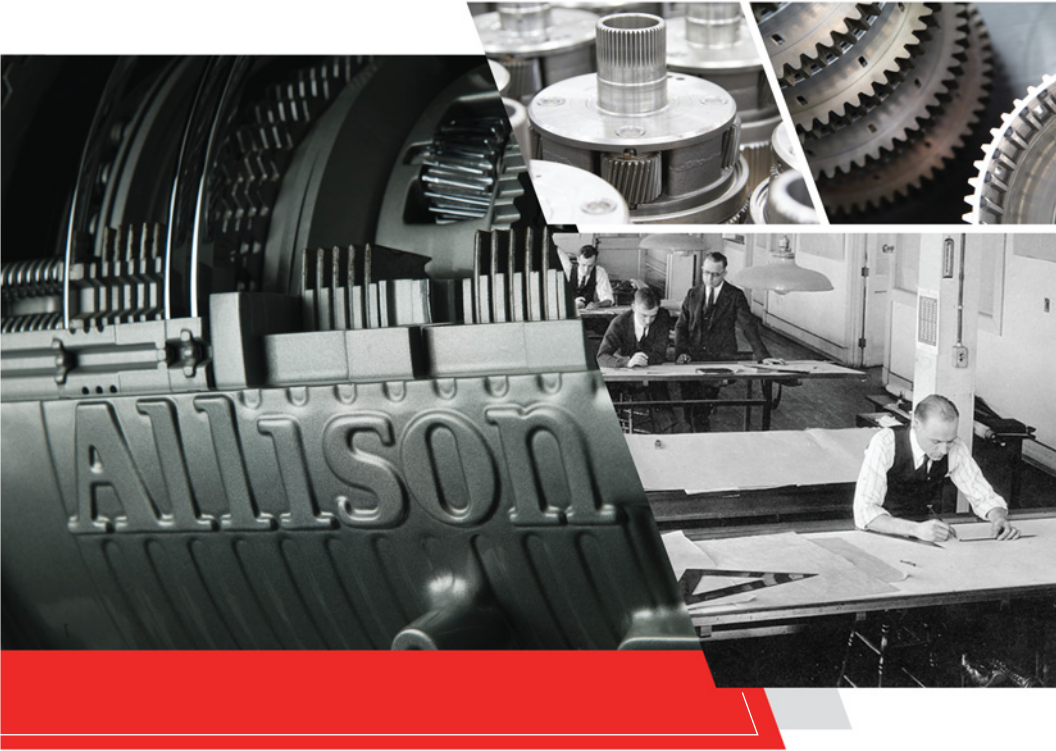


1000 and 2000 Series

Allison 5th and 6th Generation Controls



OPERATOR'S MANUAL

OM8471EN



Operator's Manual

2021 SEPTEMBER
OM8471EN

Allison Transmission

Allison 5th Generation Controls
Allison 6th Generation Controls

1000 Series™ and 2000 Series™

1000	1350 RDS	2200 MH	2350 RDS	2550 MH
1000 EVS	1350 SP	2200 PTS	2350 SP	2550 PTS
1000 HS	2100	2200 RDS	2500	2550 RDS
1000 MH	2100 EVS	2200 SP	2500 EVS	2550 SP
1000 PTS	2100 HS	2300 HS	2500 HS	2575 PTS
1000 RDS	2100 MH	2300 PTS	2500 MH	B 210
1000 SP	2100 PTS	2300 RDS	2500 PTS	B 220
1350	2100 RDS	2300 SP	2500 RDS	T 1000
1350 EVS	2100 SP	2350 EVS	2500 SP	T 2100
1350 HS	2200	2350 HS	2550	T 2200
1350 MH	2200 EVS	2350 MH	2550 EVS	
1350 PTS	2200 HS	2350 PTS	2550 HS	



Allison
Transmission.

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

IMPORTANT SAFETY INFORMATION

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions in this manual. These warnings and cautions advise of specific methods or actions that can result in personal injury, equipment damage, 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. 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 methods used.

Vehicle or equipment manufacturers (collectively hereinafter "manufacturer(s)") integrate Allison transmissions into vehicles or equipment used for a variety of vocations and services. The manufacturer is responsible for identifying the specific operating conditions to which the vehicle or equipment will be subjected and to communicate the appropriate means for preventing unintended vehicle or equipment movement within those conditions, in order to ensure vehicle or equipment safety and operator safety. The vehicle or equipment owner and operator should be aware of and follow the manufacturer's operating instructions and warnings related to parking and preventing unintended vehicle or equipment movement.

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

The WARNINGS, CAUTIONS, and NOTES in this manual apply only to the Allison transmission and not to other vehicle or equipment systems which may interact with the transmission. Be sure to review and observe any vehicle or equipment system information provided by the manufacturer and/or body builder at all times the Allison transmission is being serviced.

WARNINGS, CAUTIONS, NOTES

Three types of headings are used in this manual to attract your attention:



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



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



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

ABBREVIATIONS AND ACRONYMS

• ABMS	Acceleration Based Mode Switch
• ABS	Anti-lock Brake System
• ACCT	Allison Calibration Configuration Tool
• BUS	Bus Series Vocational Model
• COTP	Converter Over-temp Torque Protection
• DSS	Dynamic Shift Sensing
• DTC	Diagnostic Trouble Code
• DTCs	Diagnostic Trouble Codes
• EVS	Emergency Vehicle Series
• GCW	Gross Combined Weight—Laden weight of tractor/trailer or train.
• HS	Highway Series
• IMS	Internal Mode Switch
• INT	International Series
• KOH	Potassium Hydroxide
• LBSS	Load-Based Shift Scheduling
• LRTP	Low Range Torque Protection
• MH	Motorhome Series
• MIL	Malfunction Indicator Lamp
• NAS	Neutral at Stop
• OBD II	On Board Diagnostics; second generation.
• OEM	Original Equipment Manufacturer
• PTO	Power Takeoff
• PTS	Pupil Transport/Shuttle Series
• RDS	Rugged Duty Series
• rpm	Revolutions Per Minute
• SAE	Society of Automotive Engineers
• SEM	Shift Energy Management
• SESS	Super Economy Shift Schedule
• SP	Specialty Series
• TCM	Transmission Control Module
• TCMs	Transmission Control Modules

• TPS	Throttle Position Sensor
• VAC	Vehicle Acceleration Control
• VEPS	Vehicle Electronic Programming Stations

TRADEMARK USAGE

The following trademarks are the property of the companies indicated:

- Allison DOC[®] is a Registered Trademark of Allison Transmission, Inc.
- DynActive[®] is a Registered Trademark of Allison Transmission, Inc.
- FuelSense[®] is a Registered Trademark of Allison Transmission, Inc.
- TES 295[®] is a Registered Trademark of Allison Transmission, Inc.
- TES 389[®] is a Registered Trademark of Allison Transmission, Inc.
- TES 668[™] is a Trademark of Allison Transmission, Inc.
- 1000 Series[™] is a Trademark of Allison Transmission, Inc.
- 2000 Series[™] is a Trademark of Allison Transmission, Inc.

SUPERSESIONS

This manual supersedes the following Operators Manuals:

OM3364; OM3760; OM3757; OM3761; OM3758; OM8177; OM3759; OM3756

ISO 14000

As a responsible corporate citizen, Allison Transmission, Inc. is dedicated to protecting human health, natural resources and the global environment. End-users and service personnel are responsible for understanding and complying with all applicable environmental laws, safety regulations, and Allison Transmission's policies and standards. The following recommendations concern the treatment and disposal of hazardous materials resulting from servicing an Allison Transmission product.

1. All lubricants/fluids used in the operation or storage of a transmission are to be treated as hazardous waste. These fluids are to be separated and discarded per current local statutes/regulations for the purpose of recycling, treatment, storage, and/or disposal.
2. Oil soaked components (e.g., filters, seals, clutch packs, etc.) are to be treated as hazardous waste and are to be handled and discarded per current local statutes/regulations.
3. Exhausted electronic components (e.g., transmission control modules (TCM), pressure switches, speed sensors, etc.) are to be treated as electronic waste and are to be handled and discarded per current local statutes/regulations.

LIST OF WARNINGS

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.



WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.p65Warnings.ca.gov/product.

- **The following steps in this section provide general vehicle guidelines regarding the use and operation of a park pawl. Vehicle manufacturers integrate Allison transmissions into vehicles used for a variety of vocations and services. The vehicle manufacturer is responsible for identifying the specific operating conditions to which the vehicle will be subjected and to communicate the appropriate means for preventing unintended vehicle movement within those conditions, in order to ensure vehicle and operator safety. The vehicle owner and operator should be aware of and follow the vehicle manufacturer's operating instructions and warnings related to parking and preventing unintended vehicle movement.**

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- For vehicles containing 1000 and 2000 Series Transmissions with P (Park) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm or turned off.
 3. Move the gear selector to P (Park), then slowly release the service brake. Releasing the brake too quickly, especially on a steep grade, may prevent the park pawl from engaging. If the vehicle moves, immediately reapply the service brake and repeat the prior steps.
 4. Apply the vehicle's parking/emergency brake and make sure it is properly engaged.
 5. When parked facing downhill, turn the front wheels toward the curb. When parked facing uphill, turn the front wheels away from the curb. When no curb, turn the front wheels away from the street.
 6. If operating the vehicle when not in the operator's seat (such as in a tow truck) or when parking on steep grades, chock the wheels and take any other steps necessary to keep the vehicle from moving and follow any specific vehicle operating manuals or warnings.

Failure to follow this procedure, may result in unintended vehicle movement which could result in death, serious personal injury or property damage.

- R (Reverse) may not be obtained due to an active inhibitor. Check for the illumination of the RANGE INHIBIT(ED) light or CHECK TRANS (MIL) light. See the [3.12 SHIFT INHIBITS](#) section of this manual.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from R (Reverse) to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.
- To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts to or from N (Neutral) without manually or automatically applying an appropriate vehicle brake.
- **DO NOT** allow the vehicle to “coast” in N (Neutral). There is no engine braking in N (Neutral). You could lose control of the vehicle, causing property damage or personal injury. Coasting in neutral can cause severe transmission damage.
- D (Drive) and other forward ranges may not be obtained due to an active inhibitor. The range selected may not be obtained, resulting in unexpected vehicle movement. To help avoid injury and/or property damage, always apply the service brake when selecting D (Drive) or other forward ranges. Check for the RANGE INHIBIT(ED) light or the CHECK TRANS light.
- To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from a forward range to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.
- The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- To help avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.
- For vehicles containing 2100, 2300, and 2500 transmissions with PB (Auto-Apply Parking Brake) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm.
 3. Put the transmission in PB (Auto-Apply Parking Brake). Make sure the parking brake is properly engaged.
 4. Apply the emergency brakes and make sure they are properly engaged.
 5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

- R (Reverse) may not be obtained due to an active inhibitor. Check for the illumination of the RANGE INHIBIT(ED) light or CHECK TRANS (MIL) light. See the [3.12 SHIFT INHIBITS](#) section of this manual.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- For vehicles containing 1000 and 2000 Series transmissions without either P (Park) or PB (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm.
 3. Put the transmission in N (Neutral).
 4. Apply the emergency brake and/or parking brake and make sure they are properly engaged.
 5. If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If the procedure is not followed, the vehicle may move suddenly and cause injury and/or property damage.

- D (Drive) and other forward ranges may not be obtained due to an active inhibitor. The range selected may not be obtained, resulting in unexpected vehicle movement. To help avoid injury and/or property damage, always apply the service brake when selecting D (Drive) or other forward ranges. Check for the RANGE INHIBIT(ED) light or the CHECK TRANS (MIL) light.
- To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from a forward range to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—
IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **Operation with excessive loads can cause transmission damage and unexpected vehicle movement. To help avoid injury, property damage and/or transmission damage, do not exceed the following:**
 - For 1000, 2100, and 2200 transmissions, do not exceed 26,000 lb (11 800 kg) GCW or the OEM vehicle rating, whichever is less.
 - For B210, and B220 transmissions, do not exceed 29,000 lb (13 150 kg) GCW or the OEM vehicle rating, whichever is less.
 - For 1350, 2100, 2350 and 2550 transmissions, do not exceed 30,000 lb (13 600 kg) GCW or the OEM vehicle rating, whichever is less.
 - For 2300 and 2500 transmissions, do not exceed 33,000 lb (15 000 kg) GCW or the OEM rating, whichever is less.
- **To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N (Neutral) to a forward range or R (Reverse) when the throttle is open. The vehicle will lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from N (Neutral) to a forward range or R (Reverse) only when the throttle is closed and service brakes are applied.**
- **To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N (Neutral) to a forward range or R (Reverse) when the throttle is open. The vehicle will lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from N (Neutral) to a forward range or R (Reverse) only when the throttle is closed and service brakes are applied.**
- **Using the retarder or engine brake on wet or slippery roads may cause loss of traction on the drive wheels—your vehicle may slide out of control. To help avoid injury or property damage, turn the retarder or engine brake enable to OFF when driving on wet or slippery roads.**

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.
- To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N (Neutral) to D (Drive) or R (Reverse) when the engine is above low idle rpm. The vehicle may lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from N (Neutral) to a forward range or R (Reverse) only when the throttle is closed and the service brakes are applied.
- To help avoid injury and/or property damage caused by unexpected vehicle movement, do not attempt to engage P (Park) with the vehicle in motion (2 km/hr (1 mph) or higher). If you attempt to engage P (Park) with the vehicle in motion (2 km/hr (1 mph) or higher), the park pawl will ratchet, will not engage, and will not hold the vehicle. Repeated park pawl ratcheting can cause transmission damage.
- If the vehicle has four-wheel-drive and the transfer case is in Neutral, the vehicle can be free to roll even if the P (Park) position is selected. To help avoid injury and/or property damage caused by unexpected movement of the vehicle, be certain that the transfer case is in “high” drive range, not Neutral, whenever the vehicle is parked.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- If the vehicle is equipped with a two-speed axle or two-speed transfer case which is engaged in “low”, even very low vehicle speeds can produce appreciable transmission output shaft speed. Even the slightest vehicle motion can deter engagement of the park pawl in such cases. To help avoid injury and/or property damage caused by unexpected vehicle movement, be certain that the axle or transfer case is in “high” drive range whenever the vehicle is parked and the park pawl is engaged.
- For vehicles containing 1000 and 2000 Series transmissions with P (Park) selector position, follow this procedure each time the operator’s station will be unoccupied with the engine running:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm or turned off.
 3. Move the gear selector to P (Park), then slowly release the service brake. Releasing the brake too quickly, especially on a steep grade, may prevent the park pawl from engaging. If the vehicle moves, immediately reapply the service brake and repeat the prior steps.
 4. Apply the vehicle’s parking/emergency brake and make sure it is properly engaged.
 5. If operating the vehicle when not in the operator’s seat (such as in a tow truck) or when parking on steep grades, besides engaging the park pawl and applying the parking brake also chock the wheels and take any other steps necessary to keep the vehicle from moving and follow any specific vehicle operating manuals or warnings.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- For vehicles containing 1000 and 2000 Series transmissions with PB (Auto-Apply Parking Brake) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm.
 3. Put the transmission in PB (Auto-Apply Parking Brake).
 4. Apply the emergency brakes and make sure they are properly engaged.
 5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

- For vehicles containing 1000 and 2000 Series transmissions without either P (Park) or PB (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm.
 3. Put the transmission in N (Neutral).
 4. Apply the emergency brakes and/or parking brake and make sure they are properly engaged.
 5. If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. **DO NOT** leave the vehicle with the engine running unless you have taken all of the following precautions:
 - Shift the transmission to N (Neutral), P (Park), or PB (Auto-Apply Parking Brake).
 - Make sure that the engine is at low idle (500–800 rpm).
 - Apply the park brake or emergency brake and make sure it is properly engaged.
 - Chock the wheels and take any other steps necessary to keep the vehicle from moving.
- For vehicles containing 1000, 2200, 2350, and 2550 transmissions with P (Park) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:
 1. Bring the vehicle to a complete stop using the service brake.
 2. Make sure the engine is at low idle rpm.
 3. Put the transmission in P (Park).
 4. Engage the park pawl by slowly releasing the service brake.
 5. If a parking brake is present, apply the parking brake. Make sure the parking brake is properly engaged.
 6. Apply the emergency brakes and make sure they are properly engaged.
 7. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **For vehicles containing 1000 and 2000 Series transmissions without either P (Park) or PB (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:**
 - 1. Bring the vehicle to a complete stop using the service brake.**
 - 2. Make sure the engine is at low idle rpm.**
 - 3. Put the transmission in N (Neutral).**
 - 4. Apply the emergency brakes and/or parking brake and make sure they are properly engaged.**
 - 5. If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.**

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

TABLE OF CONTENTS

IMPORTANT SAFETY INFORMATION	3
ABBREVIATIONS AND ACRONYMS	4
TRADEMARK USAGE	6
ISO 14000	7
LIST OF WARNINGS	8

1.0 INTRODUCTION

1.1 KEEPING THAT ALLISON ADVANTAGE	22
1.2 A BRIEF DESCRIPTION OF THE ALLISON 1000 AND 2000 SERIES TRANSMISSIONS	24
1.3 ELECTRONIC CONTROL SYSTEM	25
1.4 TORQUE CONVERTER	26
1.5 PLANETARY GEARS AND CLUTCHES	26
1.6 COOLER CIRCUIT	27

2.0 SHIFT SELECTORS

2.1 DESCRIPTION OF AVAILABLE TYPES	28
2.2 OPERATION OF THE SHIFT SELECTOR	28
2.3 RANGE SELECTION—ALL 1000 AND 2000 SERIES TRANSMISSIONS WITH P (Park) POSITION	31
2.4 RANGE SELECTION—ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION	36
2.5 RANGE SELECTION—ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK) OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS	39

3.0 DRIVING TIPS

3.1 MAXIMUM VEHICLE LOADING	43
3.2 PREVENT MAJOR PROBLEMS	43
3.3 TURNING THE VEHICLE ON/OFF	44
3.4 ACCELERATOR CONTROL	44
3.5 PRIMARY/SECONDARY SHIFT SCHEDULES	45
3.5.1 SHIFT SCHEDULES	45
3.5.2 DYNAMIC SHIFT SENSING (DSS) (MH, BUS, HS, PTS, and RDS Models)	45
3.5.3 ALLISON TRANSMISSION FuelSense® 2.0	46
3.5.3.1 FuelSense® 2.0 Terminology Descriptions	47
3.5.3.2 FuelSense® 2.0 DRIVER INDICATOR (with FuelSense® 2.0 Package)	48
3.6 KICKDOWN	48
3.7 OUTPUT SPEED INDICATOR	49
3.8 DIAGNOSTIC CODES	49
3.9 RANGE INHIBIT(ED) LIGHT	49
3.9.1 RANGE INHIBITED WARNING LIGHT	49

3.9.1.1	CONVERTER OVER-TEMP TORQUE PROTECTION (COTP)	49
3.10	CHECK TRANS OR MALFUNCTION INDICATOR LIGHT (MIL)	50
3.11	DIAGNOSTIC CODES OVERVIEW	51
3.12	SHIFT INHIBITS	51
3.12.1	ABOVE-IDLE NEUTRAL-TO-RANGE SHIFTS	52
3.12.2	FORWARD/REVERSE DIRECTIONAL SHIFTS	52
3.12.3	TRANSMISSION PROBLEMS	52
3.12.4	AUXILIARY EQUIPMENT OPERATION	53
3.13	USING THE ENGINE TO SLOW THE VEHICLE	53
3.14	RANGE PRESELECTION	54
3.14.1	HOLD UPSHIFT	55
3.14.2	PRESELECT DOWNSHIFT	55
3.15	REVERSE	55
3.16	REFUSE PACKER STEP SWITCH (RDS and INT Models)	55
3.17	TWO-SPEED AXLE (RDS, INT, EVS, HS, and BUS Models)	56
3.18	DRIVING ON SNOW OR ICE	56
3.19	ROCKING OUT	56
3.20	OPERATING TEMPERATURES	57
3.21	HIGH FLUID TEMPERATURE	57
3.22	PARKING BRAKE	58
3.23	PARK PAWL	59
3.23.1	TORQUE LOCK	60
3.24	PARKING/LEAVING VEHICLE WITH ENGINE RUNNING	61
3.25	TOWING OR PUSHING	62
3.26	SURGING NATURAL GAS ENGINES	62

4.0 POWER TAKEOFF OPERATION

4.1	POWER TAKEOFF (PTO) SYSTEMS (RDS, MH, EVS, and BUS Models)	63
4.2	TURBINE-DRIVEN POWER TAKEOFF (PTO)	63
4.2.1	PTO CONFIGURATION	63
4.2.2	PTO ENGAGEMENT—SLIDE ENGAGEMENT INTERNAL TO PTO	64
4.2.3	PTO ENGAGEMENT—CLUTCH DRIVEN	65
4.2.4	PTO OPERATION	65
4.2.5	PTO OVERSPEED PROTECTION	66
4.3	SPLIT-SHAFT POWER TAKEOFF (PTO)	67

5.0 PROGNOSTICS

5.1	1000 AND 2000 SERIES SERVICE PROGNOSTICS	68
5.2	OIL LIFE MONITOR	69
5.3	FILTER LIFE MONITOR	70
5.4	TRANSMISSION HEALTH MONITOR	70

6.0 CARE AND MAINTENANCE

6.1	PERIODIC INSPECTIONS AND CARE	72
6.1.1	TRANSMISSION INSPECTION	72
6.1.2	VEHICLE INSPECTION	72
6.1.3	WELDING	73
6.2	IMPORTANCE OF PROPER TRANSMISSION FLUID LEVEL	73
6.3	TRANSMISSION FLUID CHECK	74
6.3.1	Fluid Check Procedure	75
6.3.2	Cold Check Procedure	75
6.3.3	Hot Check Procedure	77
6.3.4	Consistency of Readings	78
6.4	KEEPING FLUID CLEAN	78
6.5	FLUID RECOMMENDATIONS	78
6.6	TRANSMISSION FLUID AND FILTER CHANGE INTERVALS	79
6.6.1	Frequency	79
6.6.2	Abnormal Conditions	82
6.6.3	Fluid Analysis	82
6.7	TRANSMISSION FLUID CONTAMINATION	82
6.7.1	Fluid Examination	82
6.7.2	Water	82
6.7.3	Engine Coolant	83
6.7.4	Metal	83
6.8	TRANSMISSION FLUID AND FILTER CHANGE PROCEDURE	83
6.8.1	Drain Fluid	83
6.8.2	Replace Control Main Filter	84
6.8.3	Refill Transmission	85
6.9	BREATHER	86
6.9.1	Location and Purpose	86
6.9.2	Maintenance	86

7.0 DIAGNOSTICS

7.1	DIAGNOSTIC CODES AND TOOLS	87
-----	--------------------------------------	----

8.0 CUSTOMER SERVICE

8.1	OWNER ASSISTANCE	88
8.2	SERVICE LITERATURE	89
8.3	ALLISON TRANSMISSION DISTRIBUTORS	90

REVISION HISTORY	91
----------------------------	----

1.0 INTRODUCTION

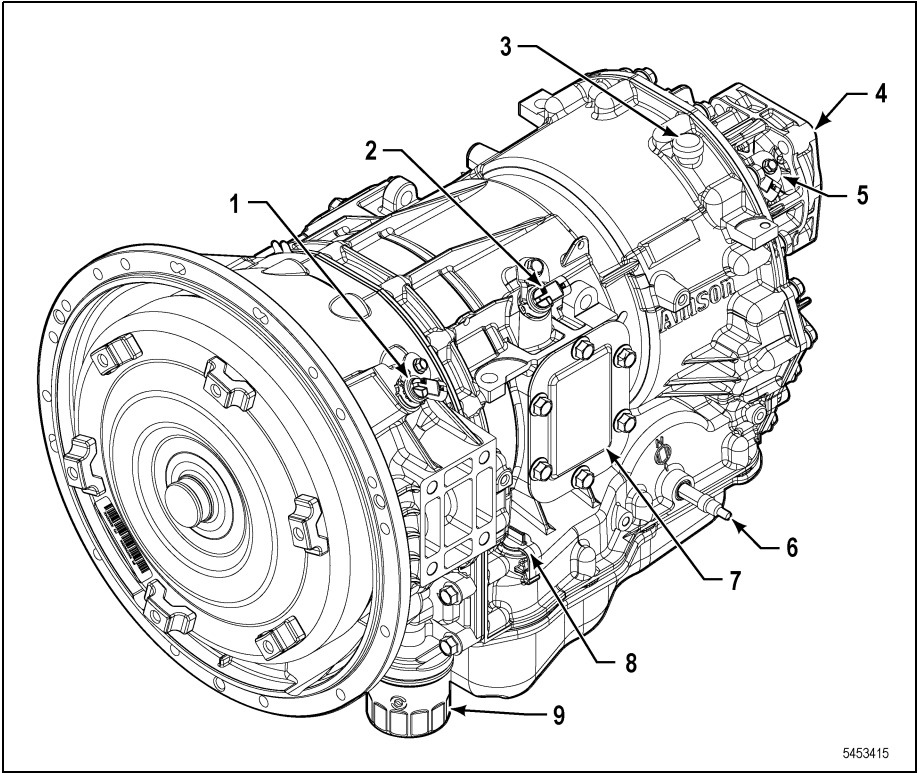
1.1 KEEPING THAT ALLISON ADVANTAGE



6065

Allison transmissions provide many advantages for the driver who must “stop and go” or change speeds frequently. Driving is easier, safer, and more efficient.

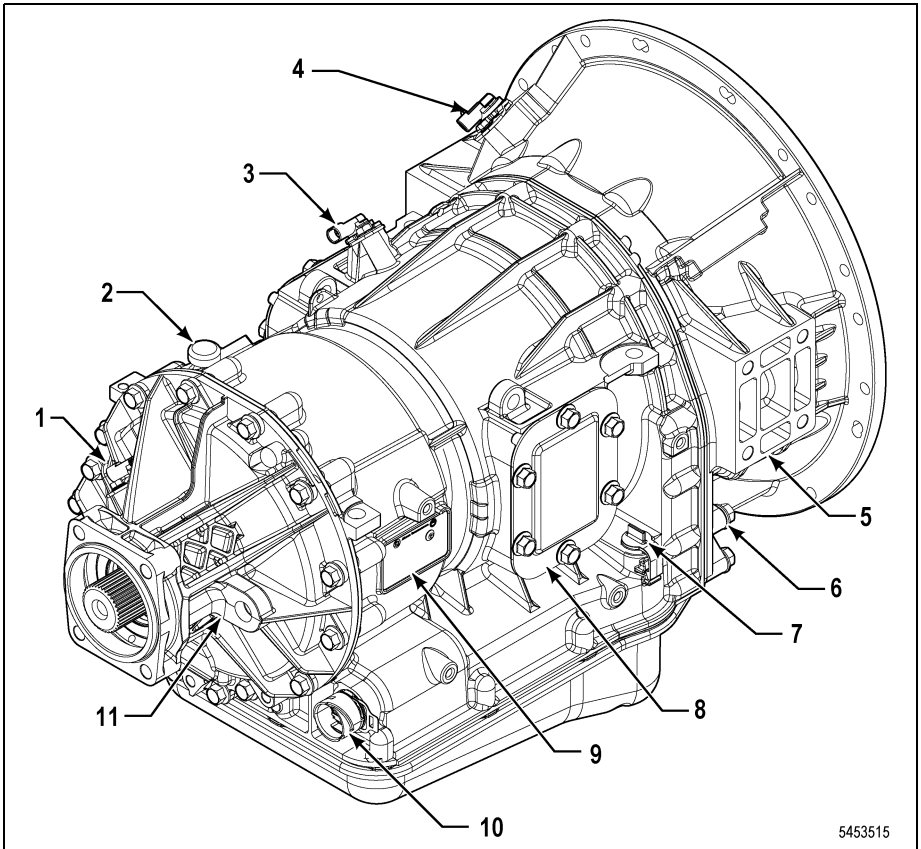
The transmissions are rugged and designed to provide long, trouble-free service. This manual will help you gain maximum benefits from your Allison-equipped vehicle.



5453415

- | | |
|--|--|
| (1) - Engine Speed Sensor | (5) - Output Speed Sensor |
| (2) - Turbine Speed Sensor | (6) - Selector Shaft |
| (3) - Breather | (7) - SAE 6-Bolt PTO Pad |
| (4) - Parking Brake Mounting Provision | (8) - Available Oil Fill Tube Location |
| | (9) - Control Main Oil Filter |

Figure 1-1. Left-Front View



5453515

- | | |
|--|--|
| (1) – Output Speed Sensor | (6) – Cooler Ports |
| (2) – Breather | (7) – Available Oil Fill Tube Location |
| (3) – Turbine Speed Sensor | (8) – SAE 6-Bolt PTO Pad |
| (4) – Engine Speed Sensor | (9) – Nameplate |
| (5) – Mounting Pad (SAE #3 Housing Only) | (10) – Main Electrical Connector |
| | (11) – Optional Tachograph Provision |

Figure 1–2. Right-Rear View

1.2 A BRIEF DESCRIPTION OF THE ALLISON 1000 AND 2000 SERIES TRANSMISSIONS

Allison Transmissions are fully automatic, torque-converter driven, electronically controlled transmissions best suited for light-medium duty, on-highway applications. Each transmission series (EVS, HS, MH, PTS, RDS, SP, BUS, and INT) contains features which have been designed for specific vocational needs.

- **1000 Series**– This transmission is best suited for light duty on-highway applications. The 1000 and 1350 transmissions have a park pawl.

- **2000 Series**– These transmissions are best suited for single-axle medium duty on-highway applications. The B220, 2200, 2350, and 2550 transmissions have a park pawl; the B210, 2100, 2300, and 2500 transmissions do not have park pawls.

The park pawl exists but cannot be engaged in some vehicle configurations using 1000, 1350, 2200, 2350, and 2550 transmissions (e.g., some rear engine vehicles with air brakes). For these configurations, the **P** (Park) position is not used.

A provision to mount a PTO is available on all transmissions. The PTO drive gear is optional.

All transmissions are capable of up to six forward ranges, dependent on TCM calibration, and one reverse. All clutches are hydraulically-actuated, spring-released, and have automatic compensation for wear. Gearing is helical type, arranged in planetary sets. Electronic controls provide automatic gear selection in each drive range and automatic engagement of the torque converter (lockup) clutch.

1.3 ELECTRONIC CONTROL SYSTEM

The transmission control system consists of five major components connected by customer-furnished wiring harnesses. The five major components are:

- Transmission Control Module (TCM)
- Engine Throttle Position Sensor (TPS) or direct electronic communication of throttle information
- Engine, turbine, and output speed sensors
- Internal Mode Switch (IMS)
- Control valve body

The control valve body contains solenoids and a pressure switch manifold to position and monitor control valve operation. The pressure switch manifold also contains a thermistor to monitor sump fluid temperature. The TPS (or engine-to-transmission communication link), speed sensors, pressure switch manifold, and internal mode switch communicate information to the TCM.

The TCM processes this information and then sends signals to actuate specific solenoids located within the control valve body in the transmission. These solenoids control both oncoming and off-going clutch pressures to provide closed-loop shift control by matching engine rpm during a shift to a previously established desired profile that is programmed into the TCM.

The transmission electronic control system has an “adaptive shifting” feature. Adaptive shifting helps optimize shift quality by monitoring critical

characteristics of clutch engagement and making on-going adjustments to improve subsequent shifts. The transmission shift calibration is based on several different types of shifts, e.g., full throttle, part throttle, closed throttle—upshifts, downshifts, etc. Each shift is associated with specific speed and throttle position parameters. In order to optimize each type of shift for normal driving, shift controls must experience operation and shifting in a wide variety of operating conditions.

A “drive in” period under varied driving conditions is required before the adaptive controls can be expected to optimize each and every shift. In general, shift quality will begin to converge to their “adapted” level following several shifts of a particular shift type.

1.4 TORQUE CONVERTER

The torque converter consists of four elements – pump, turbine, stator, and torque converter (lockup) clutch. The pump is the input element and is driven directly by the engine. The turbine is the output element and is hydraulically driven by the pump. The stator is the reaction (torque multiplying) element. When the pump turns faster than the turbine, the torque converter is multiplying torque. When the turbine approaches the speed of the pump, the stator starts to rotate with the pump and turbine. When this occurs, torque multiplication stops and the torque converter functions as a fluid coupling.

Allison Transmission torque converters contain a torque converter (lockup) clutch. When engaged, this clutch causes the torque converter pump and turbine to be locked together, enabling them to rotate in unison at engine speed. This condition, commonly referred to as “torque converter clutch operation,” provides direct drive through the transmission. This type of operation maximizes engine braking and enhances fuel economy. The torque converter (lockup) clutch is regulated by the shift controls to engage automatically. The torque converter clutch releases at lower speeds or when the TCM detects conditions requiring it to be released. The torque converter clutch contains a damping mechanism which reduces the transmittal of engine-induced torsional vibrations into and beyond the transmission.

1.5 PLANETARY GEARS AND CLUTCHES

A series of three helical, constant mesh planetary gear sets and shafts provides the mechanical gear ratios and direction of travel for the vehicle. The planetary gear sets are controlled by five multiplate clutches that work in pairs to produce up to five or six forward ranges, dependent on TCM calibration, and one reverse speed. The clutches are applied and released hydraulically in response to electronic signals from the TCM to the appropriate solenoids.

1.6 COOLER CIRCUIT

The transmission fluid is cooled by a remote-mounted oil cooler. The bottom of the transmission torque converter housing provides for the direct mounting of a control main filter and includes two ports to facilitate the attachment of the oil cooler lines.

2.0 SHIFT SELECTORS

2.1 DESCRIPTION OF AVAILABLE TYPES

The 1000 and 2000 Series transmissions use lever-type shift selectors. The shift positions on the shift selector can vary according to the shift selector installed.

2.2 OPERATION OF THE SHIFT SELECTOR

The shift selector is used by the operator to select the following ranges:

- **P** (Park) for transmissions with park pawls
- **PB** (Auto-Apply Parking Brake) for vehicles with automatically engaged parking brakes
- **R** (Reverse)
- **N** (Neutral)
- **D** (Drive)*
- **4** (Fourth Range) **
- **3** (Third Range) **
- **2** (Second Range)**
- **1** (First Range)

Ranges are selected by moving the lever to the desired selector position (**P**, **PB**, **R**, **N**, **D**, **4**, **3**, **2**, or **1**). Six speed transmission models have six forward ranges, first through sixth. Five speed transmission models have five forward ranges, first through fifth. Four speed models have four forward ranges, first through fourth. When a forward range has been selected, the transmission automatically upshifts through each range. As the vehicle slows, the transmission will downshift automatically through each range.

*The shift selector position representing this gear range may be labeled “5” or “6” (for the highest gear in the range), “OD” (for Overdrive), “D” (for the normal Drive position), “1–5” or “1–6” (for the complete gear range).

** In calibrations with five forward ranges, one of these selector positions will not be available. In calibrations with six forward ranges, two of these selector positions will not be available.

The following tables list the shift selector positions and corresponding ranges for all 1000 and 2000 Series transmissions.

Table 2–1. All 1000, 1350, 2200, 2350, and 2550 Transmissions With P (Park) Position

Shift Selector Position	Range	Shift Selector Position	Range	Shift Selector Position	Range
P (Park)	(Neutral) *	P (Park)	Neutral*	P (Park)	Neutral*
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive) **	1–5 (1–6)***	D (Drive)**	1–5 (1–6)***	D (Drive)**	1–5 (1–4)†
4 (Fourth Range)	1–4	4 (Fourth Range)	1–4	3 (Third Range)	1–3
3 (Third Range)	1–3	2 (Second Range)	1–2	2 (Second Range)	1–2
1 (First Range)	1	1 (First Range)	1	1 (First Range)	1

* With Park Pawl engaged.
 ** The shift selector position representing this gear range may be labeled “5” or “6” (for the highest gear in the range), “OD” (for Overdrive), “D” (for the normal Drive position), or “1–5” or “1–6” (for the complete gear range).
 *** Calibration dependent.
 †1–4 in Trailing Mode or 4-Speed Calibration.

Table 2–2. All 2100, 2300, and 2500 Transmissions With PB (Auto-Apply Parking Brake) Position

Shift Selector Position	Range	Shift Selector Position	Range	Shift Selector Position	Range
PB (Auto-Apply Parking Brake)	Neutral*	PB (Auto-Apply Parking Brake)	Neutral*	PB (Auto-Apply Parking Brake)	Neutral*
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive)**	1–5	D (Drive)**	1–5	D (Drive)**	1–5 (1–4)***

Table 2–2. All 2100, 2300, and 2500 Transmissions With PB (Auto-Apply Parking Brake) Position (cont'd)

Shift Selector Position	Range	Shift Selector Position	Range	Shift Selector Position	Range
4 (Fourth Range)	1–4	4 (Fourth Range)	1–4	3 (Third Range)	1–3
3 (Third Range)	1–3	2 (Second Range)	1–2	2 (Second Range)	1–2
1 (First Range)	1	1 (First Range)	1	1 (First Range)	1

* With Auto-Apply Parking Brake engaged
 ** The shift selector position representing this gear range may be labeled “5” (for the highest gear in the range), “OD” (for Overdrive), “D” (for the normal Drive position), or “1–5” (for the complete gear range).
 *** 1–4 in Trailing Mode or 4-Speed Calibration.

Table 2–3. All 1000 and 2000 Series Transmissions Without Either P (Park) or PB (Auto-Apply Parking Brake) Positions

Shift Selector Position	Range	Shift Selector Position	Range	Shift Selector Position	Range
R (Reverse)	Reverse	R (Reverse)	Reverse	R (Reverse)	Reverse
N (Neutral)	Neutral	N (Neutral)	Neutral	N (Neutral)	Neutral
D (Drive) **	1–5 (1–6) ***	D (Drive)**	1–5 (1–6) ***	D (Drive)**	1–5 (1–4)†
4 (Fourth Range)	1–4	4 (Fourth Range)	1–4	3 (Third Range)	1–3
3 (Third Range)	1–3	2 (Second Range)	1–2	2 (Second Range)	1–2
1 (First Range)	1	1 (First Range)	1	1 (First Range)	1

** The shift selector position representing this gear range may be labeled “5” or “6” (for the highest gear in the range), “OD” (for Overdrive), “D” (for the normal Drive position), or “1–5” or “1–6” (for the complete gear range).
 *** Calibration dependent.
 †1–4 in Trailing Mode or 4-Speed Calibration.

There are several features of the transmissions that can inhibit transmission shifting. See the [3.12 SHIFT INHIBITS](#) section of this manual.

With an Allison-equipped vehicle, selecting the right moment to upshift or downshift during changing road and traffic conditions is not necessary. The Allison transmission does it for you. However, knowledge of the ranges and when to select them will make vehicle control and your job even easier.

2.3 RANGE SELECTION—ALL 1000 AND 2000 SERIES TRANSMISSIONS WITH P (Park) POSITION

Table 2–4. ALL 1000 AND 2000 SERIES TRANSMISSIONS WITH P (Park) POSITION










PARK	
	<p>WARNING: The following steps in this section provide general vehicle guidelines regarding the use and operation of a park pawl. Vehicle manufacturers integrate Allison transmissions into vehicles used for a variety of vocations and services. The vehicle manufacturer is responsible for identifying the specific operating conditions to which the vehicle will be subjected and to communicate the appropriate means for preventing unintended vehicle movement within those conditions, in order to ensure vehicle and operator safety. The vehicle owner and operator should be aware of and follow the vehicle manufacturer's operating instructions and warnings related to parking and preventing unintended vehicle movement.</p>






Table 2-4. ALL 1000 AND 2000 SERIES TRANSMISSIONS WITH P (Park) POSITION (cont'd)

	<p>WARNING: For vehicles containing 1000 and 2000 Series Transmissions with P (Park) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:</p> <ol style="list-style-type: none"> 1. Bring the vehicle to a complete stop using the service brake. 2. Make sure the engine is at low idle rpm or turned off. 3. Move the gear selector to P (Park), then slowly release the service brake. Releasing the brake too quickly, especially on a steep grade, may prevent the park pawl from engaging. If the vehicle moves, immediately reapply the service brake and repeat the prior steps. 4. Apply the vehicle's parking/emergency brake and make sure it is properly engaged. 5. When parked facing downhill, turn the front wheels toward the curb. When parked facing uphill, turn the front wheels away from the curb. When no curb, turn the front wheels away from the street. 6. If operating the vehicle when not in the operator's seat (such as in a tow truck) or when parking on steep grades, chock the wheels and take any other steps necessary to keep the vehicle from moving and follow any specific vehicle operating manuals or warnings. <p>Failure to follow this procedure, may result in unintended vehicle movement which could result in death, serious personal injury or property damage.</p>
	<p>CAUTION: Attempting to engage P (Park) with the vehicle in motion (approximately 1.6 km/hr [1 mph] or higher) will result in ratcheting of the engagement mechanism and lack of engagement of the park pawl. The transmission may sustain damage as a result.</p>
	<p>CAUTION: If the vehicle has four-wheel-drive and the transfer case is in NEUTRAL, the vehicle may be free to roll even if the PARK position is selected. Be certain that the transfer case is in "high" drive range, not in NEUTRAL, whenever the vehicle is parked.</p> <p>If the vehicle is equipped with a two-speed axle or two-speed transfer case which is engaged in "low", even very slow vehicle speeds may produce appreciable transmission output shaft speed. Engagement of the park pawl in such cases may be deterred by even the slightest vehicle motion. Be certain that the axle or transfer case is in "high" drive range whenever the vehicle is parked and the park pawl is engaged.</p>


**Table 2–4. ALL 1000 AND 2000 SERIES TRANSMISSIONS
WITH P (Park) POSITION (cont'd)**

<p>P</p>	<p>Use P (Park) for the following:</p> <ul style="list-style-type: none"> • To turn the engine on or off • To check vehicle accessories • To operate the engine at idle for longer than five minutes • For stationary operation of the Power Takeoff (PTO) (if your vehicle is equipped with a PTO) <p>This position places the transmission in N (Neutral) and engages the park pawl.</p>
<p>REVERSE</p>	
	<p>WARNING: R (Reverse) may not be obtained due to an active inhibitor. Check for the illumination of the RANGE INHIBIT(ED) light or CHECK TRANS (MIL) light. See the 3.12 SHIFT INHIBITS section of this manual.</p>
	<p>WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from R (Reverse) to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.</p>
	<p>CAUTION: Do not idle in R (Reverse) for more than five minutes. Extended idling in R (Reverse) can cause transmission overheating and damage. Always select P (Park) whenever time at idle exceeds five minutes.</p>
<p>R</p>	<p>R (Reverse) is used to back up the vehicle. Completely stop the vehicle and let the engine return to idle before shifting from a forward range to R (Reverse) or from R (Reverse) to a forward range. The reverse warning signal is activated when the shift selector is in this position.</p>
<p>NEUTRAL</p>	
	<p>WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts to or from N (Neutral) without manually or automatically applying an appropriate vehicle brake.</p>
	<p>WARNING: DO NOT allow the vehicle to “coast” in N (Neutral). There is no engine braking in N (Neutral). You could lose control of the vehicle, causing property damage or personal injury. Coasting in neutral can cause severe transmission damage.</p>
<p>N</p>	<p>This position places the transmission in N (Neutral). Used for starting the engine and stationary operation.</p>




**Table 2–4. ALL 1000 AND 2000 SERIES TRANSMISSIONS
WITH P (Park) POSITION (cont'd)**

DRIVE	
	WARNING: D (Drive) and other forward ranges may not be obtained due to an active inhibitor. The range selected may not be obtained, resulting in unexpected vehicle movement. To help avoid injury and/or property damage, always apply the service brake when selecting D (Drive) or other forward ranges. Check for the RANGE INHIBIT(ED) light or the CHECK TRANS light.
	WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from a forward range to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.
	CAUTION: Do not idle in D (Drive) or any forward range for more than five minutes. Extended idling in D (Drive) can cause transmission overheating and damage. Always select P (Park) whenever time at idle exceeds five minutes.
	NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from N (Neutral) to D (Drive) or R (Reverse). D (Drive) or R (Reverse) will not be attained unless the shift is made with the engine at idle.
D*	Use D (Drive) for normal driving. The transmission will initially attain first range when D (Drive) is selected. As vehicle speed increases, the transmission will upshift automatically through each available range up to 4 (Fourth Range) or 5 (Fifth Range). As the vehicle slows, the transmission will downshift automatically.
MANUAL SELECT	
	WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.

**Table 2-4. ALL 1000 AND 2000 SERIES TRANSMISSIONS
WITH P (Park) POSITION (cont'd)**

	<p>WARNING: To help avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.</p>
<p>4** 3**</p>	<p>Use 4 (Fourth Range) or 3 (Third Range) for city traffic and braking on steep downgrades. Actual ranges available depend on programming by vehicle manufacturer.</p>
<p>3*** 2***</p>	<p>Use 3 (Third Range) or 2 (Second Range) for heavy city traffic and braking on steeper downgrades. Actual ranges available depend on programming by vehicle manufacturer.</p>
<p>1</p>	<p>Use 1 (First Range) for the following:</p> <ul style="list-style-type: none"> • When pulling through mud and deep snow • When maneuvering in tight spaces • While driving up or down very steep grades <p>1 (First Range) provides the vehicle with its maximum driving torque and maximum engine braking effect.</p>
<p>* The shift selector position representing this gear range may be labeled "5" or "6" (for the highest gear in the range), "OD" (for Overdrive), "D" (for the normal Drive position), "1-5" or "1-6" (for the complete gear range) ** 3 for shift selectors with P, R, N, D, 3, 2, 1 *** 3 for shift selectors with P, R, N, D, 4, 3, 1</p>	

2.4 RANGE SELECTION—ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION

ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION	
PARKING BRAKE	
	<p>WARNING: For vehicles containing 2100, 2300, and 2500 transmissions with PB (Auto-Apply Parking Brake) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:</p> <ol style="list-style-type: none"> 1. Bring the vehicle to a complete stop using the service brake. 2. Make sure the engine is at low idle rpm. 3. Put the transmission in PB (Auto-Apply Parking Brake). Make sure the parking brake is properly engaged. 4. Apply the emergency brakes and make sure they are properly engaged. 5. Chock the wheels and take any other steps necessary to keep the vehicle from moving. <p>If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.</p>
PB	<p>Use PB (Auto-Apply Parking Brake) for the following:</p> <ul style="list-style-type: none"> • To turn on or turn off the engine • To check vehicle accessories • To operate the engine at idle for longer than five minutes • For stationary operation of the power takeoff (if your vehicle is equipped with a PTO) <p>This position places the transmission in N (Neutral) and engages the park pawl.</p>
REVERSE	
	<p>WARNING: R (Reverse) may not be obtained due to an active inhibitor. Check for the illumination of the RANGE INHIBIT(ED) light or CHECK TRANS (MIL) light. See the 3.12 SHIFT INHIBITS section of this manual.</p>
	<p>WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from R (Reverse) to N (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting N (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.</p>

ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION



CAUTION: Do not idle in **R** (Reverse) for more than five minutes. Extended idling in **R** (Reverse) can cause transmission overheating and damage. Always select **P** (Park) whenever time at idle exceeds five minutes.

R

R (Reverse) is used to back the vehicle. Completely stop the vehicle and let the engine return to idle before shifting from a forward range to **R** (Reverse) or from **R** (Reverse) to a forward range. The reverse warning signal is activated when the shift selector is in this position.

NEUTRAL



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts to or from **N** (Neutral) without manually or automatically applying an appropriate vehicle brake.



WARNING: DO NOT allow the vehicle to “coast” in **N** (Neutral). There is no engine braking in **N** (Neutral). You could lose control of the vehicle, causing property damage or personal injury. Coasting in neutral can cause severe transmission damage.

N

This position places the transmission in **N** (Neutral). Used for starting the engine and stationary operation.

DRIVE



WARNING: **D** (Drive) and other forward ranges may not be obtained due to an active inhibitor. The range selected may not be obtained, resulting in unexpected vehicle movement. To help avoid injury and/or property damage, always apply the service brake when selecting **D** (Drive) or other forward ranges. Check for the **RANGE INHIBIT(ED)** light or the **CHECK TRANS** light.



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from a forward range to **N** (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting **N** (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.



CAUTION: Do not idle in **D** (Drive) or any forward range for more than five minutes. Extended idling in **D** (Drive) can cause transmission overheating and damage. Always select **P** (Park) whenever time at idle exceeds five minutes.



NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from **N** (Neutral) to **D** (Drive) or **R** (Reverse). **D** (Drive) or **R** (Reverse) will not be attained unless the shift is made with the engine at idle.

ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION

D*

Use **D** (Drive) for normal driving. The transmission will initially attain first range when **D** (Drive) is selected. As vehicle speed increases, the transmission will upshift automatically through each available range up to **4** (Fourth Range) or **5** (Fifth Range). As the vehicle slows, the transmission will downshift automatically.

* The shift selector position representing this gear range may be labeled “5” or “6” (for the highest gear in the range), “OD” (for Overdrive), “D” (for the normal Drive position), “1-5” or “1-6” (for the complete gear range).

MANUAL SELECT



WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.



WARNING: To help avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

3*

Use **4** (Fourth Range) or **3** (Third Range) for city traffic and braking on steep downgrades.

* **3** for shift selectors with **P, R, N, D, 3, 2, 1**

Actual ranges available depend on programming by vehicle manufacturer.

3*

Use **3** (Third Range) or **2** (Second Range) for heavy city traffic and braking on steeper downgrades.

* **3** for shift selectors with **P, R, N, D, 4, 3, 1**

Actual ranges available depend on programming by vehicle manufacturer.

ALL 2000 SERIES TRANSMISSIONS WITH PB (Auto-Apply Parking Brake) POSITION

1

Use 1 (First Range) for the following:

- When pulling through mud and deep snow
- When maneuvering in tight spaces
- While driving up or down very steep grades

1 (First Range) provides the vehicle with its maximum driving torque and maximum engine braking effect.

2.5 RANGE SELECTION—ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK) OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS

ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK) OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS

PARKING



WARNING: For vehicles containing 1000 and 2000 Series transmissions without either P (Park) or PB (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:

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

If the procedure is not followed, the vehicle may move suddenly and cause injury and/or property damage.

REVERSE



WARNING: **R** (Reverse) may not be obtained due to an active inhibitor. Check for the illumination of the **RANGE INHIBIT(ED)** light or **CHECK TRANS (MIL)** light. See the **3.12 SHIFT INHIBITS** section of this manual.

ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK) OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from **R** (Reverse) to **N** (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting **N** (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.



CAUTION: Do not idle in **R** (Reverse) for more than five minutes. Extended idling in **R** (Reverse) can cause transmission overheating and damage. Always select **P** (Park) whenever time at idle exceeds five minutes.

R

R (Reverse) is used to back the vehicle. Completely stop the vehicle and let the engine return to idle before shifting from a forward range to **R** (Reverse) or from **R** (Reverse) to a forward range. The reverse warning signal is activated when the shift selector is in this position.

NEUTRAL



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts to or from **N** (Neutral) without manually or automatically applying an appropriate vehicle brake.



WARNING: DO NOT allow the vehicle to “coast” in **N** (Neutral). There is no engine braking in **N** (Neutral). You could lose control of the vehicle, causing property damage or personal injury. Coasting in neutral can cause severe transmission damage.

N

Use **N** (Neutral) for the following:

- To turn on or turn off the engine
- To check vehicle accessories
- To operate the engine at idle for longer than five minutes
- For stationary operation of the power takeoff (if your vehicle is equipped with a PTO)

DRIVE



WARNING: **D** (Drive) and other forward ranges may not be obtained due to an active inhibitor. The range selected may not be obtained, resulting in unexpected vehicle movement. To help avoid injury and/or property damage, always apply the service brake when selecting **D** (Drive) or other forward ranges. Check for the **RANGE INHIBIT(ED)** light or the **CHECK TRANS** (MIL) light.

ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK) OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not make shifts from a forward range to **N** (Neutral) without applying the service brakes, parking brake, or emergency brake. Selecting **N** (Neutral) does not apply vehicle brakes unless an auxiliary system to apply a parking brake is installed.



CAUTION: Do not idle in **D** (Drive) or any forward range for more than five minutes. Extended idling in **D** (Drive) can cause transmission overheating and damage. Always select **P** (Park) whenever time at idle exceeds five minutes.



NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from **N** (Neutral) to **D** (Drive) or **R** (Reverse). **D** (Drive) or **R** (Reverse) will not be attained unless the shift is made with the engine at idle.

D*

Use **D** (Drive) for normal driving. The transmission will initially attain **1** (First Range) when **D** (Drive) is selected. As vehicle speed increases, the transmission will upshift automatically through each available range up to **4** (Fourth Range) or **5** (Fifth Range). As the vehicle slows, the transmission will downshift automatically. The shift selector position representing this gear range may be labeled “**5**” or “**6**” (for the highest gear in the range), “**OD**” (for Overdrive), “**D**” (for the normal Drive position), “**1–5**” or “**1–6**” (for the complete gear range).

MANUAL SELECT



WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.



WARNING: To help avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

**ALL 1000 AND 2000 SERIES TRANSMISSIONS WITHOUT EITHER P (PARK)
OR PB (AUTO-APPLY PARKING BRAKE) POSITIONS**

3*	Use 4 (Fourth Range) or 3 (Third Range) for city traffic and braking on steep downgrades. *3 for shift selectors with R, N, D, 3, 2, 1 Actual ranges available depend on programming by vehicle manufacturer.
3*	Use 3 (Third Range) or 2 (Second Range) for heavy city traffic and braking on steeper downgrades. *3 for shift selectors with R, N, D, 4, 3, 1 Actual ranges available depend on programming by vehicle manufacturer.
1	Use 1 (First Range) for the following: <ul style="list-style-type: none">• When pulling through mud and deep snow• When maneuvering in tight spaces• While driving up or down very steep grades 1 (First Range) provides the vehicle with its maximum driving torque and maximum engine braking effect.

3.0 DRIVING TIPS

3.1 MAXIMUM VEHICLE LOADING



WARNING: Operation with excessive loads can cause transmission damage and unexpected vehicle movement. To help avoid injury, property damage and/or transmission damage, do not exceed the following:

- For 1000, 2100, and 2200 transmissions, do not exceed 26,000 lb (11 800 kg) GCW or the OEM vehicle rating, whichever is less.
- For B210, and B220 transmissions, do not exceed 29,000 lb (13 150 kg) GCW or the OEM vehicle rating, whichever is less.
- For 1350, 2100, 2350 and 2550 transmissions, do not exceed 30,000 lb (13 600 kg) GCW or the OEM vehicle rating, whichever is less.
- For 2300 and 2500 transmissions, do not exceed 33,000 lb (15 000 kg) GCW or the OEM rating, whichever is less.

3.2 PREVENT MAJOR PROBLEMS

Minor problems can be kept from becoming major problems if you notify an Allison Transmission distributor or dealer when any of these conditions occur:

- Shifting feels abnormal.
- Transmission leaks fluid.
- Unusual transmission-related sounds (changes in sound caused by normal engine thermostatic fan cycling, while climbing a long grade with a heavy load, have been mistaken for transmission-related sounds).
- **CHECK TRANS** light or **RANGE INHIBIT(ED)** light comes on frequently.
- **SERVICE TRANS** light remains illuminated, if present.

3.3 TURNING THE VEHICLE ON/OFF

Before turning on or off the engine, the driver must verify that the service brake is engaged and one of the following selector positions has been selected and engaged:

- **P** (Park)
- **PB** (Auto-Apply Parking Brake)
- **N** (Neutral) if **P** (Park) or **PB** (Auto-Apply Parking Brake) is not available



NOTE: The vehicle should not start unless one of these selector positions has been selected. If the vehicle starts in any other selector position, seek service immediately.

Transmission operation at cold ambient temperatures may require preheating or the use of a lower viscosity transmission fluid. See the [6.5 FLUID RECOMMENDATIONS](#) section in this manual.

Even when the engine is warm and capable of full-throttle output, the transmission should not be taken out of **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral) for at least thirty seconds to allow for buildup of transmission fluid pressure.

3.4 ACCELERATOR CONTROL



WARNING: To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from **N** (Neutral) to a forward range or **R** (Reverse) when the throttle is open. The vehicle will lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from **N** (Neutral) to a forward range or **R** (Reverse) only when the throttle is closed and service brakes are applied.

The position of the accelerator pedal influences when automatic shifting occurs. When the pedal is fully depressed, upshifts will occur automatically at higher engine speeds. A partially depressed position of the pedal will cause upshifts to occur at lower engine speeds. An electronic throttle position signal tells the TCM how much the operator has pressed the pedal. Excessive throttle position may inhibit a directional shift.

3.5 PRIMARY/SECONDARY SHIFT SCHEDULES

3.5.1 SHIFT SCHEDULES.

The points at which shifts occur depend upon predetermined speeds and other operating conditions. A transmission “shift calibration” includes several sets of shift points which may be used according to current or anticipated operating conditions. Some shift schedules may be inhibited as a result of operating conditions, such as engine or transmission fluid temperature. Shift schedules may be changed through selection of a remote (usually dash-mounted) switch—which is typically associated with a change in anticipated vehicle operation.

The TCM includes the capacity for two separate and distinct shift calibrations (customer-selectable), one for use in “Primary Mode” of operation and one in “Secondary Mode.”

- **Primary**—This shift schedule is typically used for all normal vehicle operations.
- **Secondary**—This is an alternate shift schedule that the TCM uses upon request. Not all vehicles will be equipped with a secondary shift schedule. The request can be interlocked with a vehicle component, or be operator-controlled via a dash-mounted switch.

Your vehicle may have a dash-mounted light that illuminates when the secondary mode is active.

3.5.2 DYNAMIC SHIFT SENSING (DSS) (MH, BUS, HS, PTS, and RDS Models).



NOTE: DSS was known as Load-Based Shift Scheduling (LBSS) prior to July 2014.

Vehicles equipped with DSS do not require the operator to change selection of primary and secondary shift schedules manually and no longer require a dash-mounted OEM-installed switch or Mode button for shift schedule selection. This is because DSS *automatically* selects the appropriate shift schedule based on vehicle load and operating conditions.

DSS selects between Economy and Performance shift schedules based on the vehicle's current estimated payload (determined by acceleration rate and requested power) and the grade on which the vehicle is operating. This optimizes fuel economy while maintaining performance on vehicles so equipped.

DSS has been optimized to include a Super Economy Shift Schedule (SESS). This enhancement allows earlier up-shift under cruising conditions to further

improve fuel economy. Cruise is defined as driving with low to no acceleration at a given road speed.

Fuel economy enhancement features available on some former models are improved with the current controls due to the use of an inclinometer (a device that senses road grade) contained in current TCMs.

3.5.3 ALLISON TRANSMISSION FuelSense® 2.0.

Vehicles equipped with an Allison Transmission and a FuelSense® 2.0 package will save fuel when compared to vehicles without the package, depending on the duty cycle.

FuelSense® 2.0 is an initiative that groups software and calibration fuel economy features into packages that can be easily selected when specifying a TCM calibration in the Allison Calibration Configuration Tool (ACCT).

With the introduction of FuelSense® 2.0 packages, more descriptive feature designations have been created. Refer to [Table 3–1](#) for FuelSense® 2.0 features and package designations.

Table 3–1. FuelSense® 2.0 Features and Package Designations

Former Terminology	FuelSense® 2.0 Terminology	FuelSense® 2.0	FuelSense® 2.0 Plus	FuelSense® 2.0 Max
Low Speed Shift Calibrations	EcoCal	X	X	X
Load-Based Shift Scheduling (LBSS)	Dynamic Shift Sensing (DSS)	X	X	X
Acceleration Based Mode Switch (ABMS)				
Neutral at Stop (NAS)	Neutral at Stop Standard or Neutral at Stop Premium		X	X
Vehicle Acceleration Control (VAC)	Acceleration Rate Management			X

3.5.3.1 FuelSense® 2.0 Terminology Descriptions

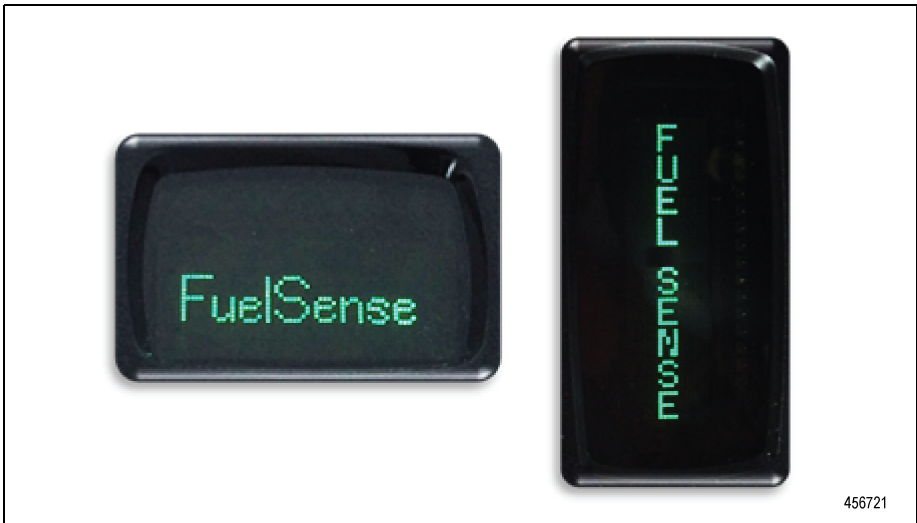
- **EcoCal:** EcoCal describes lower engine speed shift schedules designed to match the engine and duty cycle, maintain optimum engine speed, perform torque converter lockup as soon as possible, and provide necessary performance without shift cycling.
- **Dynamic Shift Sensing:** Dynamic Shift Sensing is a feature that automatically selects between EcoCal and higher speed shift schedules based on the vehicle's actual payload and the grade on which it's operating.
- **Neutral at Stop:** Neutral at Stop is a feature that reduces or eliminates the load on the engine while the vehicle is stopped, thus reducing fuel usage and emissions.
- **Acceleration Rate Management:** Acceleration Rate Management is an engine management function where the TCM manages engine torque to limit vehicle acceleration to a calibrated rate. This function will allow full torque from the engine if the vehicle is unable to reach the calibrated acceleration rate, such as on steep grades or when the vehicle is heavy. This function may be used for the following:
 - To improve fuel efficiency.
 - To reduce tire wear.
 - To reduce acceleration aggressiveness.
 - To provide for consistent acceleration in loaded and unloaded conditions.
- **DynActive® Shifting:** DynActive® Shifting is a continuously-variable method of shift scheduling. Instead of using a shift point table with defined shift points (such as 2000 rpm S1 performance), DynActive® Shifting chooses the most efficient shift point based on the current environmental and vehicle conditions. DynActive® achieves the best fuel economy for a specified level of performance. Vehicle information such as torque, speed, grade, mass, etc. are constantly analyzed to pick the most efficient shift speed. DynActive® Shifting is required in all FuelSense® 2.0 packages.

3.5.3.2 FuelSense® 2.0 DRIVER INDICATOR (with FuelSense® 2.0 Package)



NOTE: The TCM software must be configured to enable FuelSense® 2.0 in order for the FuelSense® 2.0 driver indicator initialization screen to appear. A New Parameter Option is provided in ACCT/Vehicle Electronic Programming Stations (VEPS) Programming Guides that must be answered in order to configure FuelSense® 2.0.

Vehicles equipped with a FuelSense® 2.0 package will include a display of the FuelSense® 2.0 logo. At the discretion of the OEM, vehicles not equipped with an Allison shift selector display can provide the FuelSense® 2.0 message on a dash display. The Allison shift selector will display the “Allison Transmission” initialization screen followed by a “FuelSense® 2.0” screen upon vehicle startup (refer to [Figure 3-1](#)).



456721

Figure 3-1. FuelSense® 2.0 Display

3.6 KICKDOWN

Some vehicles have a “kickdown” feature that allows the operator to choose between an “Economy” primary shift schedule and “Performance” secondary shift schedule. The throttle pedal will have a detent feel when full-throttle is achieved using “Economy” shift points. When the operator “steps through” this detent, the function is activated and “Performance” shift points are achieved.

3.7 OUTPUT SPEED INDICATOR

Your vehicle may contain a light or other indicator that is activated when a preset output speed has been exceeded in the vehicle, transmission, or auxiliary equipment. The output speed may occur in either the forward or reverse direction. This indicator may be used to alert the operator that a specific overspeed condition has occurred or to indicate that a minimum or maximum operating speed was attained.

3.8 DIAGNOSTIC CODES

See detailed information in the [7.0 DIAGNOSTICS](#) section.

3.9 RANGE INHIBIT(ED) LIGHT

3.9.1 RANGE INHIBITED WARNING LIGHT. The red or amber **RANGE INHIBIT(ED)** warning light is located on or near the shift selector. The purpose of this indicator is to alert the operator that transmission operation is being inhibited and that range shifts being requested by the operator may not occur. When certain operating conditions are detected by the TCM, the controls will command the transmission to be locked in the range currently in use. If the torque converter clutch is applied when the condition is detected, the clutch will be disengaged concurrently with the activation of the **RANGE INHIBIT(ED)** light.

Each time the engine is started, the **RANGE INHIBIT(ED)** light will illuminate, then turn off after two seconds. If the light does not illuminate during ignition, or if the light remains on after ignition, the transmission system should be checked immediately.

For the conditions under which shift inhibits occur, see the **SHIFT INHIBITS** [3.12 SHIFT INHIBITS](#) section in this manual.



NOTE: If the **RANGE INHIBIT(ED)** warning light flashes, it may indicate that COTP is active.

3.9.1.1 CONVERTER OVER-TEMP TORQUE PROTECTION (COTP)

- Purpose
 - Alerts the driver to a torque converter over-temperature condition.
 - Limits the time that the torque converter can be stalled at full power to prevent torque converter damage (*if the vehicle is equipped to limit engine rpm by SEM or LRTP*) while maintaining an acceptable level of driver control during normal operation.

Engine rpm cannot be controlled for non-SEM applications. Only SEM or LRTP equipped vehicles will be able to offer torque limits. On vehicles without SEM or LRTP, only the **RANGE INHIBIT(ED)** light will be flashed.

- Functionality
 - Converter slip speed is controlled via engine torque limiting to regulate converter temperatures to acceptable levels.
 - **RANGE INHIBIT(ED)** light flashes 1 second before and during torque reduction.
- Criteria for activating COTP
 - First level of COTP (**RANGE INHIBIT(ED)** light flashes)
 - Difference of at least 1400 rpm or greater between engine speed and transmission input speed
 - 25% throttle or greater
 - Less than 100 rpm transmission output speed
 - All conditions above must be maintained for at least sixteen seconds to activate first level of COTP (less if initial converter temp predicted hot)
 - Second level of COTP (Engine Speed will be limited to 900 rpm and **RANGE INHIBIT(ED)** light flashes)
 - Difference of at least 1400 rpm or greater between engine speed and transmission input speed
 - 25% throttle or greater
 - Less than 100 rpm transmission output speed
 - Twenty-three seconds total of throttle and output conditions being met

Once you exit the COTP condition, a software counter will count back sixteen seconds before full engine rpm is available.



NOTE: (Only SEM or LRTP equipped vehicles will be able to offer torque limits. Otherwise, only the range inhibit light will be flashed.)

3.10 CHECK TRANS OR MALFUNCTION INDICATOR LIGHT (MIL)

The red or amber **CHECK TRANS** indicator or Malfunction Indicator Light (MIL) is located on the dash panel. A MIL is present on vehicles that meet

industry On-Board Diagnostics II (OBD II) requirements. A **CHECK TRANS** indicator is present on vehicles not subject to industry OBD II requirements.

Each time the engine is started, the **CHECK TRANS** indicator or MIL will illuminate, then turn off after two seconds. If the indicator does not illuminate during ignition, or if the indicator remains on after ignition, the transmission system should be checked immediately.

Illumination of the MIL or **CHECK TRANS** indicator at any time after start-up indicates that a problem has been detected. The TCM will register a DTC and shifts may be restricted. Depending upon the severity of the problem, operation may continue in order to reach service assistance. The TCM may not respond to shift selector requests since upshifts and downshifts may be restricted and direction changes may not occur.

Illumination of the MIL or **CHECK TRANS** indicator at any time after start-up may indicate a problem with the engine or transmission, refer to the **DIAGNOSTICS** section for more information on diagnostic codes.



CAUTION: Do not drive the vehicle for any longer than one-half hour after the MIL or **CHECK TRANS** indicator illuminates. Continued operation of the vehicle for more than thirty minutes after the Check Trans or Malfunction Indicator Light illuminates is not recommended. This thirty-minute window is intended to allow the operator to reach service assistance.

3.11 DIAGNOSTIC CODES OVERVIEW

Refer to detailed information in the [7.0 DIAGNOSTICS](#) section.

3.12 SHIFT INHIBITS

The transmission control system will inhibit shifting to protect the transmission from some types of abusive operation, in response to diagnostic trouble codes, and to satisfy transmission feature/option requirements. These shift inhibits fall within the following types:

- Above-idle **N** (Neutral)-to-range shifts
- Forward/reverse directional shifts
- Transmission problems
- Auxiliary equipment operation

3.12.1 ABOVE-IDLE NEUTRAL-TO-RANGE SHIFTS.

Above-idle (greater than 900 rpm in current Allison transmissions) shifts from **N** (Neutral) to **R** (Reverse) or **N** (Neutral) to a forward range are normally inhibited (except in emergency vehicles or some other type of specialized equipment).



WARNING: To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from **N** (Neutral) to a forward range or **R** (Reverse) when the throttle is open. The vehicle will lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from **N** (Neutral) to a forward range or **R** (Reverse) only when the throttle is closed and service brakes are applied.

When these shifts are inhibited, the **RANGE INHIBIT(ED)** light illuminates. See the [3.9 RANGE INHIBIT\(ED\) LIGHT](#) section in this manual for further information.

3.12.2 FORWARD/REVERSE DIRECTIONAL SHIFTS.

Forward/reverse directional changes are typically not permitted if appreciable output shaft speed is detected.



WARNING: To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from **N** (Neutral) to a forward range or **R** (Reverse) when the throttle is open. The vehicle will lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from **N** (Neutral) to a forward range or **R** (Reverse) only when the throttle is closed and service brakes are applied.

When these shifts are inhibited, the **RANGE INHIBIT(ED)** light illuminates. See the [3.9 RANGE INHIBIT\(ED\) LIGHT](#) section in this manual for further information.

3.12.3 TRANSMISSION PROBLEMS. Lights such as the **RANGE INHIBIT(ED)**, **CHECK TRANS**, or **MIL**, and a flashing **PRNDL** display are illuminated when the transmission detects a functional concern.

An illuminated **RANGE INHIBIT(ED)** light or a flashing **PRNDL** display indicates the TCM has detected a condition in which directional shifts are not allowed to be made. This inhibited state can be a self-clearing or lasting condition depending on the amount of time the condition is present.

The following conditions may cause an inhibited state:

- Engine speed too high
- Throttle percentage incorrect
- Output speed movement

See the [3.9 RANGE INHIBIT\(ED\) LIGHT](#) or [3.10 CHECK TRANS OR MALFUNCTION INDICATOR LIGHT \(MIL\)](#) section in this manual for further information.

Depending on the severity of the DTC, the transmission may default to an operating state predefined by the TCM such as Limp Home. Limp Home mode temporarily limits normal transmission operation until the vehicle can be driven to a service location and the severity of the problem is determined. The transmission remains in the Limp Home mode until the problem has been corrected. Following an engine restart, the transmission may obtain **3** (Third Range), **N** (Neutral), or **R** (Reverse). Refer to the Sales and Service Directory (SA2229EN) for the current listing of Allison Transmission authorized distributor and service dealers.

3.12.4 AUXILIARY EQUIPMENT OPERATION. The TCM prevents shifts from **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral)-to-range when auxiliary equipment is in operation (such as a wheelchair lift). For some vehicles, such as buses, shifts from **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral)-to-range are prevented unless the brake pedal is pressed.

3.13 USING THE ENGINE TO SLOW THE VEHICLE



WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.



WARNING: To help avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

To use the engine as a braking force, select the next lower range. If the vehicle is exceeding the maximum speed for this range, use the service brakes and/or other retarding devices to slow the vehicle. When a lower speed is reached, the TCM will automatically downshift the transmission. Engine braking provides good speed control for going down grades. When the vehicle is heavily loaded, or the grade is steep, it may be desirable to preselect a lower range before reaching the grade. If the engine-governed speed is exceeded, the transmission will upshift automatically to the next range.



WARNING: Using the retarder or engine brake on wet or slippery roads may cause loss of traction on the drive wheels—your vehicle may slide out of control. To help avoid injury or property damage, turn the retarder or engine brake enable to OFF when driving on wet or slippery roads.

3.14 RANGE PRESELECTION

Range preselection means selecting a lower range to match driving conditions encountered or expect to be encountered. Learning to take advantage of preselected shifts will give you better control on slick or icy roads and on downgrades.

Downshifting to a lower range increases engine braking. The selection of a lower range often prevents cycling between that range and the next higher range on a series of short up-and-down hills.



NOTE: Preselecting during normal operation may result in reduced fuel economy.

Manual range downshifts will not occur until a calibrated value of output speed is reached. When a range downshift is manually selected and the transmission output speed is above the calibrated value, the transmission will stay in the range it was in even though a lower range was requested. Apply the vehicle service brakes or some retarding device to reduce the transmission output speed to the calibrated value and then the shift to the lower range will occur.

Two shift schedules are used with range preselection: hold upshift and preselect downshift.

3.14.1 HOLD UPSHIFT. This shift schedule keeps the transmission from shifting above the selected range. This shift schedule permits upshifts to occur if an engine overspeed condition could result by the transmission remaining (by operator selection) in a range lower than its highest range. When the hold feature is activated, transmission upshift points occur at engine speeds which are higher than normal upshifts in order to “hold” the transmission from upshifting beyond the current range.



WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, select a lower transmission range. If the engine governed speed is exceeded in the held range, however, the transmission will upshift to the next higher range to prevent engine damage. To help avoid injury and/or property damage due to loss of vehicle control, use the vehicle brakes to prevent exceeding engine governed speed in the held range.

3.14.2 PRESELECT DOWNSHIFT. This shift schedule is used when the driver preselects a lower range. The operator may preselect any range below **D** (Drive) on the shift selector at any time. When a range has been “preselected” in this manner, shift points to and from ranges above the preselected range are higher than the normal shift points. The transmission will downshift when an engine overspeed condition will not result after the shift. Shifts below the preselected range are not affected.

3.15 REVERSE

Putting the transmission into **R** (Reverse) may activate vehicle backup lights and/or reverse warning devices.

3.16 REFUSE PACKER STEP SWITCH (RDS and INT Models)

When personnel are on the rear step of a refuse packer, the transmission will operate in **1** (First Range) and **N** (Neutral) only.

- An operator request to upshift beyond **1** (First Range) or to shift to **R** (Reverse) is ignored by the TCM.
- If the transmission is in **R** (Reverse), the TCM will cause the transmission to shift to **N** (Neutral).
- If the transmission is in a forward range higher than **1** (First Range), the TCM will invoke “preselect downshifts” until **1** (First Range) is attained.

3.17 TWO-SPEED AXLE (RDS, INT, EVS, HS, and BUS Models)

The two-speed axle may be shifted while the vehicle is moving. However, the axle or vehicle manufacturer’s recommendations should be followed for shifting the axle. It is recommended that axle shifts be made with the transmission in the highest range, or vehicle stopped, to prevent a transmission shift from coinciding with an axle shift.

3.18 DRIVING ON SNOW OR ICE

If possible, reduce your vehicle speed and select a lower range before losing traction. Select the range that will not exceed the speed expected to be maintained. Accelerate or decelerate very gradually to prevent the loss of traction. It is very important to decelerate gradually when a lower range is selected. It is important that you reach the selected lower range before attempting to accelerate. This will avoid an unexpected downshift during acceleration.



NOTE: If ABS is activated, the lockup clutch is automatically disengaged.

3.19 ROCKING OUT



WARNING: To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from **N** (Neutral) to **D** (Drive) or **R** (Reverse) when the engine is above low idle rpm. The vehicle may lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from **N** (Neutral) to a forward range or **R** (Reverse) only when the throttle is closed and the service brakes are applied.



CAUTION: If the wheels are stuck and not turning, do not apply full power for more than 10 seconds in either **D** (Drive) or **R** (Reverse). Full power for more than 10 seconds under these conditions will cause the transmission to overheat. If the transmission overheats, shift to **N** (Neutral) and operate the engine at 1200–1500 rpm until it cools (2–3 minutes).

If the vehicle is stuck in deep sand, snow, or mud, it may be possible to rock it out. Shift to **D** (Drive) and apply steady, light throttle (never full throttle). When the vehicle has rocked forward as far as it will go, apply and hold the vehicle service brakes. Allow the engine to return to idle; then select **R** (Reverse). Release the brakes and apply a steady, light throttle allowing the vehicle to rock in **R** (Reverse) as far as it will go. Again, apply and hold the service brakes and allow the engine to return to idle. This procedure may be repeated in **D** (Drive) and **R** (Reverse) if each directional shift continues to move the vehicle a greater distance. Never make **N** (Neutral)-to-**D** (Drive) or directional shift changes when the engine rpm is above idle.

3.20 OPERATING TEMPERATURES

To properly operate the transmission, adhere to the following minimum and maximum transmission operating temperatures:

Sump, minimum continuous	40°C (100°F)
Sump, maximum intermittent	121°C (250°F)
To cooler, maximum intermittent	149°C (300°F)

Your transmission may have a converter-out transmission temperature gauge near the “to-cooler” port on the transmission converter housing.

3.21 HIGH FLUID TEMPERATURE



CAUTION: Always select **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral) whenever time at idle exceeds five minutes. Extended idling in any other ranges can cause transmission overheating and damage.



CAUTION: Sustained use of the parking brake with the engine running and the transmission in range can cause an overheating failure of the transmission. The vehicle can contain a buzzer or dash-mounted light to alert the operator when the ignition switch is “ON”, the parking brake is applied, and the transmission selector is in range.



CAUTION: The engine should never be operated for more than 10 seconds at full throttle with the transmission in range and the output stalled. Prolonged operation of this type will cause the transmission fluid temperature to become excessively high and will cause severe overheat damage to the transmission.

Your vehicle may have a dash indicator or other alarm that turns on when the transmission sump temperature or to-cooler temperature exceeds specified limits.

If the transmission overheats during normal operations, do the following:

- Check the fluid level in the transmission. See the [6.0 CARE AND MAINTENANCE](#) section of this manual.
- Safely stop the vehicle and check the cooling system. If it appears to be functioning properly, run the engine at 1200–1500 rpm with the transmission in **N** (Neutral). This should reduce the transmission and engine temperatures to normal operating levels in 2 or 3 minutes. If temperatures do not decrease, reduce the engine rpm.
- If high temperature in either the engine or transmission persists, stop the engine and have the overheating condition investigated by service management.

3.22 PARKING BRAKE

For shift selectors with a **PB** (Auto-Apply Parking Brake) position, selecting **PB** (Auto-Apply Parking Brake) places the transmission in **N** (Neutral) and automatically engages the parking brake. For shift selectors without a **PB** (Auto-Apply Parking Brake) position, the parking brake must be manually engaged. Your vehicle may have an indicator light that illuminates when the parking brake is applied.



CAUTION: Do not apply the transmission-mounted parking brake with the vehicle in motion. Transmission and/or driveline damage can result. In the event of a dynamic brake apply, recheck the torque of all brake mounting bolts to verify the integrity of the mount.



CAUTION: Sustained use of the parking brake with the engine running and the transmission in range can cause an overheating failure of the transmission. The vehicle can contain a buzzer or dash-mounted light to alert the operator when the ignition switch is “ON”, the parking brake is applied, and the transmission selector is in range.

3.23 PARK PAWL

A park pawl is standard on 1000, 1350, 2200, 2350 and 2550 transmissions and is not available on 2000, 2100 and 2500 transmissions. The park pawl effectively grounds the transmission output shaft, thereby preventing rotation of the driveline. Provided the vehicle is stationary, selecting **P** (Park) on the shift selector places the transmission in **N** (Neutral) and engages the park pawl. The park pawl exists but cannot be engaged in some vehicle configurations using 1000, 1350, 2200, 2350 and 2550 transmissions (e.g., some rear engine vehicles with air brakes). For these configurations, the **P** (Park) position is not used.



WARNING: To help avoid injury and/or property damage caused by unexpected vehicle movement, do not attempt to engage **P** (Park) with the vehicle in motion (2 km/hr (1 mph) or higher). If you attempt to engage **P** (Park) with the vehicle in motion (2 km/hr (1 mph) or higher), the park pawl will ratchet, will not engage, and will not hold the vehicle. Repeated park pawl ratcheting can cause transmission damage.



WARNING: If the vehicle has four-wheel-drive and the transfer case is in Neutral, the vehicle can be free to roll even if the **P** (Park) position is selected. To help avoid injury and/or property damage caused by unexpected movement of the vehicle, be certain that the transfer case is in “high” drive range, not Neutral, whenever the vehicle is parked.



WARNING: If the vehicle is equipped with a two-speed axle or two-speed transfer case which is engaged in “low”, even very low vehicle speeds can produce appreciable transmission output shaft speed. Even the slightest vehicle motion can deter engagement of the park pawl in such cases. To help avoid injury and/or property damage caused by unexpected vehicle movement, be certain that the axle or transfer case is in “high” drive range whenever the vehicle is parked and the park pawl is engaged.

3.23.1 TORQUE LOCK. If the vehicle is parked on an incline and **P** (Park) is properly engaged, the weight of the vehicle may generate an excessive amount of torque on the park pawl in the transmission. In this situation, it may be difficult to shift the transmission out of the **P** (Park) position. This condition is commonly called “torque lock.” To alleviate torque lock, do the following:

1. Taking the vehicle’s weight into consideration, push the vehicle uphill a small amount to release the pressure on the park pawl and permit a shift out of **P** (Park).
2. Shift the transmission out of **P** (Park) while applying the service brakes.
3. Release the parking brake.

3.24 PARKING/LEAVING VEHICLE WITH ENGINE RUNNING



WARNING: For vehicles containing 1000 and 2000 Series transmissions with **P** (Park) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:

1. Bring the vehicle to a complete stop using the service brake.
2. Make sure the engine is at low idle rpm or turned off.
3. Move the gear selector to **P** (Park), then slowly release the service brake. Releasing the brake too quickly, especially on a steep grade, may prevent the park pawl from engaging. If the vehicle moves, immediately reapply the service brake and repeat the prior steps.
4. Apply the vehicle's parking/emergency brake and make sure it is properly engaged.
5. If operating the vehicle when not in the operator's seat (such as in a tow truck) or when parking on steep grades, besides engaging the park pawl and applying the parking brake also chock the wheels and take any other steps necessary to keep the vehicle from moving and follow any specific vehicle operating manuals or warnings.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.



WARNING: For vehicles containing 1000 and 2000 Series transmissions with **PB** (Auto-Apply Parking Brake) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:

1. Bring the vehicle to a complete stop using the service brake.
2. Make sure the engine is at low idle rpm.
3. Put the transmission in **PB** (Auto-Apply Parking Brake).
4. Apply the emergency brakes and make sure they are properly engaged.
5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.



WARNING: For vehicles containing 1000 and 2000 Series transmissions without either **P** (Park) or **PB** (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:

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

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

3.25 TOWING OR PUSHING



CAUTION: Failure to lift the drive wheels off the road, disconnect the driveline or remove the axle shafts before towing or pushing can cause serious transmission damage.

The engine cannot be started by pushing or towing. Before pushing or towing a vehicle, lift the drive wheels off the road, disconnect the driveline, or remove the axle shafts from the drive wheels. When the axle shafts are removed, be sure to cover the wheel openings to prevent loss of lubricant and entry of dust and dirt. An auxiliary air supply will usually be required to release the vehicle brake system.

3.26 SURGING NATURAL GAS ENGINES



NOTE: Engine surging or engine speed cycling may occur on natural gas powered equipment. This condition typically occurs when the transmission is being operated in a hold position with throttle applied and the engine speed above full load engine governed speed. Surging may also occur at closed and part throttle. This condition is an engine characteristic and NOT a transmission concern.

4.0 POWER TAKEOFF OPERATION

4.1 POWER TAKEOFF (PTO) SYSTEMS (RDS, MH, EVS, and BUS Models)

Three types of PTO systems may be used with the 1000 and 2000 Series transmissions:

- **Transmission-Mounted Turbine-Driven PTO** — A transmission-mounted turbine-driven PTO drive provides both an infinitely-variable PTO drive ratio and a protective hydraulic cushion against abrupt loading/unloading (during “converter mode” operation) and engine-driven PTO speed control (during “torque converter clutch mode” operation).
- **Split-Shaft PTO** — A split-shaft PTO, a chassis-mounted component, is typically used in applications which require full engine power being available to either propel the vehicle or to power auxiliary equipment through the PTO drive—but not both simultaneously. In both cases, the transmission output shaft delivers power to the split-shaft transfer case. The split-shaft transfer case is then shifted to deliver this power to either the driveline or PTO drive.
- **Flywheel-Driven PTO** — A flywheel-driven PTO, often called a “sandwich PTO,” mounts between the engine and transmission. The PTO is normally driven directly by the engine.

4.2 TURBINE-DRIVEN POWER TAKEOFF (PTO)

The following pertains only to Transmission-Mounted Turbine-Driven PTOs.

4.2.1 PTO CONFIGURATION. The PTO is mounted on the left and/or right side of the transmission housing. The PTO drivetrain consists of a large drive gear in the transmission, an idler gear arrangement, and a smaller driven gear in the PTO. The drive gear is integral to the transmission rotating clutch housing, which rotates at the same speed as the torque converter turbine. With this drive configuration, the PTO rotates in the same direction as the engine.

Two types of transmission-mounted PTOs may be used with these transmission models.

- **Constant-drive PTO** — Used in applications which require full-time PTO operation. The PTO driven gear is in constant mesh with the drive gear and cannot be disengaged.
- **Clutch shift PTO** — Used in applications which require only part-time operation of the PTO or the capability to engage or disengage the driven equipment. Clutch shift PTO engagement/disengagement provision is accomplished by a hydraulic clutch mechanism in the PTO assembly. The PTO can be engaged or disengaged at any time (except when the PTO is controlled by the TCM).

4.2.2 PTO ENGAGEMENT—SLIDE ENGAGEMENT INTERNAL TO PTO.



CAUTION: Only use “constant-mesh” PTOs. DO NOT use “manual shift” PTOs which engage/disengage with the PTO drive gear in the transmission or the transmission may be damaged. Only use PTOs where the sliding gear is within the PTO.



WARNING: If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. DO NOT leave the vehicle with the engine running unless you have taken all of the following precautions:

- Shift the transmission to **N** (Neutral), **P** (Park), or **PB** (Auto-Apply Parking Brake).
- Make sure that the engine is at low idle (500–800 rpm).
- Apply the park brake or emergency brake and make sure it is properly engaged.
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.

Engage the PTO drivetrain as follows:

1. With the vehicle stopped, put the shift selector in a forward range while keeping the service brakes applied.
2. Set the engine speed at idle.
3. Engage the PTO. If gears do not engage, release the brakes momentarily to allow slight vehicle movement. Engage the PTO. Repeat as needed until the PTO is engaged.
4. Shift to **N** (Neutral) and operate the PTO as needed.

Disengage the PTO drivetrain as follows:

1. Idle the engine.

2. Set the brake.
3. Place the shift selector in a drive range, stopping the PTO-driven equipment.
4. Disengage the PTO.
5. Operate the vehicle in the normal manner.

4.2.3 PTO ENGAGEMENT—CLUTCH DRIVEN. The PTO will engage only when the PTO switch is on, the throttle position is low, and engine speed and output speed are within user-specified limits. If the PTO is controlled by the TCM, your vehicle may have a light on the dash that illuminates when the PTO is engaged.



CAUTION: Some vehicles “creep” in range at low vehicle speeds while maintaining a specified engine speed for PTO operation (e.g., paint strippers and feedlot trucks). DO NOT use the vehicle brakes to control vehicle speed during PTO operation. Use ONLY throttle to control both engine and vehicle speed when the transmission is in reverse or a forward range. Applying BOTH brakes and throttle will cause the transmission to overheat. Extended operation at elevated temperatures will damage the transmission.



CAUTION: Do not exceed the engagement and operational speed limits imposed on the driven equipment during the operation of the PTO. Exceeding the speed limits produces high hydraulic pressure in the PTO that can damage the PTO components. Consult the vehicle manufacturer’s literature for these speed limits.

4.2.4 PTO OPERATION. The transmission operates in either converter mode or torque converter clutch mode. In converter mode, the torque converter (lockup) clutch is not engaged and the PTO is driven through the torque converter. In converter mode the speed is always less than engine speed and the torque is always greater than input torque. In torque converter clutch mode, the torque converter (lockup) clutch is engaged, the PTO drivetrain is driven at engine rpm.

The PTO drive is normally in continuous converter mode operation when the transmission is in **P** (Park), **PB** (Auto-Apply Parking Brake), **R** (Reverse), **N** (Neutral), and **D** (Drive). Torque converter clutch operation in **N** (Neutral) is available for some applications. If the PTO is used with the transmission in **D** (Drive) or another forward range, transmission shifts (both converter/torque converter clutch mode shifts and shifts between gears) are based on the

automatic shift sequence of the transmission shift controls. PTO drive gear speed will be affected each time a shift occurs.

With the vehicle stopped and the engine at idle, PTO output speed is dependent upon the transmission gear selection.

- If the transmission is in **D** (Drive) or **R** (Reverse), the PTO output speed is zero.
- If the transmission is in **N** (Neutral), **P** (Park), or **PB** (Auto-Apply Parking Brake), the PTO output will rotate.

In some vehicles, the transmission shifts into **N** (Neutral) regardless of the shift selector position under the following conditions:

- The PTO is requested
- The transmission output speed is near zero
- The throttle position is near zero

To reselect a range after the PTO is turned off, the operator must shift into **N** (Neutral), then shift to the desired range.



CAUTION: Do not exceed the engagement and operational speed limits imposed on the driven equipment during the operation of the PTO. Exceeding the speed limits produces high hydraulic pressure that can damage the PTO components. Consult the vehicle manufacturer's literature for these speed limits.



CAUTION: When PTO disengagement occurs due to an overspeed condition, the PTO will automatically re-engage at a lower, user-specified speed. Re-engaging the PTO at a high speed can cause re-engagement shock that could damage a high-inertia PTO-driven system. PTO re-engagement speed parameters must be set by qualified, Allison trained personnel.

4.2.5 PTO OVERSPEED PROTECTION. All 1000 and 2000 Series-equipped vehicles with PTO request have engagement and operational speed limits programmed into the TCM to help protect PTO equipment. The PTO deactivates when operational speeds (either engine or transmission output) are exceeded. When the PTO is disengaged due to overspeed, the PTO will be automatically re-engaged at a user specified speed, which is relatively low.

4.3 SPLIT-SHAFT POWER TAKEOFF (PTO)

For many split-shaft PTOs, holding the transmission in direct drive at all engine speeds is desirable. In this manner, the automatic range shifts are eliminated, thereby eliminating rapid torque changes which would occur at the driven equipment during a shift in the transmission. Such a condition, for instance, could create an undesirable pressure surge (and directional control problem) at the nozzle-end of a fire hose.



NOTE: Some 1000 and 2000 Series transmission models have a control provision that supports a split-shaft PTO application. This function will allow for **3** (Third Range) range lockup operation only. Consult your Allison distributor for additional requirements and operational information associated with this feature.

5.0 PROGNOSTICS

5.1 1000 AND 2000 SERIES SERVICE PROGNOSTICS

Prognostics are used to predict the need for transmission maintenance. The Service Prognostics package requires the use of Allison-approved TES 295[®], TES 668[™], or TES 389[®] fluids and Control Main Filter P/N 29539579. Transmission operating parameters monitored by the prognostics feature are:

1. Oil Life Monitor
2. Filter Life Monitor
3. Transmission Health Monitor



NOTE: To determine if your vehicle has Prognostics enabled, observe operation of the OEM-installed service indicator light. This light illuminates for five seconds during start-up in all vehicles equipped with Prognostics. When Prognostics are enabled, the service indicator light illuminates again for three seconds after the initial five-second bulb check. If you are still unable to determine whether your vehicle has Prognostics enabled, consult your OEM service department or an authorized Allison distributor or dealer.

When a specified service threshold is detected for one of these parameters, the **TRANS SERVICE** indicator is illuminated to alert the operator to the need for action. Failure to attend to the service condition and reset the **TRANS SERVICE** indicator within a defined operating period will result in the illumination of the **CHECK TRANS** indicator (in addition to the **TRANS SERVICE** light), indicating the increased probability that the service condition may/will develop into a more serious condition.

The process for resetting the **TRANS SERVICE** indicator varies for each feature and is described in each of the following sections. Use the Allison DOC[®] to review the current status of any of these features and a history of indicator resets.



CAUTION: Transmission Prognostics features may be turned **ON** or **OFF** by a special transmission calibration and **REQUIRES** the use of Allison approved TES 295[®], TES 668[™], or TES 389[®] fluids. If any other fluids are used, prognostic features must be turned **OFF**. Prognostic information will not be accurate with the use of any other transmission fluids and could result in improper maintenance activities resulting in transmission damage. If Prognostics is not programmed or is turned **OFF**, the kilometers (miles)/hours/months method of determining fluid and filter change intervals will apply. See charts in the CARE AND MAINTENANCE section of your Operator's Manual or visit www.allisontransmission.com for a list of Allison-approved TES fluids or read Service Tips 1099 (current revision) for details.

5.2 OIL LIFE MONITOR

The **TRANS SERVICE** indicator illuminates when the remaining fluid life reaches approximately 2 percent (the parameter begins at 100 percent moving downward towards the lowest threshold), indicating the required change of the transmission fluid. The **TRANS SERVICE** indicator is lit steadily upon each initialization of the TCM, and remains on for approximately two minutes after the initial selection of a drive range, until service is performed and the indicator is reset.

The **TRANS SERVICE** indicator can be reset with the Allison DOC[®]. It may also be reset by selecting **N (Neutral)-D (Drive)-N (Neutral)-D (Drive)-N (Neutral)-R (Reverse)-N (Neutral)** on the shift selector, pausing briefly (less than three seconds) between each selector movement, with the ignition on and the engine not running. More details are provided in applicable Allison service literature for your specific transmission model.

Failure to perform maintenance and reset the **TRANS SERVICE** indicator within the next 100 hours of transmission operation will result in the illumination of the **CHECK TRANS** light (in addition to the **TRANS SERVICE** light). Any time this light is illuminated, the TCM registers a Diagnostic Trouble Code (DTC), which requires the use of Allison DOC[®] to clear the code.

In addition to viewing DTC, the Allison DOC[®] may also be used to display the amount of transmission operation from the initial service indication until the service reset.

Open Allison DOC[®] and go the DTC and General screen. You will find the Prognostics Information box is in the lower right corner. This is where the Oil Life Remaining information is found. If the filter has been changed the Oil Life

Remaining can be reset using the Allison DOC®. Select the Action Request tab and then select Reset Prognostic Information. The Oil Remaining Life and Filter Life Monitor reset selection can be made.

5.3 FILTER LIFE MONITOR

The **TRANS SERVICE** indicator flashes beginning with the first TCM initialization after reaching the time and mileage parameters, indicating the filter has reached the end of its designed life. The indicator continues to flash for two minutes after **D** (Drive) has been selected. Thereafter, the indicator illuminates and flashes upon each TCM initialization, continuing to flash for two minutes after the selection of **D** (Drive) each time, until service is performed and the indicator is reset.

The **TRANS SERVICE** indicator can be reset with the Allison DOC®. It may also be reset by selecting **N (Neutral)-R (Reverse)-N (Neutral)-R (Reverse)-N (Neutral)-D (Drive)-N (Neutral)** on the shift selector, pausing briefly (less than three seconds) between each selector movement, with the ignition on and the engine not running. More details are provided in applicable Allison service literature for your specific transmission model.

Failure to perform maintenance and reset the **TRANS SERVICE** indicator after an additional 100 hours of transmission operation results in the illumination of the **CHECK TRANS** light (in addition to the **TRANS SERVICE** light). Any time this light is illuminated, the TCM registers a DTC, which requires the use of Allison DOC® to clear the DTC.

In addition to viewing DTC, the Allison DOC® may also be used to display the amount of transmission operation from the initial service indication until the service reset.

Open Allison DOC® and go to the DTC and General screen. You will find the Prognostics Information box in the lower-right corner. This is where the Filter Monitor Expired information is found. If the filter has been changed, the Filter Monitor can be reset using the Allison DOC®. Select the Action Request tab and then select Reset Prognostic Information. The Filter Monitor reset selection can be made.

5.4 TRANSMISSION HEALTH MONITOR

The **TRANS SERVICE** indicator will be illuminated, indicating the need for clutch maintenance, when the remaining clutch life reaches approximately 10 percent, or if the running clearance exceeds a maximum value which may indicate a non-wear-related issue. The indicator will be lit steadily upon initialization of the TCM, and will remain on steady at all times, continuing to operate in this manner until service is performed and the indicator is reset.

If reset does not occur within 100 hours, the **CHECK TRANS** indicator will be illuminated (in addition to the **TRANS SERVICE** light) and the TCM will register a DTC.

The indicator will reset automatically upon elimination of the clutch clearance condition which initiated it. The indicator can also be reset using the Allison DOC[®] if necessary.

The Allison DOC[®] may be used to display the amount of transmission operation from the initial service indication until the service reset.

6.0 CARE AND MAINTENANCE

6.1 PERIODIC INSPECTIONS AND CARE

6.1.1 TRANSMISSION INSPECTION.



CAUTION: Do not spray steam, water, or cleaning solution directly at electrical connectors or the breather. Fluids forced into electrical connectors can cause false codes and cross-talk. Steam, water, or cleaning solution forced into the breather will contaminate the transmission fluid. Seal all openings, the breather, and electrical connections before spraying steam, water, or cleaning solution on the transmission.

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 the following:

- Loose bolts—transmission and mounting components
- Fluid leaks—repair immediately
- Loose, dirty, or improperly adjusted throttle sensor or shift selector linkage
- Damaged or loose hoses
- Worn, frayed, or improperly routed electrical harnesses
- Worn or damaged electrical connectors
- Worn or out-of-phase driveline U-joints and slip fittings
- Clogged or dirty breather

6.1.2 VEHICLE INSPECTION. Check the vehicle cooling system occasionally for evidence of transmission fluid (which would indicate a faulty oil cooler) and for blocked or restricted air flow through the radiator or transmission cooler.

6.1.3 WELDING.



CAUTION: When welding on the vehicle:

- DO NOT WELD on the vehicle without disconnecting all control system wiring harness connectors from the TCM.
- DO NOT WELD on the vehicle without disconnecting TCM battery power and ground leads.
- DO NOT WELD on any control components.
- DO NOT CONNECT welding cables to any control components.
- PROTECT CONTROL COMPONENTS FROM SPARKS AND HEAT DURING WELDING.

A label describing on-vehicle welding precautions (ST2067EN) 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 warning label.

6.2 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 fluid 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.

6.3 TRANSMISSION FLUID CHECK



WARNING: For vehicles containing 1000, 2200, 2350, and 2550 transmissions with **P** (Park) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:

1. Bring the vehicle to a complete stop using the service brake.
2. Make sure the engine is at low idle rpm.
3. Put the transmission in **P** (Park).
4. Engage the park pawl by slowly releasing the service brake.
5. If a parking brake is present, apply the parking brake. Make sure the parking brake is properly engaged.
6. Apply the emergency brakes and make sure they are properly engaged.
7. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.



WARNING: For vehicles containing 2100, 2300, and 2500 transmissions with **PB** (Auto-Apply Parking Brake) selector position, follow this procedure each time the operator's station will be unoccupied with the engine running:

1. Bring the vehicle to a complete stop using the service brake.
2. Make sure the engine is at low idle rpm.
3. Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure the parking brake is properly engaged.
4. Apply the emergency brakes and make sure they are properly engaged.
5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.



WARNING: For vehicles containing 1000 and 2000 Series transmissions without either **P** (Park) or **PB** (Auto-Apply Parking Brake) selector positions, each time you park the vehicle or leave the operator's station with the engine running, do the following:

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

If this procedure is not followed, the vehicle can move unexpectedly and cause injury and/or property damage.

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

6.3.2 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.

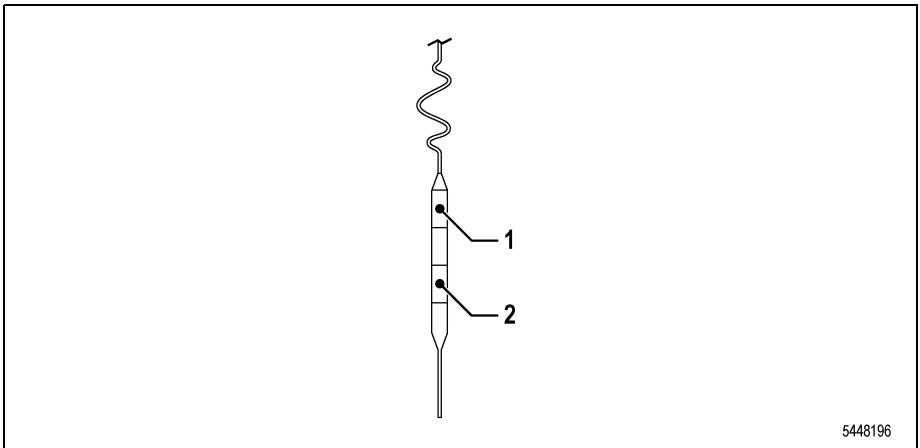


CAUTION: The fluid level rises as fluid temperature rises. DO NOT fill the transmission above the COLD band if the transmission fluid is below normal operating temperatures. During operation, an overfull transmission can become overheated, leading to transmission damage.

Check the fluid level as follows:

1. Bring the vehicle to a complete stop on a level surface using the service brake.
2. Make sure the engine is at low idle rpm (with fast idle disabled).
3. Put the transmission in **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral) depending on the type of parking options equipped on the transmission as explained in the warnings above.

4. Apply any other parking brake, if present, and make sure it is properly engaged.
5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.
6. Run the engine at 1000–1500 rpm for at least one minute to purge air from the system. Apply the service brakes and shift to **D** (Drive), then to **N** (Neutral), and then shift to **R** (Reverse) to fill the hydraulic system. Finally, shift to **P** (Park) or **PB** (Auto-Apply Parking Brake), if available, or **N** (Neutral) and allow the engine to idle (500-800 rpm). Slowly release the service brakes.
7. With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
8. Insert the dipstick into the tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.
9. If the fluid level is within the COLD band (refer to [Figure 6–1](#)), the transmission may be operated until the fluid is hot enough to perform a HOT CHECK. If the fluid level is not within the COLD band, add or drain fluid as necessary to bring it to the middle of the COLD band.
10. Perform a HOT CHECK at the first opportunity after the normal operating sump temperature of 71°C–93°C (160°F–200°F) is reached.



5448196

(1) – HOT Band

(2) – COLD Band

Figure 6–1. Typical Dipstick Markings

6.3.3 Hot Check Procedure.



CAUTION: When performing the HOT CHECK procedure, the fluid must be at operating temperature to be sure of an accurate check and help prevent transmission damage. The fluid rises as temperature increases. During operation, an overfull transmission can become overheated, leading to transmission damage.



NOTE: If a transmission temperature gauge is not present, check fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under load for at least one hour.

Operate the transmission in **D** (Drive) until the following normal operating temperatures are reached:

- **Sump temperature**—71°C–93°C (160°F–200°F)
- **Converter-out temperature**—82°C–104°C (180°F–220°F)

Check the fluid level as follows:

1. Bring the vehicle to a complete stop on a level surface using the service brake.
2. Make sure the engine is at low idle rpm (with fast idle disabled).
3. Put the transmission in **P** (Park), **PB** (Auto-Apply Parking Brake), or **N** (Neutral) depending on the type of parking options equipped on the transmission as explained in the warnings above.
4. Apply any other parking brake, if present, and make sure it is properly engaged.
5. Chock the wheels and take any other steps necessary to keep the vehicle from moving.
6. With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
7. Insert the dipstick into the tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.



NOTE: Safe operating level is within the HOT band on the dipstick (refer to [Figure 6–1](#)). The width of the HOT band represents approximately 1.0 liter (1.06 quart) of fluid at normal operating sump temperature.

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

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

6.4 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 and some seals to fail.

6.5 FLUID RECOMMENDATIONS

Hydraulic fluids (oils) used in the transmission are important influences on transmission performance, reliability, and durability. Any fluids meeting TES 389[®], TES 295[®] or TES 668[™] specifications are acceptable for use in the 1000 and 2000 Series transmissions.

To make sure the fluid is qualified for use in Allison transmissions, check for a TES 389[®], TES 295[®], TES 668[™] fluid license or approval numbers on the container, or consult the lubricant manufacturer. Consult your Allison Transmission dealer or distributor before using other fluid types.



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

When choosing the optimum viscosity grade of fluid to use, duty cycle, preheat capabilities, and/or geographic location must be taken into consideration. The table below lists the minimum fluid temperatures at which the transmission may be safely operated without preheating the fluid. Preheat with auxiliary heating equipment or by running the equipment or vehicle with the transmission in **P** (Park) or **PB** (Auto-Apply Parking Brake), if available, or **N** (Neutral) for a minimum of 20 minutes before attempting range operation.

Table 6–1. Transmission Fluid Operating Temperature Requirements

Viscosity Grade	Ambient Temperature Below Which Preheat is Required	
	Celsius	Fahrenheit
TES 389®	-25°	-13°
Allison approved TES 295® or TES 668™	-35°	-31°

Shifting is inhibited and torque converter clutch mode is not reached until the transmission fluid operating temperature requirements have been met. Refer to [Table 6–1](#). As the transmission reaches normal operating temperature, all shift ranges and the torque converter clutch mode begin to function.

6.6 TRANSMISSION FLUID AND FILTER CHANGE INTERVALS



CAUTION: Transmission fluid and filter change frequency is determined by the severity of transmission service. To help avoid transmission damage, more frequent changes can be necessary than recommended in the general guidelines when operating conditions create high levels of contamination or overheating.

6.6.1 Frequency.



NOTE: Fluid Exchanging Machines are not recommended or recognized due to variation and inconsistencies that may not guarantee removal of 100 percent of the used fluid.



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



NOTE: Local conditions, severity of operation or duty cycle may require more or less frequent fluid change intervals that differ from the published recommended fluid change intervals of Allison Transmission. Allison Transmission recommends that customers use fluid analysis as the primary method for determining fluid change intervals. In the absence of a fluid analysis program the fluid change intervals listed in the charts should be used.

Severe Vocations are defined as vehicles experiencing duty cycles that require stopping more than once in a mile. General Vocations include all other vocations. Local conditions, severity of operation, or duty cycle may require more or less frequent fluid change intervals that differ from the published recommended fluid change intervals of Allison Transmission.

The following table is given only as a general guide for fluid and filter change intervals.



NOTE: Refer to [Table 6–2](#) for Filter Type/Part Number Information and Fluid Capacity Information.



NOTE: Change fluid and filters at or before recommended mileage, months, or hours have elapsed, whichever occurs first.



NOTE: Local conditions, severity of operation or duty cycle may require more or less frequent fluid change intervals that differ from the published recommended fluid change intervals of Allison Transmission. Allison Transmission recommends that customers use fluid analysis as the primary method for determining fluid change intervals. In the absence of a fluid analysis program the fluid change intervals listed in the charts should be used.

Table 6–2. Recommended Filter Change/Fluid Intervals

1000 and 2000 Series Fluid And Filter Change Interval Recommendations					
		Prognostics Turned Off or Not Calibrated in TCM		Prognostics Turned On	
	Duty Cycle	Allison Approved TES 668™ and/or TES 295® Fluid	Allison Approved TES 389® Fluid	Allison Approved TES 668™ and/or TES 295® Fluid	Allison Approved TES 389® Fluid
Fluid	General*	150,000 Miles (240,000 km) 4,000 Hours 48 Months	50,000 Miles (80,000 km) 2,000 Hours 24 Months	When indicated by controller or 48 months, whichever occurs first	When indicated by controller or 24 months, whichever occurs first (MY2010)
	Severe**	75,000 Miles (120,000 km) 3,000 Hours 36 Months	12,000 Miles (20,000 km) 500 Hours 6 Months		
Spin-On Control Main Filter	General*	50,000 Miles (80,000 km) 2,000 Hours 24 Months	50,000 Miles (80,000 km) 2,000 Hours 24 Months	When indicated by controller or 48 months, whichever occurs first	When indicated by controller or 24 months, whichever occurs first (MY2010)
	Severe**	50,000 Miles (80,000 km) 2,000 Hours 24 Months	12,000 Miles (20,000 km) 500 Hours 6 Months		
Internal Filter	All	Overhaul	Overhaul	Overhaul	Overhaul
<p>NOTE: TES 389® cannot be used in MY09.</p> <p>NOTE: Anything less than 100 percent concentration of TES 668™ and/or TES 295® Allison approved fluids is considered a mixture and should utilize Schedule One TES 389® change intervals. Also, mixtures shall not be used with Prognostics.</p>					
<p>* General Vocation: All vocations not classified as Severe</p> <p>** Severe Vocation: On/Off Highway, Refuse, City Transit, Shuttle Transit</p>					

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

6.6.3 Fluid Analysis. Transmission protection and fluid change intervals can be optimized by monitoring fluid oxidation according to the tests and limits shown in the following table. Fluid oxidation can be monitored through a fluid analysis firm and/or by using an oil analysis kit. Allison Transmission recommends that customers use fluid analysis as the primary method for determining fluid and filter change intervals. In the absence of a fluid analysis program the fluid change intervals listed in [Table 6–2](#) should be followed.

- Fluid analysis firms—Consult your local telephone directory for fluid analysis firms. To make sure fluid analysis is consistent and accurate, use only one fluid analysis firm. Refer to the Technician's Guide for Automatic Transmission Fluid, GN2055EN, for additional information.
- Oil analysis kits, P/N 29537805, are available through your normal Allison Transmission parts source.

Refer to the Technician's Guide for Automatic Transmission Fluid, GN2055EN, for additional information.

Table 6–3. Fluid Oxidation Measurement Limits

Test	Limit
Viscosity	±25 percent change from new fluid
Total Acid Number	+3.0 * change from new fluid
*mg of KOH required to neutralize a gram of fluid.	

6.7 TRANSMISSION FLUID CONTAMINATION

6.7.1 Fluid Examination. At each fluid change, examine the drained fluid for evidence of dirt or water. A normal amount of condensation (not to exceed 0.2 percent maximum) will appear in the fluid during operation.

6.7.2 Water. Obvious water contamination of the transmission fluid requires inspecting and pressure testing the cooler (heat exchanger) for leaks between the water and fluid areas. Engine oil or transmission fluid in the water side of the cooler (heat exchanger) is another sign of a leak. Be sure to locate the correct source of contamination.

6.7.3 Engine Coolant.



CAUTION: Engine coolant in the transmission hydraulic system requires immediate action to prevent malfunction and possible serious transmission damage. Completely disassemble, inspect, and clean the transmission. Remove all traces of the coolant and varnish deposits resulting from engine coolant contamination. Replace the torque converter, all seals, gaskets, bearings, friction clutch plates, solenoids, and all rusted parts.

Any trace of glycol or greater than 0.2 percent water contamination requires complete disassembly and cleanup of the transmission and replacement of seals, gaskets, clutch plates, and bearings. Solenoid resistance should be measured and checked against the specifications. Solenoids not within specification should be replaced. Refer to SIL 18-TR-98.

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



CAUTION: After flushing the cooler, be sure to check cooler circuit restriction. If circuit pressure drop is above specification, the cooler has excessive trapped particles and must be replaced. Excessive pressure drop impedes transmission cooling which can cause overheating and transmission damage.

6.8 TRANSMISSION FLUID AND FILTER CHANGE PROCEDURE

6.8.1 Drain Fluid.

1. Drain the fluid when the transmission is at normal operating sump temperature of 71–93°C (160–200°F). Hot fluid flows quicker and drains more completely.
2. Remove the drain plug from the oil pan and allow the fluid to drain into a suitable container.
3. Examine the fluid as described in the [6.7.1 Fluid Examination](#) paragraph in this Section.

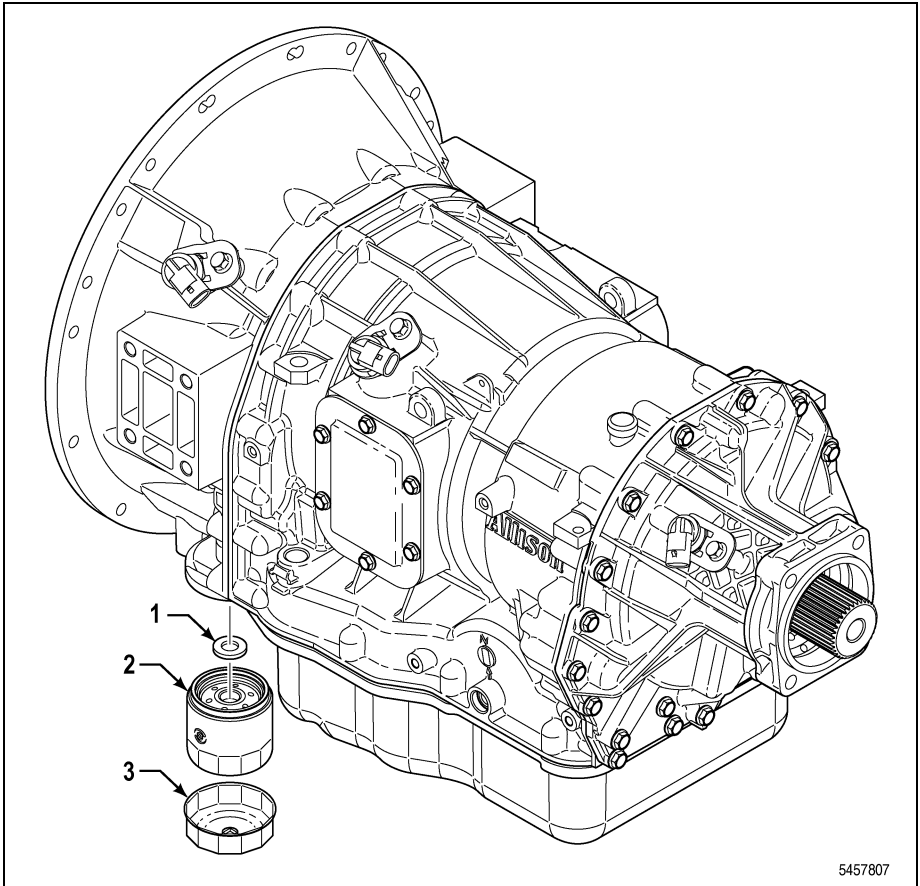
6.8.2 Replace Control Main Filter.

1. Using a standard strap-type filter wrench or the J-45023 Filter Wrench tool, remove the control main filter (Figure 6-2) by rotating it in the counterclockwise direction.
2. Remove the magnet from the filter attachment tube or from the top of the filter element.
3. Clean any metal debris from the magnet. Report any metal pieces larger than dust to your maintenance personnel.
4. Reinstall the magnet onto the filter attachment tube.
5. Lubricate the gasket on the control-main filter with transmission fluid.
6. Install, by hand, the control-main filter until the gasket on the control-main filter touches the converter housing or cooler manifold.
7. Using the J-45023 Filter Wrench tool or by hand, turn the filter ONE FULL TURN ONLY after gasket contact.



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

8. Reinstall the drain plug and sealing washer. Tighten the drain plug to 30–40 N·m (22–30 lb ft).



- (1) - Magnet
- (2) - Filter

- (3) - J-45023

Figure 6–2. Replacing the Control Main Filter

6.8.3 Refill Transmission. Refer to [Table 6–4](#) for fluid refill quantities. 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 [6.3 TRANSMISSION FLUID CHECK](#).



NOTE: Quantities listed are approximations and do not include external lines and cooler hose.

Table 6–4. Transmission Fluid Capacity

Sump	Initial Fill		Refill	
	Liters	Quarts	Liters	Quarts
Standard	14	14.8	10	10.6
Shallow	12	12.7	7	7.4

6.9 BREATHER

6.9.1 Location and Purpose. The vent assembly (breather) is located at the top left-rear of the transmission main housing (refer to [Figure 1–2](#)). The vent assembly prevents air pressure buildup within the transmission and its passage must be kept clean and open.



CAUTION: Do not spray steam, water, or cleaning solution directly at the vent assembly (breather). Spraying steam, water, or cleaning solution at the vent assembly can force the water or cleaning solution into the transmission and contaminate the transmission fluid. Seal all openings and the vent assembly (breather) before spraying steam, water, or cleaning solutions on the transmission.

6.9.2 Maintenance. The amount of dust and dirt encountered determines the frequency of vent assembly (breather) cleaning. Use care when cleaning the transmission.

7.0 DIAGNOSTICS

7.1 DIAGNOSTIC CODES AND TOOLS

The illumination of the **CHECK TRANS** indicator or **MIL** any time after start-up indicates that the TCM has registered a DTC. DTCs are used to identify the nature of a malfunction.

Use any Allison DOC[®] diagnostic tool to access DTCs and troubleshoot transmission complaints.

The following Allison DOC[®] diagnostic tools are available:

- Allison DOC[®] – full feature service tool.
- Allison DOC[®] For Fleets–Service Tool – diagnostic only.

For more information regarding Allison DOC[®] diagnostic tools, please visit www.allisontransmission.com– Click on “Service” and then click on “Diagnostic Tools”.

For additional help, **contact an authorized Allison Transmission distributor or service dealer or the Allison Technical Assistance Center at 800-252-5283**. Refer to the Sales and Service Directory (SA2229EN) or use the Allison Transmission Sales and Service Locator Tool on the Allison Transmission web site at www.allisontransmission.com for current Allison Transmission authorized distributors and service dealers.

8.0 CUSTOMER SERVICE

8.1 OWNER ASSISTANCE

The satisfaction and goodwill of the owners of Allison transmissions are of primary concern to Allison Transmission, Inc., its distributors, and their dealers.

As an owner of an Allison transmission, you have service locations throughout the world that are eager to meet your parts and service needs with:

- Expert service by trained personnel.
- Emergency service 24 hours a day in many areas.
- Complete parts support.
- Sales teams to help determine your transmission requirements.
- Product information and literature.

Normally, 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. Check the telephone directory for the Allison Transmission service outlet nearest you or use Allison Transmission's Sales and Service Locator tool on the Allison Transmission website at www.allisontransmission.com.

We recognize, however, that despite the best intentions of everyone concerned, misunderstandings may occur. To further assure your complete satisfaction, we have developed the following three-step procedure to be followed in the event a problem has not been handled satisfactorily.

Step One—Discuss your problem with a member of management from the distributorship or dealership. Frequently, complaints are the result of a breakdown in communication and can be resolved quickly by a member of management. If you have already discussed the problem with the Sales or Service Manager, contact the General Manager. All Allison Transmission, Inc. dealers are associated with an Allison Transmission, Inc. distributor. If the problem originates with a dealer, explain the matter to a management member of the distributorship with whom the dealer has his service agreement. The dealer will provide his Allison Transmission distributor's name, address, and telephone number on request.

Step Two—When it appears the problem cannot be readily resolved at the distributor level without additional assistance, **contact the Allison Technical Assistance Center at 800-252-5283**. They will place you in contact with the Regional Customer Support Manager for your area.

For prompt assistance, please have the following information available:

- Name and location of authorized distributor or dealer.
- Type and make of vehicle/equipment.
- Transmission model number, serial number, and assembly number (if equipped with electronic controls, also provide the TCM assembly number).
- Transmission delivery date and accumulated miles and/or hours of operation.
- Nature of problem.
- Chronological summary of your transmission's history.

Step Three—If you are still not satisfied after contacting the Regional Customer Support Manager, **present the entire matter to the Home Office by writing to the following address:**

Allison Transmission
Attn: Manager, Warranty Administration
PO Box 894, Mail Code PF9
Indianapolis, IN 46206-0894

The inclusion of all pertinent information will assist the Home Office in expediting the matter.

When contacting the Home Office, please keep in mind that ultimately the problem will likely be resolved at the distributorship or dealership using their facilities, equipment, and personnel. Therefore, it is suggested that **Step One** be followed when experiencing a problem.

Your purchase of an Allison Transmission product is greatly appreciated, and it is our sincere desire to assure complete satisfaction.

8.2 SERVICE LITERATURE

Allison Transmission, Inc. service literature provides fully illustrated instructions for operation, maintenance, troubleshooting, service, overhaul, and parts support for your transmission. For maximum performance and service life from your unit, you may order additional publications via phone, email or web.

TOLL FREE: 844-829-3595
INTERNATIONAL: 613-271-3842
allisontransmission@gilmore.ca
www.allisontransmissionpublications.com

For more information about Allison products please visit
www.allisontransmission.com.

8.3 ALLISON TRANSMISSION DISTRIBUTORS



NOTE: Go to www.allisontransmission.com/sales-service-locator for a complete and up-to-date listing of Allison Transmission Service Centers.

REVISION HISTORY

This revision history includes a summary of changes made to the following topics between 2021/03 and 2021/09.

1-2. A BRIEF DESCRIPTION OF THE ALLISON 1000 AND 2000 SERIES TRANSMISSIONS

2021/04 Replaced Product Family with Series.

2021/05 Updated paragraph about range capability being dependent on TCM calibration.

1-5. PLANETARY GEARS AND CLUTCHES

2021/05 Updated paragraph about range capability being dependent on TCM calibration.

3-5. PRIMARY/SECONDARY SHIFT SCHEDULES

2021/04 Reworked paragraph and table to include 6th Generation relevance.

3-12. SHIFT INHIBITS

2021/04 Removed nonessential information about former generation shift inhibiting rpm speed.

5-1. 1000 AND 2000 SERIES SERVICE PROGNOSTICS

2021/05 Changed Product Family to Series. Removed model year references and updated note. Added TES 668™.

6-5. FLUID RECOMMENDATIONS

2021/05 Added TES 668™

6-6. TRANSMISSION FLUID AND FILTER CHANGE INTERVALS

2021/05 Replaced schedule tables with updated tables

6-7. TRANSMISSION FLUID CONTAMINATION

2021/05 Updated Water paragraph, replaced Engine Coolant caution, and removed note under Metal

NOTES

NOTES

NOTES



A World Of Support

From our headquarters in Indianapolis, Indiana to our manufacturing plants in Hungary and India, to approximately 1,500 Allison Authorized Distributors and Dealers around the globe, you are never far from the products, training, service and support you demand.

Our support starts from the moment an Allison transmission is specified. We work with you to ensure that the model and ratings fit your engine to create a tailored package of powerful performance and reliable efficiency. And when you need parts or service, you can count on global access to factory-trained specialists and Allison Genuine Parts™.

allisontransmission.com

*One Allison Way
Indianapolis, Indiana USA 46222-3271*

OM8471EN (202109)

*Information or specifications subject to
change without notice or obligation.*

© 2021 Allison Transmission Inc.
All Rights Reserved.

allisontransmission.com

