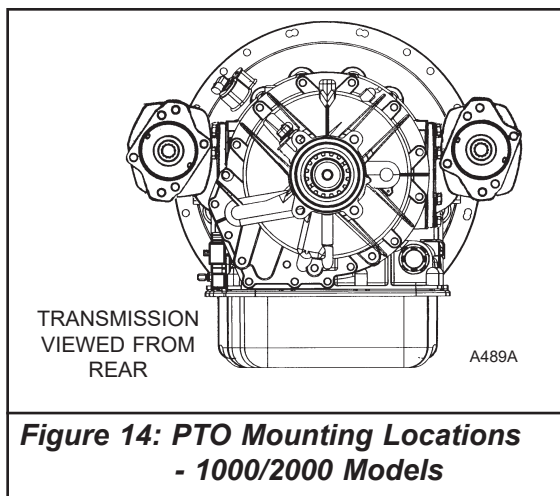
The availability, location and type of the PTO drive provisions vary by transmission model. The PTO provision is standard on certain transmission models. Some transmission models do not include the PTO provision. The PTO provision is optional for other models. To determine which models include the PTO provision, refer to *Features and Options* for the [1000/2000](#), the [3000](#) and the [4000](#) Product Families.

Allison ships the transmission with the PTO drive provisions sealed by a gasket and metal cover. Several PTO manufacturers sell PTO units that are compatible with Allison transmissions. These PTO units are available in numerous configurations that meet the needs of a wide variety of applications. For more information on using PTOs with Allison transmissions, refer to [Power Take-Off \(PTO\) – General System Design](#).

#### **1000/2000 and 2900 Models (Figures 1, 14, 15)**

- Converter-driven PTO provision
- Two six-bolt PTO pads located on either side of the transmission main case
- If the specific model includes the PTO option, the transmission will include a PTO drive gear.
- If specific model does not include the PTO option, the transmission assembly does not have a PTO drive gear. The transmission still has the two PTO pads, even when there is no PTO drive gear.
- Inclusion of the PTO provision does not affect the physical size of the transmission

Refer to [PTO System Design for the 1000/2000 and 2900 Product Families](#) for more information.





### 3000 Models (Figures 1 & 15)

- Engine-driven PTO provision
- Two ten-bolt PTO pads integral to the PTO converter housings
- Side-side PTO option has PTO pads at approximately 4:00 o'clock and 8:00 o'clock, viewed from the rear of the transmission
- Top-side PTO option has PTO pads at approximately 1:00 o'clock and 8:00 o'clock, viewed from the rear of the transmission

For more information refer to [PTO System Design for the 3000 and 4000 Product Families](#).

### 4000 Models (Figures 1 & 16)

- Engine-driven PTO provision
- Two ten-bolt PTO pads integral to the PTO converter housing
- PTO pads at approximately 1:00 o'clock and 8:00 o'clock, viewed from the rear of the transmission

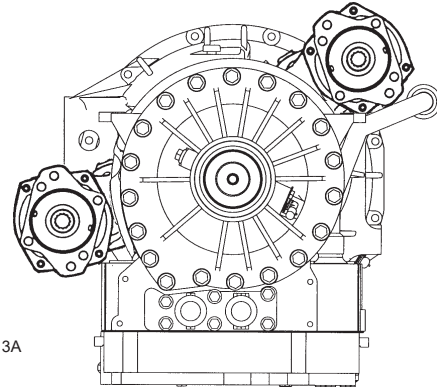
For more information refer to [PTO System Design for the 3000 and 4000 Product Families](#).

## 4.13 FLUID AND FILTRATION

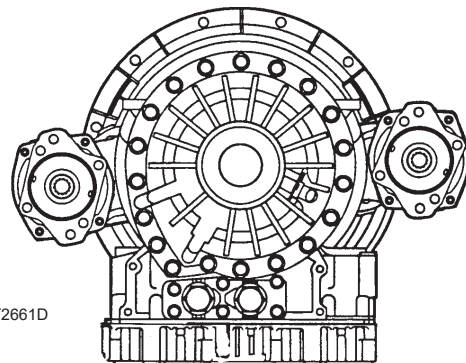
The continuous circulation of clean fluid is necessary for proper operation, lubrication, and temperature control of the transmission. As a standard feature, integral filters are provided with each transmission to provide filtration of the fluid circuits. Location of the filters vary for each Product Family as described in paragraph 4.13.1. No additional external fluid filtration is required. However, for 3000 and 4000 models, the internal filters may be replaced with remote-mounted filter circuits.

A drain plug is provided with each transmission for draining fluid when servicing the transmission. The plugs are located near the rear of the transmission on the bottom surface of the 1000/2000 transmission oil pan or 3000/4000 transmission oil sump.

**TOP / SIDE PTO MOUNTING LOCATIONS**



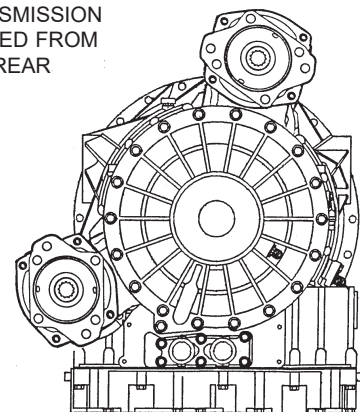
**SIDE / SIDE PTO MOUNTING LOCATIONS**



**TRANSMISSIONS VIEWED FROM THE REAR**

**Figure 15: PTO Mounting Locations  
– 3000 Product Family**

**TRANSMISSION  
VIEWED FROM  
REAR**



**Figure 16: PTO Mounting Locations  
– 4000 Product Family**

#### 4.13.1 INTEGRAL FILTRATION CIRCUITS

##### 1000/2000 Models (Figure 17)

The 1000/2000 models have a spin-on filter, attached to the converter housing at the lower left front of the transmission. A suction filter, located in the oil pan, provides final filtration of the fluid before it enters the oil pump. Two small magnets are also present in the fluid system to capture and retain any metallic debris which may be present:

- one inside the oil pan
- one in the fluid path at the inlet of the fluid filter.

For more information, refer to [Fluid Filtration for the 1000/2000 Product Family](#).

##### 3000/4000 Models (Figure 18)

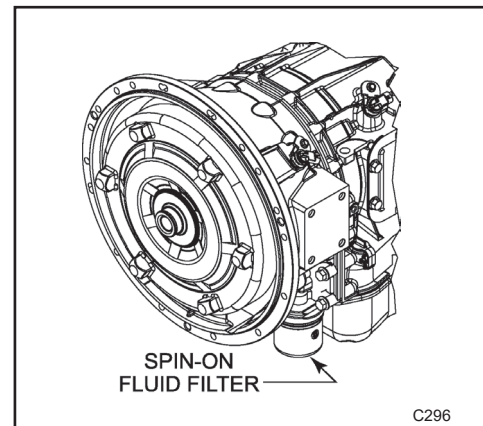
Two filters are located inside 3000 and 4000 Models:

- one for the main fluid supply
- one for the cooler return circuit

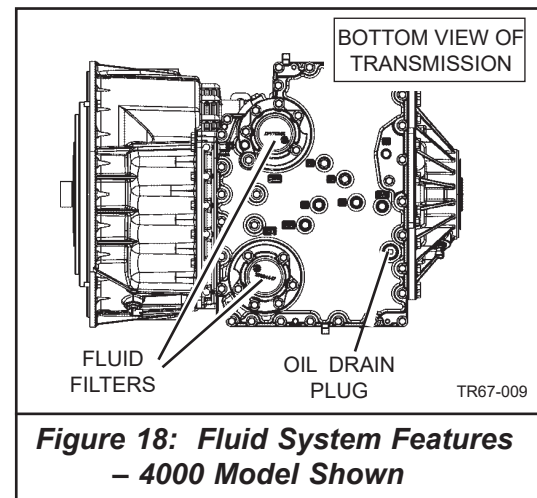
Access is provided by removable covers on the bottom of the transmission near the front outside corners of the control module, which is also called the oil sump. The fluid drain plug includes a magnetic core to capture and retain any metallic debris which is present in the oil sump of these models. For more information, refer to [Fluid Filtration for the 3000 and 4000 Product Families](#).

#### 4.13.2 REMOTE FILTER PROVISIONS

As an optional feature for 3000 and 4000 models, provisions are available for mounting cartridge-type oil filters remote from the transmission. The two standard filter covers on the bottom of the transmission are replaced with covers equipped with provisions to attach SAE straight-thread O-ring hose fittings for the remote circuits. Remote-mount spin-on filter assemblies complete the installation. A remote filter kit is available from the Allison Parts Distribution Center. For more information, contact your Allison representative and request [Service Information Letter \(SIL\) 12-WT-04, Remote Filter Kit](#).



**Figure 17: Fluid System Filter  
– 1000/2000 Models**



**Figure 18: Fluid System Features  
– 4000 Model Shown**

## 4.14 OIL LEVEL MONITORING

### 4.14.1 OIL FILL TUBE AND DIPSTICK

Each transmission includes at least one provision to mount an oil fill tube and dipstick assembly on the transmission. Permanent plugs are installed in unused fill tube openings.

#### 1000/2000 Models (Figure 19)

- Includes two fill tube and dipstick provisions, one on each side of the transmission
- Fill tubes and dipsticks are provided by the vehicle builder

For installation requirements, refer to [Fill Tube and Dipstick Design Requirements for the 1000/2000 Product Family](#).

#### 3000 Models (Figure 20)

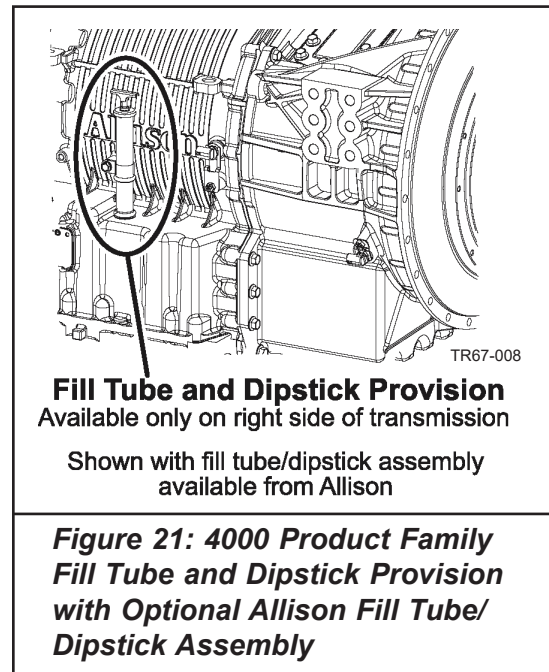
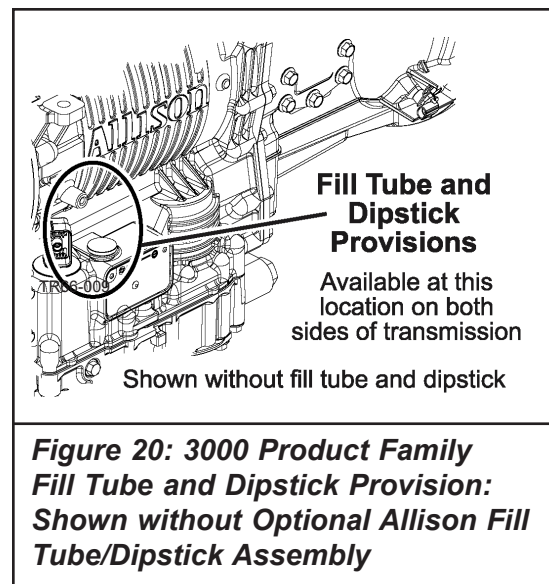
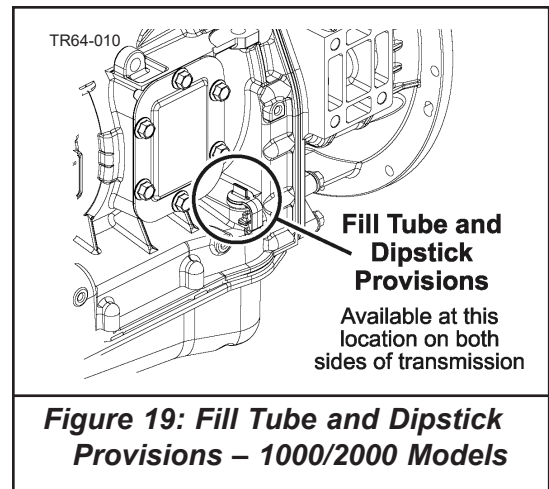
- Includes two fill tube and dipstick provisions, one on each side of the transmission
- Fill tubes and dipsticks are typically provided by the vehicle builder
- Allison offers a short fill tube/dipstick assembly that may be ordered as part of the transmission assembly

For installation requirements, refer to [Fill Tube and Dipstick Design Requirements for the 3000 and 4000 Product Families](#).

#### 4000 Models (Figure 21)

- Includes one fill tube and dipstick provision located on the right side of the transmission as viewed from the rear
- Fill tubes and dipsticks are typically provided by the vehicle builder
- Allison offers a short fill tube/dipstick assembly that may be ordered as part of the transmission assembly

For installation requirements, refer to [Fill Tube and Dipstick Design Requirements for the 3000 and 4000 Product Families](#).



#### **4.14.2 ELECTRONIC OIL LEVEL SENSOR (OLS)**

In addition to the conventional dipstick, most transmissions in the 3000 and 4000 Product Families are equipped with an electronic oil level sensor which is capable of checking transmission oil level. To determine if this feature is available with your transmission model, refer to [Features and Options](#) for the [3000](#) or the [4000](#) Product Family. When available, the OLS is an integral component of the transmission control module. The OLS checks the oil level only when the vehicle is stopped and the transmission is in neutral. The transmission shift selector is used to request the oil level status. When requested, the oil level is indicated on the shift selector's display. For more information on the oil level sensor, refer to [Allison 5th Generation Controls Section B: System Operation for the 3000 and 4000 Product Families](#).

#### **4.15 COOLER PROVISIONS**

The operation of an automatic transmission generates heat. The transmission is cooled by routing the transmission fluid through a cooler. Allison offers a wide variety of provisions for cooling the transmission fluid. Guidance for selecting the proper provision to satisfy the cooling requirements of a specific transmission configuration and vehicle application is provided in the various [Transmission Cooling](#) documents.

The cooler is often located remotely from the transmission. As an alternative, Allison offers coolers that attach directly to the rear of the 3000 and the 4000 Product Family transmissions.

3000 and 4000 transmissions equipped with retarders generate higher levels of heat than non-retarder transmissions. This higher heat load requires additional cooling and special cooling considerations. In many retarder applications, two cooler circuits are necessary – one for the fluid circulating in the retarder and one for the fluid in the transmission sump.

Availability of some of the cooling provisions discussed in this document may be limited. Refer to [Features and Options](#) for the [1000/2000](#), the [3000](#) or the [4000](#) Product Family to determine which of the provisions are available with your transmission model.

##### **4.15.1 1000/2000 MODELS**

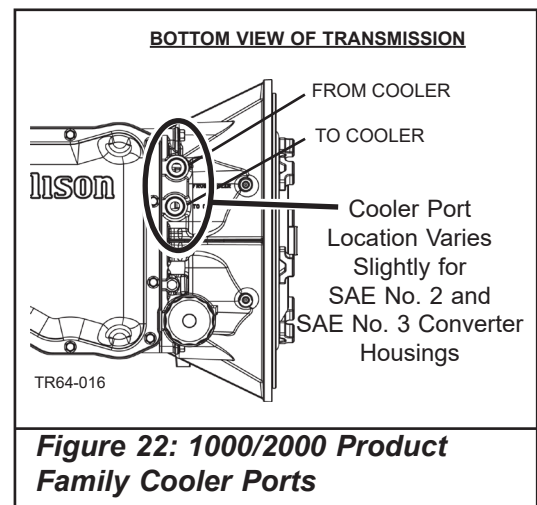
The oil cooler ports are located on the bottom of the transmission converter housing, near the converter housing/main case split line.

The SAE No. 2 and SAE No. 3 converter housings have the same size cooler ports (Figure 22):

- the cooler ports are integral to the bottom surface of the converter housings
- port size is 1.0625-12 UNF-2B inch-series SAE straight-thread O-ring

##### **4.15.2 3000/4000 NON-RETARDER MODELS**

Two optional locations for the cooler ports are available for coolers mounted remotely from the transmission. In addition, Allison offers coolers that mount directly to the rear of the transmission.





### Rear Cooler Ports (Figure 23)

- located on a manifold attached to the rear surface of the main case, below the rear cover
- port size is 1.3125 inch-series SAE straight-thread O-ring for both the 3000 and 4000 Product Families

### Front Cooler Ports (Figure 24)

- located on the front surface of the oil sump
- available only with the 101 mm (4-inch) deep oil sump
- port size is 1.0625 inch-series SAE straight-thread O-ring for the 3000 Product Family
- port size is 1.3125 inch-series SAE straight-thread O-ring for the 4000 Product Family

### Direct-Mount Coolers (Figure 25)

- attach to the rear surface of the transmission main case, below the transmission rear cover
- plumbing between the transmission and cooler is internal which eliminates the external circuit for transmission fluid
- engine coolant is routed to and from the direct-mount cooler
- this provision is not available for all transmission models
- standard and high capacity coolers are available for both the 3000 and 4000 non-retarder transmissions

### 4.15.3 3000/4000 RETARDER-EQUIPPED MODELS

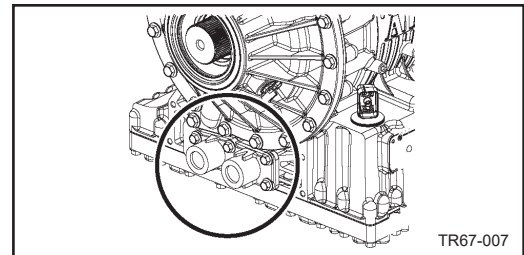
Allison offers cooler ports at the rear of the transmission for retarder cooling. In addition, Allison offers a variety of retarder coolers that attach directly to the transmission.

### Retarder Rear Cooler Ports (Figure 26)

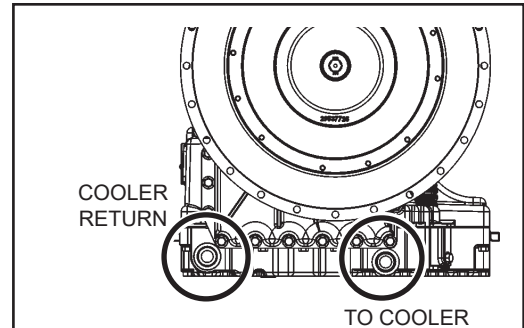
- located on the lower rear surface of the retarder housing
- port size is 1.625 inch-series SAE straight-thread O-ring

### Front Cooler Ports (Figure 24)

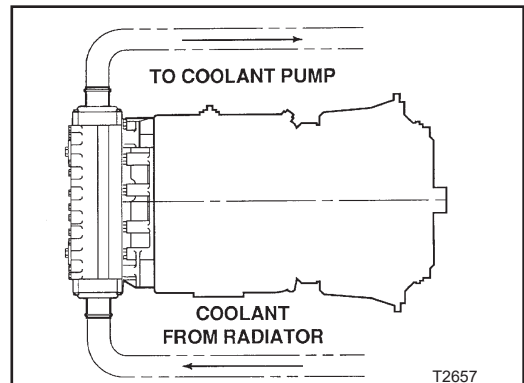
- available only for supplementary cooling of the fluid in the transmission sump in conjunction with a cooler for the retarder circuit that utilizes the rear cooler ports
- located on the front surface of the oil sump
- available only with the 101 mm (4-inch) deep oil sump
- port size is 1.0625 inch-series SAE straight-thread O-ring for the 3000 Product Family
- port size is 1.3125 inch-series SAE straight-thread O-ring for the 4000 Product Family



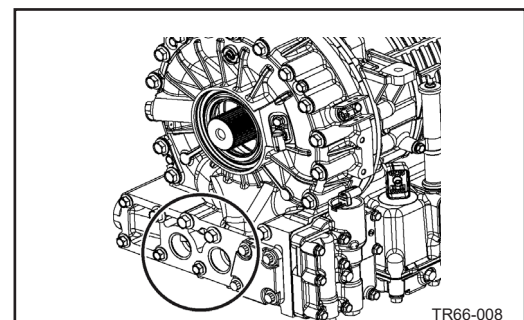
**Figure 23: Rear Cooler Ports, 3000/4000 Non-Retarder Models – 4000 Model Shown**



**Figure 24: Front Cooler Ports, 3000/4000 Product Families – 4000 Model Shown**



**Figure 25: Direct-Mount Oil Cooler**



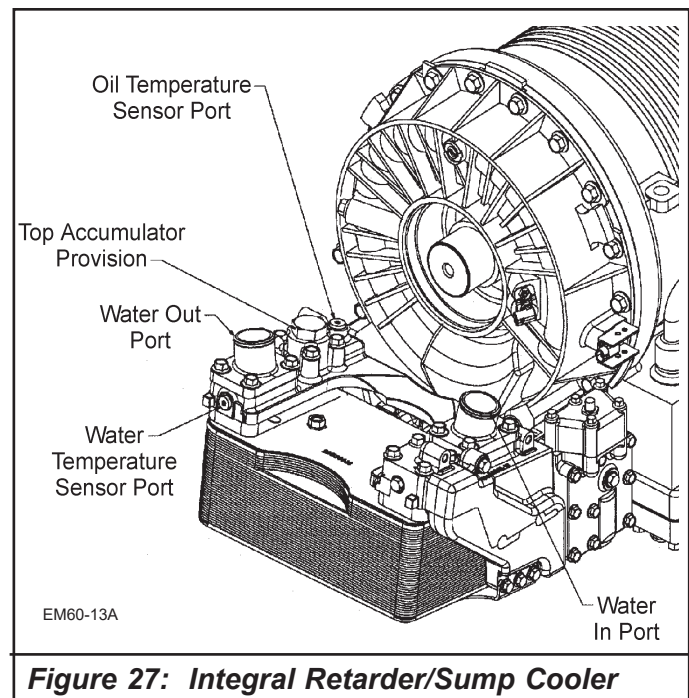
**Figure 26: Rear Cooler Ports, 3000 Retarder Model Shown**

### Direct-Mount Retarder / Sump Cooler (Figure 27)

- special cooler which has two chambers for cooling the retarder circuit fluid separately from the fluid in the transmission sump
- attaches to the lower rear surface of the retarder housing
- plumbing between the transmission sump, the retarder, and the cooler is internal which eliminates the external circuits for transmission fluid
- engine coolant is routed to and from the retarder/sump cooler

### Remote Retarder / Sump Cooling

- can be accomplished one of two ways:
  - one special cooler which has two chambers for cooling the retarder circuit fluid separately from the fluid in the transmission sump
  - two separate coolers – one used for cooling the retarder circuit fluid and a separate cooler for the transmission sump fluid
- fluids from the transmission retarder and from the transmission sump are routed to and from the remote cooler or coolers
- engine coolant is routed to and from the remote cooler or coolers



**Figure 27: Integral Retarder/Sump Cooler**

### Direct-Mount Retarder Coolers Without Sump Cooling

- attach to the rear surface of the transmission main case, below the transmission rear cover
- plumbing between the transmission and cooler is internal which eliminates the external circuit for transmission fluid
- does not provide cooling for the oil in the transmission sump during retarder operation
- engine coolant is routed to and from the direct-mount cooler
- this provision is not available for all transmission models
- this provision may not be acceptable for all retarder applications and installations

## 4.16 TRANSMISSION CONTROLS

These transmission families are controlled by Allison 6th Generation Electronic Controls, a micro-processor-based control system. This control system operates on either 12-volt or 24-volt negative-ground vehicle power.

The main components of the control system are:

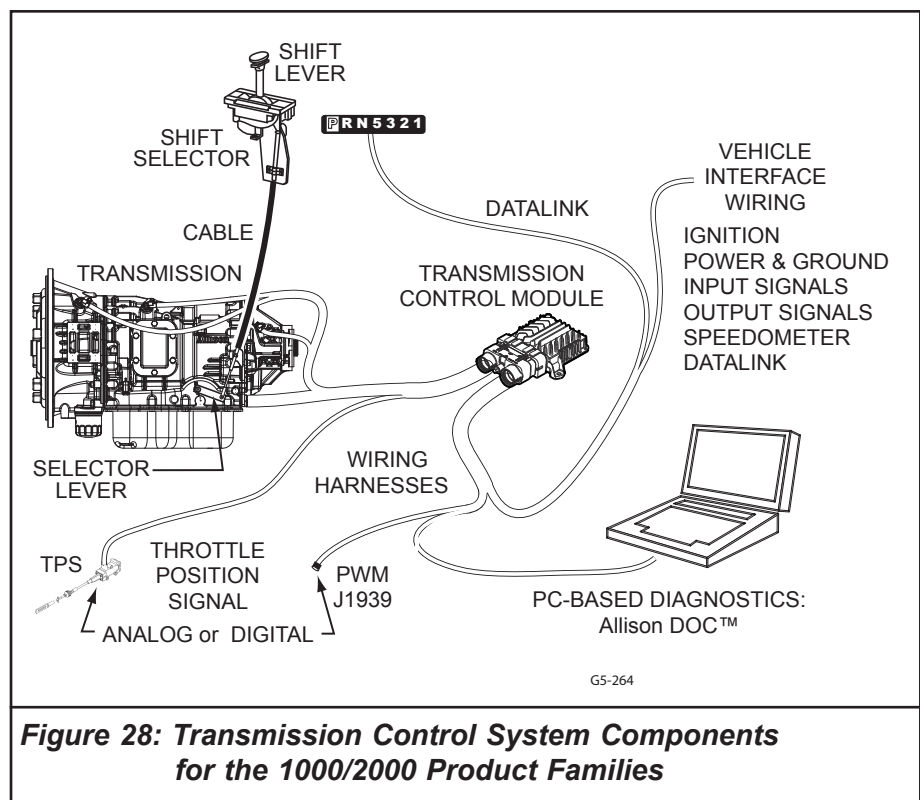
- the Transmission Control Module (TCM)
- the shift selector
- the control valve body attached to the bottom of the gearbox section of the transmission
- the wiring harness that connects the above components

Figure 28 shows the controls components for the 1000/2000 models. Figure 29 shows the controls components for the 2900 models. Figure 30 shows components for the 3000 and 4000 models.

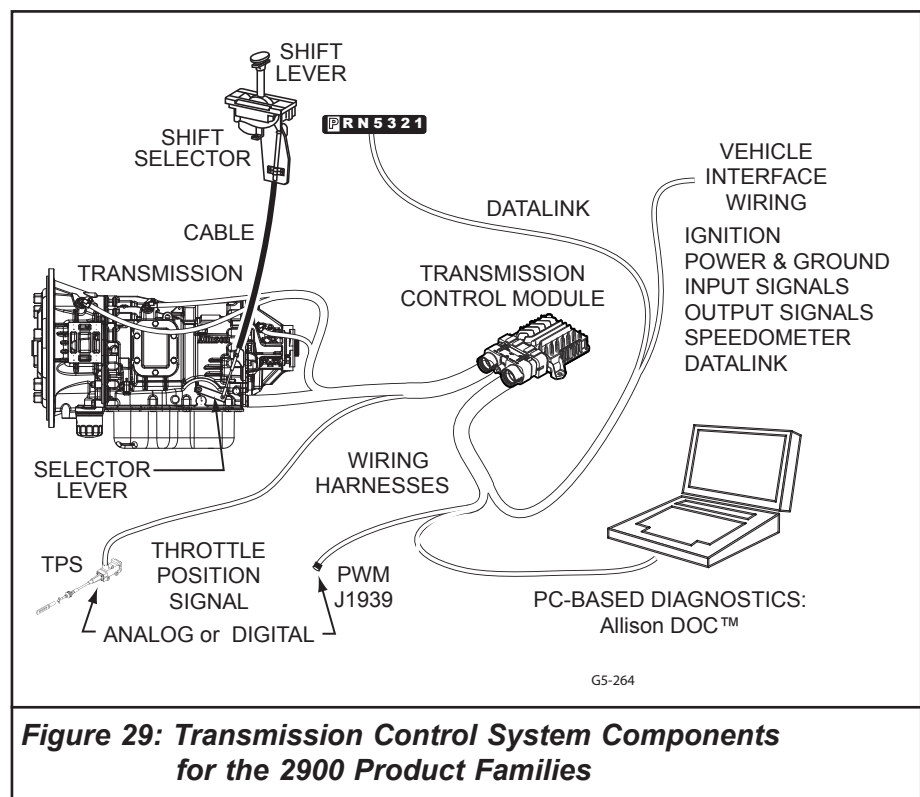
The control system performs the following basic functions:

- automatically shifts the transmission, optimizing the transmittal of engine power to the driveline for

- vehicle propulsion
- protects the transmission against certain types of user abuse
- diagnoses the controls hardware, software, and some transmission systems, providing both on-board diagnostics and service tool support
- communicates over SAE J1939, J1587, and ISO-9141 communication datalinks in order to fully integrate transmission operation with electronically-controlled engines and other vehicle systems
- interfaces with other vehicle systems and functions via the datalinks or via discrete, hardwired signals

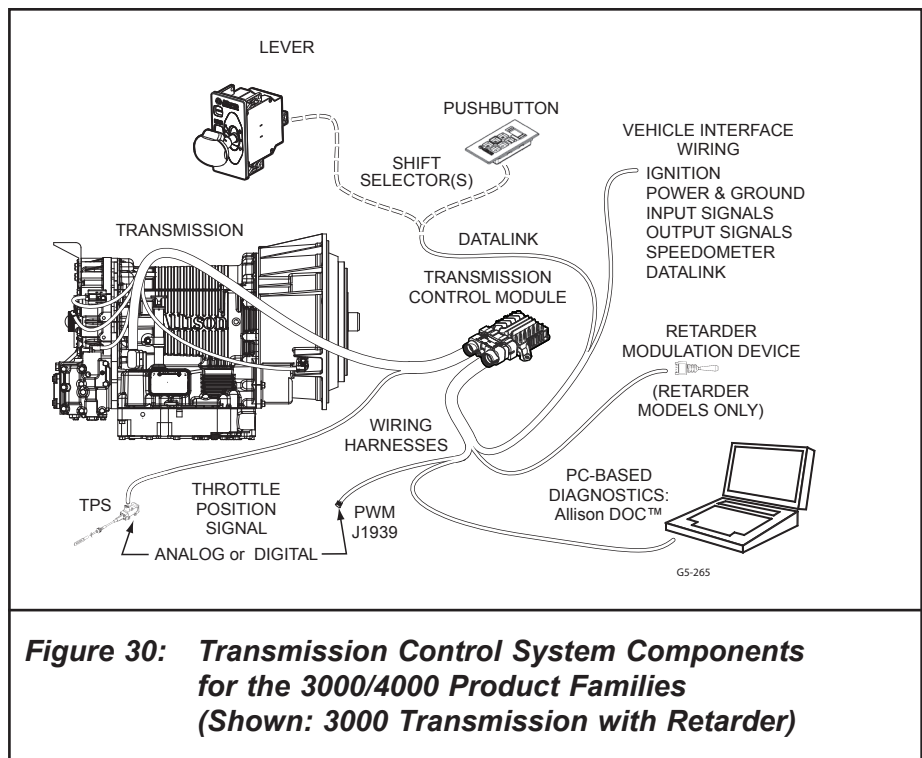


The vehicle operator uses the shift selector to select neutral, reverse, drive or another forward range. The shift selector sends the range selection to the TCM. The TCM evaluates operating conditions and sends the necessary commands to the control valve body in the transmission. The control valve body hydraulically applies and releases the appropriate clutches. When the operator selects drive, the TCM controls the automatic upshifting and downshifting of the transmission based upon vehicle speed, throttle position, and load conditions.



The TCM may be programmed with a combination of features which interface with other vehicle systems. These features can assist the operator with vehicle operation, control the operation of accessory equipment on the vehicle, protect the transmission and the vehicle from abuse. Examples of these features are listed below:

- dedicated neutral start signal to prevent starting the engine when the transmission is in range
- reverse warning signal to activate backup lights or audible backup signal
- signal to drive an electronic speedometer
- input functions received by the TCM to activate auxiliary functions in the transmission control system, such as indicating that the anti-lock brake system (ABS) response is active so that the transmission controls can disengage lockup and turn off the retarder
- output functions sent by the TCM to activate vehicle functions when specific transmission conditions exist, such as indicating when the transmission conditions are conducive to use of the engine brake



**Figure 30: Transmission Control System Components for the 3000/4000 Product Families (Shown: 3000 Transmission with Retarder)**

For a more detailed description of the transmission controls, refer to the following *Allison 6th Generation Controls* documents:

- [Section A-1: Controls System Familiarization](#)
- [Section A-2: Shift Calibration Familiarization](#)
- [Section B: System Operation](#) for the [1000/2000](#), [2900](#), or for the [3000/4000](#) Product Families.

#### 4.17 FASTENERS AND FITTINGS

The transmissions in these product families are designed primarily to metric standards. Except as noted, fasteners are metric-based and require metric tools for installation and service. Exceptions are:

- ports for coolers, remote filters, and the retarder accumulator hose connections, which are designed for inch-series straight-thread O-ring fittings
- main pressure taps on the transmission, which are designed for inch-series UNF threads
- the oil drain plug on the transmission sump or oil pan, which are designed for inch-series UNF threads

Most thru-holes on the transmission, controls components, and miscellaneous Allison parts have been sized to provide clearance for both metric and inch-series fasteners if both are available in the relative size of the thru opening.



## LIST OF REFERENCED DOCUMENTS

- [3700 Model Installation Manual](#)
- [Allison 6th Generation Controls Installation Manual:](#)
  - [Section A-1, Controls System Familiarization](#)
  - [Section A-2, Shift Calibration Familiarization](#)
- [Allison 5th Generation Controls Installation Manual: Section B, System Operation](#)
  - for [1000/2000 Product Family Models](#)
  - for [2900 Product Family Models](#)
  - for [3000/4000 Product Family Models](#)
- [Engine-Transmission Adaptation Design](#) for [1000/2000 and 2900](#), or for [3000 & 4000](#) Product Families
- [Features & Options](#) for the [1000/2000](#), the [2900](#), the [3000](#) and the [4000](#) Product Families
- [Fill Tube and Dipstick Design Requirements](#) for [1000/2000 and 2900](#) or for [3000 and 4000](#) Product Families
- [Fluid Filtration](#) for [1000/2000 and 2900](#) or [3000 and 4000](#) Product Families
- [Ground-Driven Pump Provision](#)
- [Park Brake Provisions System Design](#) for the 1000/2000 and 2900 Product Families
- [Parking Provisions – System Design](#) for the 3000 and 4000 Product Families
- [Park Pawl System Design](#) for the 1000/2000 and 2900 Product Families
- [Power Take-Off \(PTO\) – System Design](#)
  - [General](#)
  - for the [1000/2000 and 2900 Product Families](#)
  - for the [3000 and 4000 Product Families](#)
- [Provision for Non-Allison Transfer Case](#) for [1000/2000 and 2900](#) or the [3000 and 4000](#) Product Families
- [Retarder Option](#)
- [Service Information Letter \(SIL\) 12-WT-04, Remote Filter Kit](#)
- [Tachograph Drive Provision](#)
- [Transmission Cooling documents](#)
- [Transmission Data](#) for the [1000/2000](#), the [2900](#), the [3000](#) and the [4000](#) Product Families
- [Transmission Families and Models](#)
- [Transmission Mounting Design – Remote from Engine](#)

### Technical Documents

- [TD-148, Engine/Converter Matching](#)
- [Technical Document \(TD\) 188, Application and Installation Requirements for 2nd Reverse](#)

## REVISION HISTORY

### **May 26, 2022**

- Added the 2900 Product Family

### **May 20, 2016**

- In 4.1, revised comments about available gear ratios to include xFE™ close ratio models, and added a link to the Transmission Data section of Tech Data
- Revised Figure 28 to show 5th Gen TCM
- Revised Figure 29 to show 5th Gen TCM and Lever Shift Selector
- In 4.9.2, corrected 3000 Product Family PTO vs non-PTO converter housing length difference to show that PTO housing is 106.7 mm (4.2 in) longer than the non-PTO housing. Previously this document incorrectly showed that the 3000 Product Family PTO converter housing was 73 mm (2.9 in) longer than the non-PTO housing.
- In 4.16, changed "drop lockup" to "disengage lockup"

### **May 28, 2015**

- Revised document to refer to 5th Gen Controls. Previously referred to 4th Gen Controls

### **September 7, 2010**

- In 4.1, added 2nd Reverse for selected 7-speed models in the 4000 Product Family.
- In 4.5.2, for 3000 Product Family, Allison now offers only one type of park brake assembly.
- Added new paragraph 4.8 to describe the ground-driven pump provision.
- In 4.9.1 and 4.15.1, removed description of the 1000/2000 Product Family converter housings that went out of production in January, 2010.
- In 4.9.2, for 3000 top/side PTO provision, indicated that the unfinished side mounting pads may be available only in some geographical regions.

### **February 10, 2009**

- In 4.8.1 and 4.14.1, added description of the 1000/2000 Product Family converter housings that will be available beginning in January, 2010. Added graphics that show the new housings.

### **October 27, 2008**

- In 4.11, corrected the PTO pad bolt-pattern from eight tapped holes to ten tapped holes for the 3000 and 4000 Product Families.
- In 4.12.2, "refer to SIL 12-WT-04" was replaced with "contact your Allison representative and request SIL 12-WT-04" for more information on 3000/4000 remote filters.

### **July 17, 2008**

- Prepared document for Extranet publication

### **June 9, 2008**

- Created new document, Transmission Product Description