



Operator's Manual

MD/HD/B Series
Allison On-Highway Transmissions
WTEC II Electronic Controls

OM2157EN

OM2157EN

Operator's Manual

Allison On-Highway MD/HD/B Transmission Series WTEC II Electronic Controls

MD 3060/3066/3560 (P)(R)

HD 4060/4560 (P)(R)

B 300/400/500 (P)(R)



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WARNINGS, CAUTIONS, AND NOTES

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

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

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



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



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



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

TRADEMARK INFORMATION

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Pro-Link® is a registered trademark of Micro Processor Systems, Inc.
Allison DOC™ is a trademark of General Motors Corporation.

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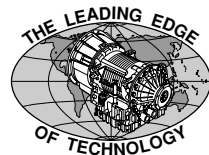
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INTRODUCTION



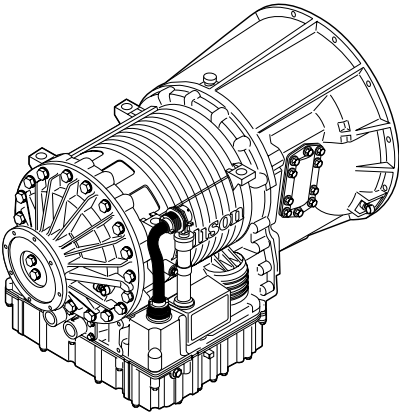
KEEPING THAT ALLISON ADVANTAGE



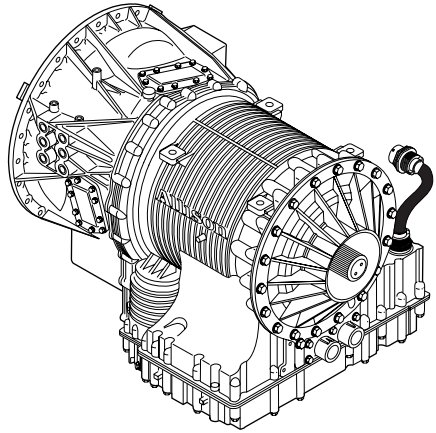
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Allison **WORLD TRANSMISSIONS (WT)** provide many advantages for the driver who must “stop and go” or change speeds frequently. Driving is easier, safer, and more efficient.

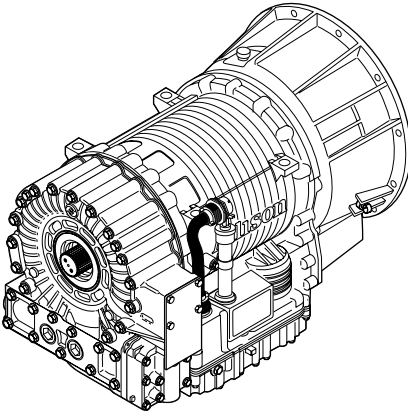
The **WT Series** transmissions are rugged and designed to provide long, trouble-free service. This handbook will help you gain maximum benefits from your **ALLISON**-equipped vehicle.



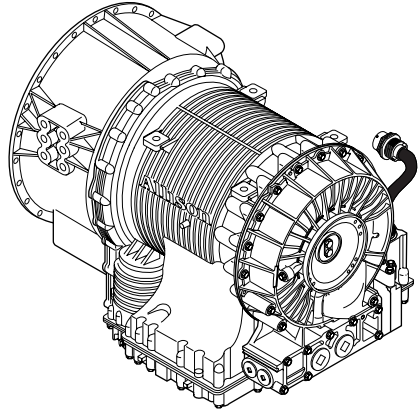
MD 3060P
MD 3066P
MD 3560P



HD 4060P
HD 4560P



B 300R
B 400R



B 500R

V03495

Typical WT Series Transmissions

A BRIEF DESCRIPTION OF THE ALLISON WORLD TRANSMISSIONS

Included in the Allison World Transmission family are the MD, HD, and B Series transmissions. The transmissions described in this handbook include the World Transmission Electronic Control system, a torque converter with lockup and torsion damper, and three planetary gear sets. These transmissions may also contain an integral retarder (the R in the model name) or power takeoff provision (the P in the model name).

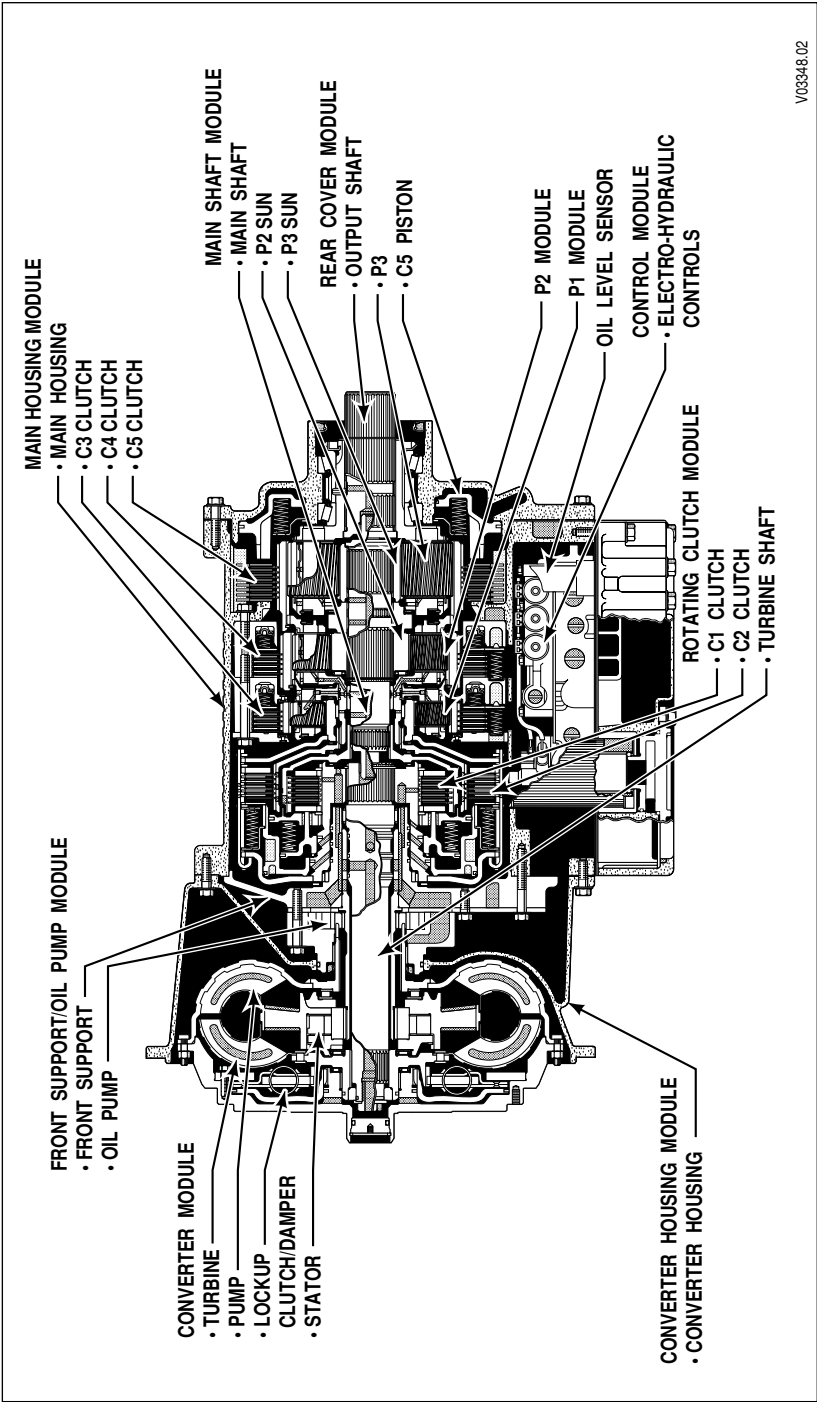
WT ELECTRONIC CONTROL SYSTEM

WTEC II controls will be available until January, 1998. WTEC III controls, which are optional for calendar year 1997, will be standard starting in January, 1998. Refer to OM2995EN Operator's Manual for WTEC III information. The WT Electronic Control System consists of five major components connected by wiring harnesses — Electronic Control Unit (ECU), engine throttle position sensor (or by serial communication link with engine electronics), three speed sensors, shift selector (may be integral with ECU), and control module (which contains solenoid valves and a pressure switch). The throttle position sensor, speed sensors, pressure switch, and shift selector transmit information to the ECU. The ECU processes this information and then sends signals to actuate specific solenoids located on the control module in the transmission. These solenoids control both oncoming and offgoing clutch pressures to provide closed-loop shift control by matching rpm during a shift to a previously established desired profile that is programmed into the ECU.

Another feature of the World Transmission is its ability to adapt or “learn” as it operates. Each shift is measured electronically, stored and used by the ECU to adapt or “learn” the optimum conditions for future clutch apply and release.

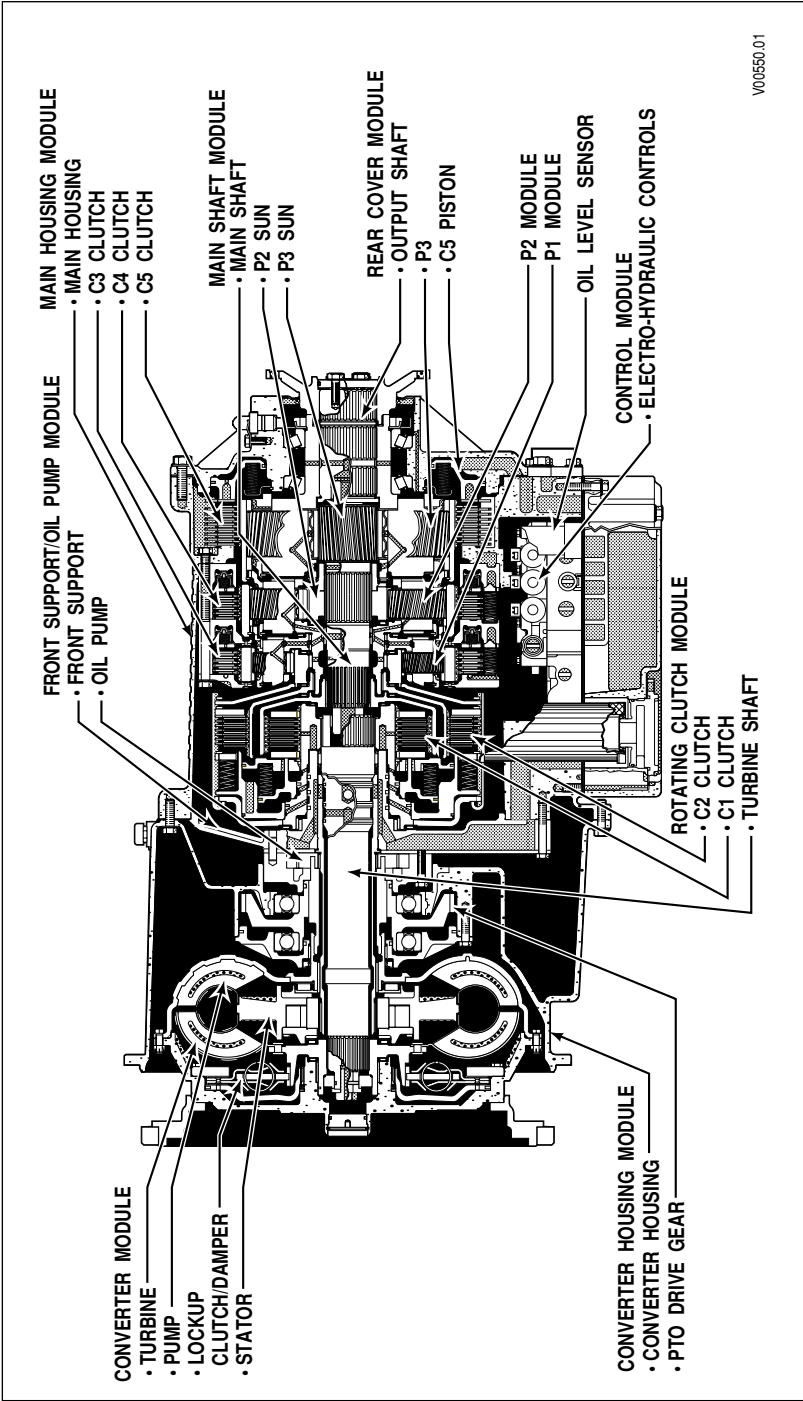


NOTE: If the shift quality of low mileage vehicles, or vehicles with new or recalibrated ECUs is unacceptable, simply drive the vehicle through its shift ranges for awhile. After this “learning” period, any rough shifting will automatically be corrected and shift quality will be restored.



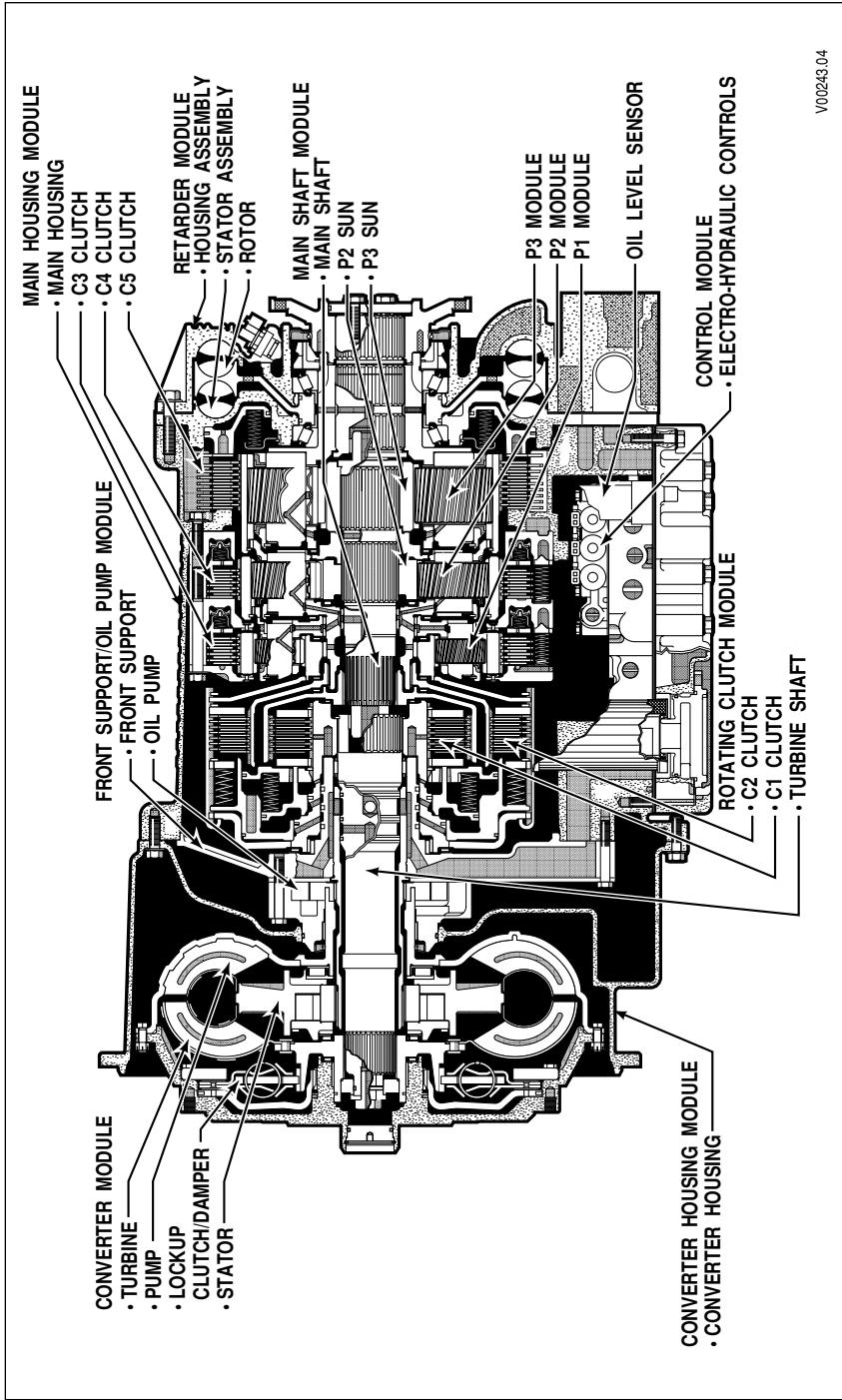
V03348.02

Typical MD 3060, B 300, B 400 Transmission Cross Section



V00550.01

Typical HD 4560P Transmission Cross Section



MAIN HOUSING MODULE
 • MAIN HOUSING
 • C3 CLUTCH
 • C4 CLUTCH
 • C5 CLUTCH

FRONT SUPPORT/OIL PUMP MODULE
 • FRONT SUPPORT
 • OIL PUMP

CONVERTER MODULE
 • TURBINE
 • PUMP
 • LOCKUP CLUTCH/DAMPER
 • STATOR

RETARDER MODULE
 • HOUSING ASSEMBLY
 • STATOR ASSEMBLY
 • ROTOR

MAIN SHAFT MODULE
 • MAIN SHAFT
 • P2 SUN
 • P3 SUN

P3 MODULE
 P2 MODULE
 P1 MODULE

OIL LEVEL SENSOR
 CONTROL MODULE
 • ELECTRO-HYDRAULIC CONTROLS

ROTATING CLUTCH MODULE
 • C2 CLUTCH
 • C1 CLUTCH
 • TURBINE SHAFT

CONVERTER HOUSING MODULE
 • CONVERTER HOUSING

V0243.04

Typical B 500R Transmission Cross Section

WT ELECTRONIC CONTROL SYSTEM *(cont'd)*



NOTE: If the shift quality of low mileage vehicles, or vehicles with new or recalibrated ECUs is unacceptable, contact your nearest Allison service outlet for help in restoring good shift quality.



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

The ECU is programmed to provide the most suitable operating characteristics for a specific application. This handbook does not attempt to describe all of the possible combinations. The information contained herein describes only the operating characteristics most frequently requested by the vehicle manufacturer.

TORQUE CONVERTER

The torque converter consists of three elements — pump, turbine, and stator. 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.

The lockup clutch is located inside the torque converter and consists of three elements — piston, clutch plate/damper, and backplate. The piston and backplate are driven by the engine. The clutch plate/damper, located between the piston and the backplate, is splined to the converter turbine. The lockup clutch is engaged and released in response to electronic signals from the ECU. Lockup clutch engagement provides a direct drive from the engine to the transmission gearing. This eliminates converter slippage and provides maximum fuel economy. The torsional damper absorbs engine torsional vibration.

The lockup clutch releases at lower speeds or when the ECU detects conditions requiring it to be released.

PLANETARY GEARS AND CLUTCHES

A series of three helical 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 six forward speeds and one reverse speed. The clutches are applied and released hydraulically in response to electronic signals from the ECU to the appropriate solenoids.

COOLER CIRCUIT

The transmission fluid is cooled by an integral (transmission-mounted) or remote-mounted oil cooler. Connections to the cooling circuit are located at the front or rear of the transmission to facilitate installation of remote cooler lines. On shallow sump models, only rear ports are available. The integral cooler is located on the lower rear portion of the transmission, replacing the remote cooler manifold. Integral cooler oil ports are internal requiring only coolant to be routed to and from the cooler.

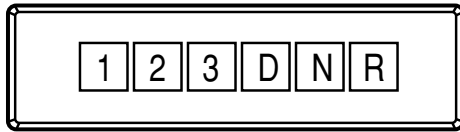
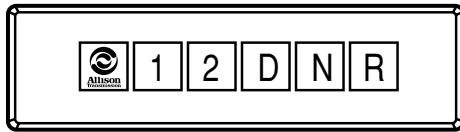
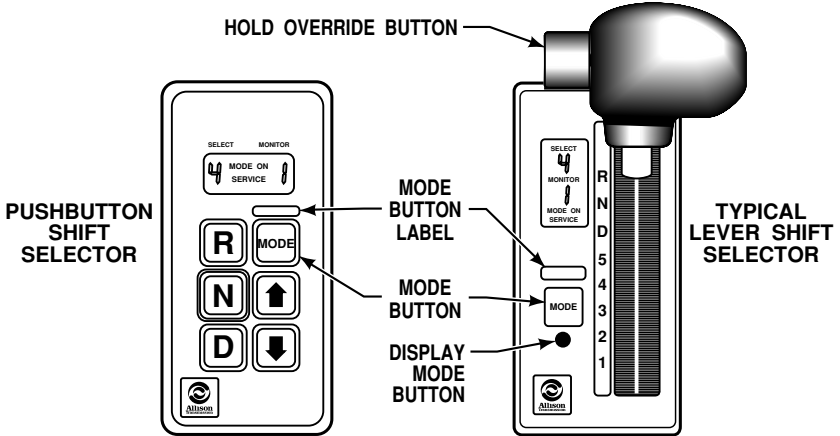
RETARDER

Use the retarder to lessen the demands on the vehicle service brakes.

The self-contained retarder is at the output of the transmission and consists of a vaned rotor which rotates in a vaned cavity. The rotor is splined to and driven by the output shaft. An external accumulator holds transmission fluid until the retarder is activated. When the retarder is activated, the fluid in the accumulator is pressurized and directed into the retarder cavity. The interaction of the fluid with the rotating and stationary vanes causes the retarder rotor speed, and hence the output shaft, to decrease and slow the vehicle. See Page 22 for additional retarder information.

When the retarder is deactivated, the retarder cavity is evacuated and the accumulator is recharged with fluid.

SHIFT SELECTORS



STRIP PUSHBUTTON SHIFT SELECTORS

V01525.03

Typical WT Series Shift Selectors

Vehicle manufacturers may choose different types of shift selectors for their vehicles. The shift selector in your Allison-equipped vehicle will be similar to one of those shown above.

The pushbutton shift selector has **R, N, D**, ↓, ↑, a **MODE** button, and a digital display. When a range select button is pressed, a tone will sound, the **SELECT** indicator displays the chosen operation (if the ECU determines the shift is acceptable), and the transmission will shift to the initial range as indicated on the **MONITOR** display. In **D** (Drive), selection of a specific range can be accomplished by pressing the ↑ (Up) or ↓ (Down) arrow buttons. Conditions resulting in the **DO NOT SHIFT** light coming on will disable the pad and no tone will sound. (See Page 17 for detailed explanation of the **DO NOT SHIFT** light.)

The lever shift selector is an electro-mechanical control. The shift positions can vary according to the shift selector installed. Positions (**R, N, and D**) are selected by pressing the **HOLD OVERRIDE** button and moving the lever to the desired range position. It is possible to move between forward range positions without pressing the **HOLD OVERRIDE** button.

Strip pushbutton shift selectors are available with various range selections. When a range button is pressed, the button window is backlit and a tone sounds; the transmission then applies an initial range. Conditions resulting in the **DO NOT SHIFT** light located on the instrument panel will disable the pad and no tones will sound. (See Page 17 for detailed explanation of the **DO NOT SHIFT** light.)

The pushbutton and lever shift selectors incorporate a **MODE** button.

A variety of programming options are available for the shift selector **MODE** button. When the **MODE** button is pushed, “Mode On” appears in the shift selector digital display and the programmed option is attained. Pressing the **MODE** button again returns the system to normal operation.

Consult your vehicle supplier to determine exact **MODE** button programming and resulting vehicle operation. Programming can also be determined by providing the Electronic Control Unit CIN number (located on a label on the ECU) to your nearest Allison Distributor.

The following table lists possible MODE button programming available, potential MODE button labels, and operational restrictions related to that MODE button programming.

MODE Button Programming Available	Potential MODE Button Labels	Operational Restrictions
<p>Secondary Shift Schedule Changes transmission shift points to accommodate varying operational situations</p>	<p>Alternate, Haul, On Road, City, Highway, Road, Perf, Plow, Economy, Power, Empty, Norm, Off Road</p>	<p>None; secondary schedule may include a different number of ranges; primary schedule is attained whenever the ECU is initialized</p>
<p>D1 Selection Provides for quick selection of a specific, programmed range (usually the transmission's lowest range)</p>	<p>Creep, Hold, Plow, Special, Low, First, Off Road, Lo Axle</p>	<p>ECU will not allow the shift to occur if engine or transmission overspeed will result</p>
<p>PTO Enable Enables the PTO when other operational conditions are met</p>	<p>Pack, Hoist, Special, Dump, Load, Pour, Spray, Spread, PTO, Pump</p>	<p>Throttle, engine speed and output speed must be below programmed limits to engage; throttle, engine speed and output speed must be below programmed limits during operation</p>

A **DISPLAY MODE** button on the lever selector allows access to fluid level information (when equipped with oil level sensor) and diagnostic code information. Access diagnostic codes with the pushbutton selector by pressing the ↑ (Up) and ↓ (Down) arrow buttons at the same time.* Refer to Page 37, Diagnosis.

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

* The ↑ (Up) and ↓ (Down) arrows must be pushed in unison twice to access diagnostic codes on transmissions equipped with an electronic oil level sensor.

RANGE SELECTION — PUSHBUTTON AND LEVER SHIFT SELECTORS WITH DIGITAL DISPLAY

RANGE SELECTION

PUSHBUTTON SHIFT SELECTOR



TYPICAL LEVER SHIFT SELECTOR

V01291.03



WARNING: If you leave the vehicle and the engine is running, the vehicle can move suddenly and you or others could be injured. If you must leave the engine running, do not leave the vehicle until you:

- Put the transmission in **N** (Neutral)...and
- Apply the parking brake and emergency brakes and make sure they are properly engaged...and
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.

R

Completely stop the vehicle before shifting from a forward range to Reverse or from Reverse to a forward range. The **SELECT** indicator will display **R** and the **MONITOR** will display **R** when Reverse is attained.



WARNING: If you let the vehicle coast in **N** (Neutral), there is no engine braking and you could lose control. Coasting can also cause severe transmission damage. To help avoid injury and property damage, do not allow the vehicle to coast in **N** (Neutral).

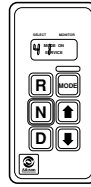
N

Use Neutral when you start the engine, to check vehicle accessories, and for extended periods of engine idle operation. For vehicles equipped with the pushbutton selector, Neutral is selected by the ECU at startup. For vehicles equipped with the lever selector, the vehicle will not start unless Neutral has been selected. If the vehicle starts in any range other than Neutral, seek service immediately. Neutral is also used during stationary operation of the power takeoff (if your vehicle is equipped with a PTO). The **SELECT** indicator will display **N** and the **MONITOR** will display **N** when Neutral is attained.

RANGE SELECTION — PUSHBUTTON AND LEVER SHIFT SELECTORS WITH DIGITAL DISPLAY *(cont'd)*

RANGE SELECTION

PUSHBUTTON SHIFT SELECTOR



TYPICAL LEVER SHIFT SELECTOR

V01291.03



NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from **N** (Neutral) to **D** (Drive) or **R** (Reverse). The shift from **N** (Neutral) to **D** (Drive) or **R** (Reverse) is inhibited when engine speed is above idle. **N** (Neutral) must be reselected and the idle speed reduced before the shift will occur. When shifts to **D** (Drive) or **R** (Reverse) are inhibited, the **SELECT** digit on the shift selector will flash.

D

The transmission will initially attain first range when **D** (Drive) is selected (except for those units programmed to start in second range). As vehicle speed increases, the transmission will upshift automatically through each range. As the vehicle slows, the transmission will downshift automatically. The **SELECT** indicator will display the highest range available and the **MONITOR** will display the current operating range.



NOTE: Even though **D** (Drive) is selected, it may not be attained due to active inhibit functions such as high throttle, high engine idle speed or other vehicle system inhibits. Some vehicles require a full apply of the service brakes before a shift out of **N** (Neutral) is allowed. Check for active diagnostic codes if **D** (Drive) is not attained.



WARNING: If you just downshift or just use service brakes when going downhill, you can lose control and cause injury and property damage. 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 helps you to 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 may upshift to the next higher range. This will reduce 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.

RANGE SELECTION — PUSHBUTTON AND LEVER SHIFT SELECTORS WITH DIGITAL DISPLAY *(cont'd)*

RANGE SELECTION

PUSHBUTTON SHIFT SELECTOR



TYPICAL LEVER SHIFT SELECTOR

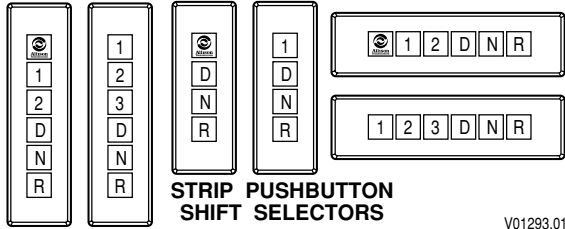


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<p>5</p> <p>4</p> <p>3</p> <p>2</p>	<p>Occasionally, road conditions, load, or traffic conditions will make it desirable to restrict automatic shifting to a lower range. Lower ranges provide greater engine braking for going down grades (the lower the range, the greater the braking effect). Always select lower ranges when using the retarder or engine brake to descend grades.</p> <p>The pushbutton selector utilizes arrow buttons to select individual forward ranges. Push the ↑ (Up) or ↓ (Down) arrow to the desired range. The SELECT indicator will display your choice and the MONITOR will display the current operating range. Even though a lower range was selected, the transmission may not downshift until vehicle speed is reduced.</p>
<p>1</p>	<p>Use this range when pulling through mud and deep snow, when maneuvering in tight spaces, or while driving up or down steep grades. First range provides the vehicle with its maximum driving power and maximum engine braking power. For vehicles equipped with the pushbutton selector, push the ↓ (Down) arrow until first range appears in the select window.</p>

RANGE SELECTION — STRIP PUSHBUTTON SHIFT SELECTORS

RANGE SELECTION



V01293.01



WARNING: If you leave the vehicle and the engine is running, the vehicle can move suddenly and you or others could be injured. If you must leave the engine running, do not leave the vehicle until you:

- Put the transmission in **N** (Neutral)...and
- Apply the parking brake and emergency brakes and make sure they are properly engaged...and
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.

R

Completely stop the vehicle before shifting from a forward range to **Reverse** or from **Reverse** to a forward range. The LED window on the **Reverse** pushbutton will illuminate and **Reverse** will be attained.



WARNING: If you let the vehicle coast in **N** (Neutral), there is no engine braking and you could lose control. Coasting can also cause severe transmission damage. To help avoid injury and property damage, do not allow the vehicle to coast in **N** (Neutral).

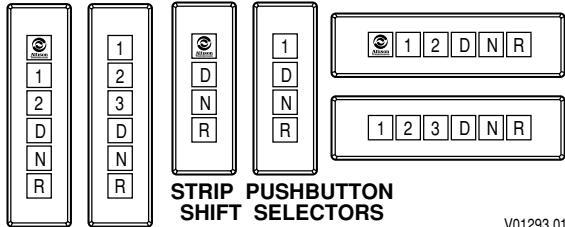
N

Use Neutral when you start the engine, to check vehicle accessories, and for extended periods of engine idle operation. For vehicles equipped with the pushbutton selector, Neutral is automatically set by the ECU during startup. For vehicles equipped with the lever selector, the vehicle will not start until Neutral has been manually selected. If the vehicle starts in any range other than Neutral, seek service immediately. Neutral is also used during stationary operation of the power takeoff (if your vehicle is equipped with a PTO). The **SELECT** indicator will display **N** and the **MONITOR** will display **N** when Neutral is attained.

RANGE SELECTION — STRIP PUSHBUTTON SHIFT SELECTORS

(cont'd)

RANGE SELECTION



V01293.01

D

The transmission will initially attain first range when **Drive** is selected. As speed increases, the transmission automatically upshifts through each range. As the vehicle slows, the transmission automatically downshifts. The LED on the **Drive** pushbutton will illuminate and the appropriate range of **Drive** will be attained.



NOTE: Even though **D** (Drive) is selected, it may not be attained due to active inhibit functions such as high throttle, high engine idle speed or other vehicle system inhibits. Some vehicles require a full apply of the service brakes before a shift out of **N** (Neutral) is allowed.



WARNING: If you just downshift or just use service brakes when going downhill, you can lose control and cause injury and property damage. 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 helps you to 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 may upshift to the next higher range. This will reduce 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

The **3rd** range (your strip pushbutton selector may not have this capability) will provide progressively greater engine braking for going down grades.

Push the **3rd** range pushbutton. The LED on the **3rd** range pushbutton illuminates, and providing conditions are satisfactory, **3rd** is attained.

2

1

Adverse Conditions. Use **2nd** or **1st** range (your strip pushbutton selector may not have this capability) when pulling through mud and deep snow, maneuvering in tight spaces, or while driving up or down steep grades when maximum output power is required. These ranges provide the vehicle with its maximum driving power and maximum engine braking power.

DRIVING TIPS



SERVICE INDICATOR LIGHT



NOTE: Some older systems do not use this light.

The illumination of this light notifies the operator that the transmission ECU is not receiving required input signals. Although the transmission can continue to operate, seek service advice promptly.

The SERVICE indicator light is located in the digital display window of the pushbutton and lever shift selectors. The SERVICE indicator light will illuminate and then turn off after a few seconds each time the engine is started. This momentary lighting shows that the status light is operational. Whenever the SERVICE indicator light does not illuminate during start-up or if the light remains illuminated, have the system checked immediately.

DO NOT SHIFT LIGHT

The electronic control system is programmed to inform the operator of a problem with the transmission system and automatically take action to protect the operator, vehicle, and transmission. To do this, the Electronic Control Unit (ECU) restricts shifting, turns on the DO NOT SHIFT (DNS) light on the instrument panel, and registers a diagnostic code.



NOTE: For some problems, diagnostic codes may be registered without the ECU activating the DO NOT SHIFT light. Your Allison Transmission authorized service outlet should be consulted whenever there is a transmission-related concern. They have the equipment to check for diagnostic codes and to correct problems which arise.

Each time the engine is started, the DO NOT SHIFT light will illuminate, then turn off after a few seconds. This momentary lighting is to show that the status light circuits are working properly. If the DNS light does not illuminate during ignition, or if the light remains on after ignition, the system should be checked immediately.

Continued illumination of the DNS light during vehicle operation (other than start-up) indicates that the ECU has signaled a diagnostic code. Illumination of the DNS light is accompanied by eight seconds of short beeps from the shift selector. The beeps are audible indications that shifts are being restricted. The SELECT digit on the shift selector display will be blank and the ECU may not respond to shift selector requests.

The indications from the shift selector are provided to inform the operator that the transmission is not performing as designed and is operating with reduced capabilities. Before turning the ignition off, the transmission may be operated for a short time in the selected range in order to “limp home” for service assistance. Service should be performed immediately in order to minimize the potential for damage to the transmission.

If the ignition switch is turned off when a DO NOT SHIFT condition exists, the transmission controls will reset to a Neutral condition. If the cause for the DO NOT SHIFT condition still exists when the engine is restarted, the transmission may remain in Neutral.

Generally, while the DNS light is on, upshifts and downshifts will be restricted and **direction changes will not occur**. If the shift lever (lever shift selector only) is moved while the DNS light is on, a continuous beep alarm sounds. The alarm stops when the lever is moved back to the position it was in when the DNS light was illuminated. Pushbutton shift selectors do not respond to any operator shift requests while the DNS light is illuminated. The lockup clutch is disengaged when transmission shifting is restricted or during any critical transmission malfunction.

DIAGNOSTIC CODES

Diagnostic codes are numerical indications relating to a detected malfunction in transmission operation. Each code consists of a two-digit main code and a two-digit subcode. These codes are logged in a list in the ECU memory with the most severe or otherwise most recent code listed first. A maximum of five codes (numbered d1–d5) may be listed in memory at one time. As codes are added, the oldest nonactive code is dropped from the list. If all five codes are active and a sixth code occurs, the code with the lowest priority that is not included on the severity list is dropped from the list. Access to the diagnostic codes and code information is through the pushbutton and lever shift selectors or the diagnostic data reader.

The ECU separately stores both active and historical (nonactive) codes. An active code is any code that is current in the ECU decision-making process. Historical codes are codes that are retained in the ECUs memory and will not affect the ECU decision-making process unless they recur. Historical codes are useful in determining if a problem is isolated, is intermittent, or results from a previous malfunction.

When the diagnostic mode is entered, the first code (position d1) is displayed as follows (each display item lasts for two seconds): d1, main code (two digits), sub-code (two digits), sequence repeats. Press the MODE button momentarily to display codes for position d2 and press again for positions d3, d4, and d5 in the same manner. After a programmed number of ignition cycles, a code may be deleted from memory if it has not recurred.

The shift selector diagnostic mode will end automatically after two minutes without operator input.

DIAGNOSTIC CODE DISPLAY PROCEDURE

Diagnostic codes can be read and cleared by two methods:

- With the Allison DOC™ or Pro-Link® 9000 Diagnostic Data Reader. The use of the Allison DOC™ or Pro-Link® 9000 diagnostic tool is described in the instruction manual furnished with each tool.
- With the pushbutton or lever shift selector.

Pushbutton Shift Selector

- Bring the vehicle to a stop at a safe location.
- Apply the parking brake.

To Display Stored Codes:

- Simultaneously press the ↑ (Up) and ↓ (Down) arrow buttons once to access the diagnostic display mode — press the buttons twice if a transmission oil level sensor is installed.
- Observe the digital display for codes.
- Press the MODE button to see the next code — repeat for subsequent codes.

To Clear Active Indicators and Resume Vehicle Operation:

- Press and hold the MODE button for approximately three seconds until a new tone is heard. Release the MODE button and if the conditions which caused the active indicators are not present, the active indicators are cleared and normal operation is resumed. The DNS light and SERVICE icon are examples of active indicators. Some codes are self-clearing and others require ignition cycles to clear.

Lever Shift Selector

- Bring the vehicle to a stop at a safe location.
- Apply the parking brake.

To Display Stored Codes:

- Press the DISPLAY MODE button once to access the diagnostic display mode — press the button twice if a transmission oil level sensor is installed.
- Observe the digital display for codes.
- Press the MODE button to see the next code — repeat for subsequent codes.

To Clear Active Indicators and Resume Vehicle Operation:

- Press and hold the MODE button for approximately three seconds.
- Begin operating as normal — have the transmission checked at the earliest opportunity by an Allison Transmission distributor or dealer.



NOTE: If the condition that caused the code is still present, the code will again become active.

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 **D** (Drive) or **R** (Reverse) when the throttle is open. These shifts are possible at 30–40 percent throttle. The transmission will remain in **N** (Neutral) if these kind of shifts are made at throttle openings above 30–40 percent. If this happens, close the throttle and reselect **N** (Neutral) and then **D** (Drive) or **R** (Reverse). Avoid this condition by always making shifts from **N** (Neutral) to **D** (Drive) or **R** (Reverse) at closed throttle.

The position of the accelerator pedal influences the timing at which automatic shifting occurs. When the pedal is fully depressed, upshifts will occur automatically at high engine speeds. A partially depressed position of the pedal will cause the upshifts to occur at lower engine speeds. An electronic throttle position signal tells the ECU how much the operator has depressed the pedal. Excessive throttle position affects directional change shifts (shifts from **N** (Neutral) to **D** (Drive) or **R** (Reverse)).

DOWNSHIFT OR REVERSE INHIBITOR FEATURE



NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from **N** (Neutral) to **D** (Drive) or **R** (Reverse). The shift from **N** (Neutral) to **D** (Drive) or **R** (Reverse) is inhibited when engine speed is above idle. **N** (Neutral) must be reselected and the idle speed reduced before the shift will occur. When shifts to **D** (Drive) or **R** (Reverse) are inhibited, The SELECT digit on the shift selector will flash.

Although there is no speed limitation on upshifting, there is on downshifting and shifts from **N** (Neutral) into **D** (Drive) or **R** (Reverse). If a downshift or Neutral-to-range shift is selected when the engine speed is too high, the ECU will prevent the shift from occurring until **N** (Neutral) is reselected and/or the shift is made at a lower speed. A continuous “beep” tone is emitted if **R** (Reverse) is selected during forward movement or a Neutral-to-range shift is selected at too high an engine speed.

USING THE ENGINE TO SLOW THE VEHICLE



WARNING: If you just downshift or just use service brakes when going downhill, you can lose control and cause injury and property damage. 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 helps you to 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 may upshift to the next higher range. This will reduce 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 retarder to slow the vehicle. When a lower speed is reached, the ECU 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 engine-governed speed is exceeded, the transmission will upshift automatically to the next range.

USING THE HYDRAULIC RETARDER



WARNINGS: DO NOT USE THE RETARDER DURING INCLEMENT WEATHER OR WHEN ROAD SURFACES ARE SLIPPERY. De-energize the retarder at the master control switch.

On vehicles which have the primary retarder control based upon closed throttle position, brake pedal position, or brake apply pressure, always manually disable the retarder controls during inclement weather or slippery road conditions.

Regardless of the type of Allison WT retarder controls on your vehicle, the following safety features are common to each configuration:

- The retarder can be disabled when inclement weather or slippery road conditions are present
- Vehicle brake lights will always be on when the retarder is applied
- Anti-lock brake systems must be wired to send a signal to the transmission ECU when the brake system is activated.



NOTE: The retarder is automatically disabled whenever the vehicle ABS (antilock brake system) is active. There is no need to take a separate action to disable the retarder in inclement weather if the vehicle is ABS-equipped (proper ABS signal must be sent to the ECU).



NOTE: Avoid rapid ON-OFF cycling of the retarder. Allow at least ten seconds between retarder applies so the retarder accumulator can recharge and provide rapid retarder response at the next retarder application.

A hydraulic retarder is available on all of the models covered in this manual. The retarder is activated and controlled in various ways. The control depends upon the vehicle type and particular duty cycle. Both manual and automatic controls are available. Automatic controls are applied by the ECU. Some types of controls and the amount of retarder application are shown in Table 1 on Page 23.

Table 1. Types of Retarder Control

Type	Description	Amount of Application
Manual	Separate apply pedal	Zero to Full apply
Automatic	Hand lever	Six levels based on lever position
Brake Pressure Apply	Auto “Full On”	“Full On” when closed throttle sensed
Brake Pressure Apply	Single pressure switch	Off or “Full On” (based on brake pressure)
Pedal Position	Three pressure switches	1/3, 2/3, or “Full On” (based on brake pressure)
Combinations of the above systems	Special brake pedal	1/3, 2/3, or “Full On” (based on pedal position)
	Auto “half-on” plus pressure switch	Half capacity at closed throttle or “Full On” with brake pressure
	Auto “1/3 on” plus two pressure switches	1/3 capacity at closed throttle or 2/3 and “Full On” with brake pressure
	Hand lever plus pressure switch	6 levels of modulation with lever, or “Full On” with brake pressure
	Foot pedal plus pressure switch	Full modulation with separate pedal, or “Full On” with brake pressure
	Hand lever plus interface for special pedal	6 levels of modulation with lever, or 3 levels of modulation based on pedal position

Contact your vehicle manufacturer to understand how the retarder controls have been integrated into your vehicle.



CAUTION: Observe the following cautions when driving a vehicle equipped with a retarder.

BE SURE THAT THE RETARDER IS ONLY ACTIVE WHEN THE THROTTLE IS CLOSED.

OBSERVE TRANSMISSION AND ENGINE TEMPERATURE LIMITS AT ALL TIMES. Select the lowest possible transmission range to increase the cooling system capacity and total retardation available.

In the event of OVERHEATING, APPLY THE SERVICE BRAKES AND DOWNSHIFT TO A LOWER RANGE TO REDUCE VEHICLE SPEED. CONTINUE TO OPERATE AT LOWER SPEEDS.

OBSERVE THE RETARDER “OVERTEMP” LIGHT to ensure that the vehicle control system is functioning properly.

An automatic retarder capacity reduction is produced by the ECU when maximum retarder out fluid temperature is exceeded. The retarder is automatically returned to full capacity when the retarder out fluid temperature is reduced.

DO NOT OPERATE THE RETARDER SIMULTANEOUSLY WITH AN ENGINE BRAKE. Extreme torque loads can be produced which are potentially damaging to the drive train.

RANGE PRESELECTION

Range preselection means selecting a lower range to match driving conditions you encounter or expect to encounter. 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.

TWO-SPEED AXLE (Some WT Applications)

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.

COLD WEATHER STARTS

All WT Series transmissions are programmed to restrict full operation until specific temperatures are reached. Refer to the following chart for temperature restrictions.

Sump Oil Temperature	DO NOT SHIFT Light	Operation
-32°C (-25°F) and below	OFF *	Neutral, Reverse, Second*
-32°C (-25°F) to -7°C (20°F)	OFF *	Neutral, Reverse, Second*
-7°C (20°F) to 121°C (250°F)	OFF	Full operation in all ranges

* For some early software versions, the DO NOT SHIFT light is illuminated and transmission operation is restricted to Neutral range only.

Transmission operation at cold ambient temperatures may require preheating or the use of a lower viscosity transmission fluid. Refer to **RECOMMENDED AUTOMATIC TRANSMISSION FLUID AND VISCOSITY GRADE** on Page 35.

DRIVING ON SNOW OR ICE



WARNING: Using the retarder on wet or slippery roads can be like jamming on the brakes — your vehicle may slide out of control. To help avoid injury or property damage, turn the retarder enable to OFF when driving on wet or slippery roads.



NOTE: The retarder is automatically disabled whenever the vehicle ABS (antilock brake system) is active. There is no need to take a separate action to disable the retarder in inclement weather if the vehicle is ABS-equipped.

Here is where all of your ability as a professional driver comes into focus regardless of what transmission you have. If possible, reduce your speed and select a lower range before you lose traction. Select the range that will not exceed the speed you expect to maintain. Accelerate or decelerate very gradually to prevent losing traction. It is very important to slow gradually when a lower range is selected. It is important that you reach the lower range selected before attempting to accelerate. This will avoid an unexpected downshift during acceleration.

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 throttle is open. These shifts are possible at 30–40 percent throttle. The transmission will remain in **N** (Neutral) if these kind of shifts are made at throttle openings above 30–40 percent. If this happens, close the throttle and reselect **N** (Neutral) and then **D** (Drive) or **R** (Reverse). Avoid this condition by always making shifts from **N** (Neutral) to **D** (Drive) or **R** (Reverse) at closed throttle.



CAUTION: DO NOT make **N** (Neutral)-to-**D** (Drive) or directional shift changes when the engine rpm is above idle. Also, if the wheels are stuck and not turning, do not apply full power for more than 30 seconds in either **D** (Drive) or **R** (Reverse). Full power for more than 30 seconds under these conditions may 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 and allow 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.

HIGH FLUID TEMPERATURE

The transmission is considered to be overheated when any of the following temperatures are exceeded:

Sump fluid	121°C (250°F)
Converter out fluid to cooler	149°C (300°F)
Retarder out fluid to cooler	165°C (330°F)

If the sump fluid temperature reaches 128°C (262°F) the ECU will inhibit operation in the higher ranges and a code will be logged (“EMERGENCY” applications are not affected).

If the transmission overheats during normal operations, check the fluid level in the transmission. (Refer to the Fluid Check Procedures as described in the Care and Maintenance section starting on Page 29 of this handbook.)

If the engine temperature gauge indicates a high temperature, the transmission is probably overheated. 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.



CAUTION: The engine should never be operated for more than 30 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 result in severe overheat damage to the transmission.

If the engine temperature indicates a high temperature, an engine problem is indicated. If high temperature in either the engine or transmission persists, stop the engine and have the overheating condition investigated by maintenance personnel.

PARKING BRAKE

Select **N** (Neutral) and apply the parking brake to secure the vehicle when it is not attended. Always make sure the vehicle's parking brake system has been maintained per the manufacturer's specifications.



WARNING: Take the following precautions so that unexpected, possible sudden vehicle movement is avoided. Whenever it becomes necessary to leave the vehicle, even momentarily, while the engine is running, place the transmission shift selector in **N** (Neutral), set the parking brake and/or emergency brakes, and chock the wheels.

TOWING OR PUSHING



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

The engine cannot be started by pushing or towing. Before pushing or towing a vehicle, disconnect the driveline, lift the drive wheels off the road, 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.

TURNING OFF THE VEHICLE

Always select **N** (Neutral) prior to turning off the vehicle engine.



POWER TAKEOFF OPERATION

ENGINE-DRIVEN POWER TAKEOFF (PTO)



CAUTION: Do not exceed the engagement and operational speed limits imposed on the driven equipment during the operation of the PTO.

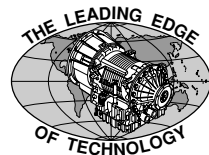
If a PTO is present, it will be mounted on either the left or right side of MD, B 300, and B 400 models. On HD and B 500 models, the PTO will be located on the left side or on the top of the transmission. The PTO drive gear is engine-driven and therefore provides direct engine power. The PTO can be operated when the vehicle is either moving or stopped.

The PTO gear is in constant mesh with the drive gear in the converter housing. PTOs are either constant drive (output always powered) or clutched drive. The output of a clutched drive PTO is powered when the PTO clutch is pressurized.

Be sure that the limits for PTO engagement speed and operational speed are not exceeded. Consult the vehicle manufacturer's literature for these speed limits. Also, all WT-equipped vehicles with PTO have engagement and operational speed limits programmed into the ECU to help protect PTO equipment. Some speed limit default values which are programmed in the ECU may be out of the operating range and will need to be set for your particular PTO duty cycle. Consult your vehicle manufacturer to see if your transmission has been programmed and what operational limits have been established.

When the programmed engine or output engagement speed is exceeded, the PTO will not engage. The PTO engagement must be retried after the speed has been reduced. When operational speeds (either engine or transmission output) are exceeded, the PTO will deactivate and the PTO engagement process must be repeated.

CARE AND MAINTENANCE



PERIODIC INSPECTIONS



The Allison WT Series require minimum maintenance. Careful attention to the fluid level and the connections for the electronic and hydraulic circuits is most important.

For easier inspection, the transmission should be kept clean. Make periodic checks for loose bolts and leaking fluid lines. Check the condition of the electrical harnesses regularly. Check the engine cooling system occasionally for evidence of transmission fluid which would indicate a faulty oil cooler. Report any abnormal condition to your maintenance personnel.

PREVENT MAJOR PROBLEMS

Help the Electronic Control System oversee the operation of the transmission. Minor problems can be kept from becoming major problems if you notify an Allison Transmission distributor or dealer when one of these conditions occur:

- Shifting feels odd
- 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)
- **DO NOT SHIFT** light comes on frequently

IMPORTANCE OF PROPER FLUID LEVEL

Because the transmission fluid cools, lubricates, and transmits hydraulic power, it is important that the proper fluid level be maintained at all times. If the fluid level is too low, the converter and clutches do not receive an adequate supply of fluid. If fluid level is too high, the fluid can aerate. Aerated fluid can cause the transmission to shift erratically or overheat.

OIL LEVEL SENSOR

The WT Series has an optional oil level sensor that allows the operator to obtain an indication of fluid level from the shift selector.



NOTE: To correctly check the transmission fluid level using the dipstick, the transmission fluid must be at operating temperature. The oil level sensor method of checking the fluid level compensates for transmission fluid temperature between 60°C–104°C (140°F–220°F). Any temperature below 60°C (140°F) or above 104°C (220°F) will result in an **Invalid for Display** condition.

FLUID LEVEL CHECK USING THE PUSHBUTTON OR LEVER SHIFT SELECTOR



NOTE: The pushbutton and lever selectors can display two characters at one time. One character is displayed under the **SELECT** heading and one under the **MONITOR** heading.

- Park the vehicle on a level surface, shift to **N** (Neutral), and apply the parking brake.
- **Pushbutton shift selector** — If equipped with an oil level sensor, simultaneously press the ↑ (Up) and ↓ (Down) arrow buttons.
- **Lever shift selector** — If equipped with an oil level sensor, press the **DISPLAY MODE** button one time.



NOTE: The fluid level check may be delayed until the following conditions are met:

- The fluid temperature is above 60°C (140°F) and below 104°C (220°F).
- The transmission is in **N** (Neutral).
- The vehicle has been stationary for approximately two minutes to allow the fluid to settle.
- The engine is at idle.
- The transmission output shaft is stopped.

The indication of a delayed fluid level check is a flashing display under **SELECT** and a digit countdown from 8 to 1 under **MONITOR**.

1. **Correct Fluid Level** — “OL” is displayed (“OL” represents “Fluid (Oil) Level Check Mode”), followed by “OK.” The “OK” display indicates the fluid is within the “OK” zone. The sensor display and the transmission dipstick may not agree exactly because the oil level sensor compensates for fluid temperature.

2. **Low Fluid Level** — “OL” is displayed (“OL” represents “Fluid (Oil) Level Check Mode”), followed by “LO” (“LO” represents “Low Oil Level”) and the number of quarts the transmission fluid is low. Example: “02” indicates 2 additional quarts of fluid will bring the fluid level within the middle of the “OK” zone.
3. **High Fluid Level** — “OL” is displayed (“OL” represents “Fluid (Oil) Level Check Mode”), followed by “HI” (“HI” represents “High Oil Level”) and the number of quarts the transmission is overfilled. Example: “01” indicates 1 quart of fluid above the full transmission level.
4. **Invalid for Display** — “OL” is displayed (“OL” represents “Fluid (Oil) Level Check Mode”), followed by “- -” and a numerical display. The numerical display is a fault code and indicates conditions are not proper to receive the fluid level information, or that there is a system malfunction. The fault codes that may be encountered are shown in Table 2.

Table 2. Oil Level Fault Codes

DISPLAY	CAUSE OF CODE
“OL” “- -” “0 X”	Settling time too short
“OL” “- -” “5 0”	Engine speed (rpm) too low
“OL” “- -” “5 9”	Engine speed (rpm) too high
“OL” “- -” “6 5”	Neutral must be selected
“OL” “- -” “7 0”	Sump fluid temperature too low
“OL” “- -” “7 9”	Sump fluid temperature too high
“OL” “- -” “8 9”	Output shaft rotation
“OL” “- -” “9 5”	Sensor failure*



CAUTION: Low or high fluid level can cause overheating and irregular shift patterns. These conditions can damage the transmission if not corrected.

- To exit the fluid level display mode, press any range button on the pushbutton shift selector, or press the **DISPLAY MODE** button once on the lever shift selector.

* Report sensor failure display to a distributor or dealer in your area (check the telephone directory for an Allison Transmission distributor or dealer nearest you).

FLUID LEVEL CHECK USING THE STRIP PUSHBUTTON SHIFT SELECTOR



NOTE: The strip pushbutton selector can display fluid level information through illuminating the pushbuttons and tone. The listed reactions will continue until the fluid level mode is deactivated.

- Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake and/or emergency brakes.
- Initiate display of information with a separate switch provided by the vehicle manufacturer.
- The strip pushbutton selector indicates fluid level conditions as follows:
 1. **Correct Fluid Level** — Indicated by a flashing red LED on the **N** (Neutral) pushbutton. The Correct Fluid Level display indicates the fluid is within the “O K” zone.
 2. **Low Fluid Level** — Indicated by a flashing red LED on the **R** (Reverse) pushbutton and a tone. The number of times the tone is sounded will indicate the number of quarts the transmission is low on fluid. The **N** (Neutral) pushbutton red LED will remain on during this display.
 3. **High Fluid Level** — Indicated by a flashing red LED on the **D** (Drive) pushbutton and a tone. The number of times the tone is sounded will indicate the number of quarts the transmission is overfilled. The **N** (Neutral) pushbutton red LED will remain on during this display.



CAUTION: Low or high fluid level can cause overheating and irregular shift patterns. These conditions can damage the transmission if not corrected.

4. **Invalid for Display** — Indicated by flashing red LED lights in a repeated sequence from **R** (Reverse) down through the lowest **D** (Drive) range while the **N** (Neutral) red LED remains constantly illuminated. A constant tone will sound until the fluid level mode is exited.



NOTE: Invalid for Display — is activated when conditions are present that do not allow the fluid level to be checked. Review the following conditions and correct as necessary. If these conditions cannot be corrected, contact the nearest distributor or dealer in your area (check the telephone directory for the Allison Transmission distributor or dealer nearest you).

POSSIBLE CONDITIONS THAT WILL CAUSE INVALID FOR DISPLAY

- Settling time too short
 - Engine speed (rpm) too low
 - Engine speed (rpm) too high
 - N (Neutral) must be selected
 - Sump fluid temperature too low (below 60°C or 140°F)
 - Sump fluid temperature too high (above 104°C or 220°F)
 - Output shaft rotation
- To exit the fluid level display mode you can either press a pushbutton or deactivate the manufacturer-provided switch used to enter the fluid level check mode.

MANUAL FLUID CHECK PROCEDURE



WARNING: If you leave the vehicle and the engine is running, the vehicle can move suddenly and you or others could be injured. If you must leave the engine running, do not leave the vehicle until you:

- Put the transmission in N (Neutral)...and
- Apply the parking brake and emergency brakes and make sure they are properly engaged...and
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.



Clean around the end of the fill tube before removing the dipstick. This will aid in preventing dirt or foreign matter from entering the hydraulic system, which can cause valves to stick, undue wear of transmission parts, or clog passages. Check the fluid level by the following procedure and report any abnormal level to your maintenance personnel.

COLD CHECK

The Cold Check determines if the transmission has enough fluid to be operated safely until a Hot Check can be made.



CAUTION: DO NOT start the engine until the presence of transmission fluid has been confirmed. Remove the transmission fluid dipstick and be sure that the static fluid level is near the HOT FULL mark.

A cold check may be made after initial start-up and the presence of transmission fluid has been confirmed (the sump fluid temperature is then typically 16°C–49°C; 60°F–120°F).

- If the engine has been shut down for an extended time, park the vehicle on a level surface and apply the parking brake.
- Start and run the engine at idle (500–800 rpm) in **N** (Neutral) for about one minute. Shift to **D** (Drive) and then to **R** (Reverse) to clear the hydraulic circuits of air. Shift to **N** (Neutral) and leave engine at idle.
- After wiping the dipstick clean, check the fluid level. If the fluid on the dipstick is within the COLD RUN band, the level is satisfactory. If the fluid level is not within this band, add or drain fluid as necessary to bring the level within the COLD RUN band.
- Perform a Hot Check at the first opportunity after normal operating temperature (71°C–93°C; 160°F–200°F) is reached.



CAUTION: The transmission must not be operated for extended periods of time until a Hot Check has verified proper fluid level. Transmission damage can result from extended operation at improper fluid level conditions.



CAUTION: An accurate fluid level check cannot be made unless the engine is idling (500–800 rpm) in **N** (Neutral), the transmission fluid is at the proper temperature, and the vehicle is on a level surface.

HOT CHECK

Because the fluid level rises as temperature increases, the fluid must be hot to ensure an accurate check.

- Be sure fluid has reached normal operating temperature (71°C–93°C; 160°F–200°F). If a transmission temperature gauge is not present, check fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under load for at least one hour.
- Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake and allow the engine to idle (500–800 rpm).
- After wiping the dipstick clean, check the fluid level. The safe operating level is anywhere within the HOT RUN band on the dipstick.
- If the level is not within this band, add or drain fluid as necessary to bring the level within the HOT RUN band.
- Be sure that fluid level checks are consistent. Check level more than once and if readings are not consistent, check to be sure that the transmission breather is clean and not clogged. If readings are still not consistent, contact your nearest Allison distributor or dealer.

RECOMMENDED AUTOMATIC TRANSMISSION FLUID AND VISCOSITY GRADE

- Hydraulic fluids (oils) used in the transmission are important influences on transmission performance, reliability, and durability. DEXRON®-III fluids are recommended for on-highway applications. Type C-4 fluids are recommended for severe duty and off-highway applications.
- Some DEXRON®-III fluids are also qualified as Type C-4 fluids. To ensure the fluid is qualified for use in Allison transmissions check for the DEXRON®-III license numbers and/or C-4 approval numbers on the container or consult the lubricant manufacturer. Consult your Allison Transmission dealer or distributor before using other fluid types. Fluid types such as Type F and universal farm fluids may or may not be properly qualified for use in your Allison transmission.



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

- When choosing the optimum viscosity grade of fluid, duty cycle, preheat capabilities, and/or geographical location must be taken into consideration. Table 3 lists the minimum fluid temperatures at which the transmission may be safely operated without preheating. Preheat with auxiliary heating equipment or by running the equipment or vehicle with the transmission in neutral for a minimum of 20 minutes before attempting range operation.

Table 3. Operating Temperature Requirements For Transmission Fluid

Viscosity Grade	Ambient Temperature Below Which Preheat Is Required	
	Celsius	Fahrenheit
SAE 0W-20*	-30	-22
DEXRON®-III	-27	-17
SAE 10W	-20	-4
SAE 15W-40	-15	5
SAE 30	0	32
SAE 40	10	50

* "Arctic" as defined by MIL-L-46167B(Ref. 13-TR-90.)

KEEPING FLUID CLEAN



CAUTION: Do not use containers or fillers for transmission fluid that have been used for any antifreeze solution. Antifreeze and coolant solutions contain ethylene glycol which, if introduced into the transmission, can cause the clutch plates to fail.

It is absolutely necessary that transmission fluid be clean. The fluid must be handled in clean containers to prevent foreign material from entering the transmission.

FLUID AND INTERNAL FILTER CHANGE INTERVAL RECOMMENDATIONS



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

Allison requires all MD, HD and B Series transmissions to have the main filter (not the lube filter or fluid) changed after the first 5,000 miles (8000 km) or 200 hours of operation, whichever comes first. Refer to SIL 10-TR-99, latest revision, for convenient kit and fluid information. Refer to Mechanic's Tips (MT3004EN), latest version, for location of the main filter and the filter change procedure.

Table 4 is given only as a general guide for fluid and filter change intervals for MD 3000/B 300/B 400 Series transmissions.

Table 5 is given only as a general guide for fluid and filter change intervals for HD 4000/B 500 Series transmissions.

Table 4. Transmission Fluid and Filter Change for MD 3000/B 300/B 400
Schedule 1. Recommended Fluid and Filter Change Intervals (Non-TranSynd™/Non-TES 295 Fluid)

SEVERE VOCATION				GENERAL VOCATION		
Fluid	Filters			Fluid	Filters	
	Main	Internal	Lube/Auxiliary		Main	Internal
12,000 Miles (20 000 km) 6 Months 500 Hours	12,000 Miles (20 000 km) 6 Months 500 Hours	Overhaul	12,000 Miles (20 000 km) 6 Months 500 Hours	25,000 Miles (40 000 km) 12 Months 1000 Hours	25,000 Miles (40 000 km) 12 Months 1000 Hours	25,000 Miles (40 000 km) 12 Months 1000 Hours

NOTE: The following recommendations in Schedule 2 are based upon the transmission containing 100% of TranSynd™ fluid.
MD/HD Product Line Filter change intervals in Schedule 2 are only valid with the use of Allison Transmission Gold series filters.
Flushing Machines are not recommended or recognized due to variation and inconsistencies with ensuring removal of 100% of the used fluid.

Schedule 2. Recommended Fluid and Filter Change Intervals (TranSynd™/TES 295 Fluid)						
75,000 Miles (120 000 km) 36 Months 3000 Hours	75,000 Miles (120 000 km) 36 Months 3000 Hours	Overhaul	75,000 Miles (120 000 km) 36 Months 3000 Hours	150,000 Miles (240 000 km) 48 Months 4000 Hours	75,000 Miles (120 000 km) 36 Months 3000 Hours	75,000 Miles (120 000 km) 36 Months 3000 Hours

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

Severe Vocation: All Retarders, On/Off Highway, Refuse, Transit, and Intercity Coach with duty cycle greater than one (1) stop per mile.

General Vocation: Intercity Coach with duty cycle less than or equal to one (1) stop per mile and all other vocations.

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

Table 5. Transmission Fluid and Filter Change for HD 4000/B 500 Series
Schedule 1. Recommended Fluid and Filter Change Intervals (Non-TransSynd™/Non-TES 295 Fluid)

SEVERE VOCATION				GENERAL VOCATION			
Fluid	Filters			Fluid	Filters		
	Main	Internal	Lube/Auxiliary		Main	Internal	Lube/Auxiliary
12,000 Miles (20 000 km) 6 Months 500 Hours	12,000 Miles (20 000 km) 6 Months 500 Hours	Overhaul	12,000 Miles (20 000 km) 6 Months 500 Hours	25,000 Miles (40 000 km) 12 Months 1000 Hours	Overhaul	25,000 Miles (40 000 km) 12 Months 1000 Hours	25,000 Miles (40 000 km) 12 Months 1000 Hours

NOTE: The following recommendations in Schedule 2 are based upon the transmission containing 100% of TransSynd™ fluid.
 MD/HD Product Line Filter change intervals in Schedule 2 and 3 are only valid with the use of Allison Transmission Gold series filters.

Flushing Machines are not recommended or recognized due to variation and inconsistencies with ensuring removal of 100% of the used fluid.

4 inch Control Module (3.5 inch approximately) — Requires filter kit P/N 29540494							
Schedule 2. Recommended Fluid and Filter Change Intervals (TransSynd™/TES 295 Fluid)							
75,000 Miles (120 000 km) 36 Months 3000 Hours	75,000 Miles (120 000 km) 36 Months 3000 Hours	Overhaul	75,000 Miles (120 000 km) 36 Months 3000 Hours	150,000 Miles (240 000 km) 48 Months 4000 Hours	Overhaul	75,000 Miles (120 000 km) 36 Months 3000 Hours	75,000 Miles (120 000 km) 36 Months 3000 Hours

Table 5. Transmission Fluid and Filter Change for HD 4000/B 500 Series (cont'd)

Schedule 3. Recommended Fluid and Filter Change Intervals (Non-TranSynd™/Non-TEs 295 Fluid)

SEVERE VOCATION				GENERAL VOCATION			
Fluid	Filters			Fluid	Filters		
	Main	Internal	Lube/Auxiliary		Main	Internal	Lube/Auxiliary
2 inch Control Module (1.75 inch approximately) — Requires filter kit P/N 29540493							
Schedule 4. Recommended Fluid and Filter Change Intervals (TranSynd™/TES 295 Fluid)							
50,000 Miles (80 000 km) 24 Months 2000 Hours	Overhaul	50,000 Miles (80 000 km) 24 Months 2000 Hours	150,000 Miles (240 000 km) 48 Months 4000 Hours	Overhaul	50,000 Miles (80 000 km) 24 Months 2000 Hours	Overhaul	50,000 Miles (80 000 km) 24 Months 2000 Hours

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

Severe Vocation: All Retarders, On/Off Highway, Refuse, Transit, and Intercity Coach with duty cycle greater than one (1) stop per mile.

General Vocation: Intercity Coach with duty cycle less than or equal to one (1) stop per mile and all other vocations.

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



CAUTION: Transmission fluid and filters must be changed whenever there is evidence of dirt or a high temperature condition. A high temperature condition is indicated when the transmission fluid is discolored, has a strong odor or has exceeded oil analysis limits shown in Table 6.

Fluid Analysis. Transmission protection and fluid change intervals can be optimized by monitoring fluid oxidation according to the tests and limits shown in Table 6. Consult your local telephone directory for fluid analysis firms. To ensure consistent and accurate fluid analysis, use only one fluid analysis firm. Refer to the Technician's Guide for Automatic Transmission Fluid, GN2055EN, for additional information.

Table 6. Fluid Oxidation Measurement Limits

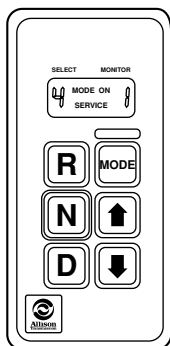
Test	Limit
Viscosity	±25% change from new fluid
Total Acid Number	+3.0* change from new fluid
Solids	2% by volume maximum
* mg of KOH to neutralize a g of fluid.	

DIAGNOSIS

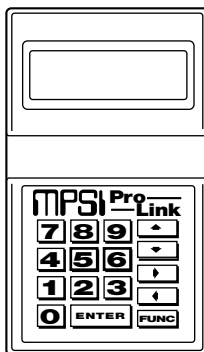
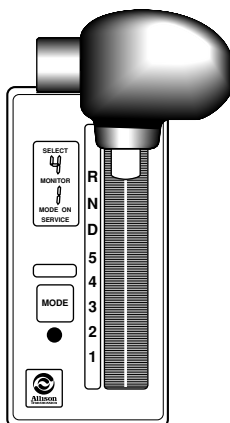


DIAGNOSTIC CODES

Continued illumination of the **DO NOT SHIFT** light during vehicle operation (not during start-up) indicates the ECU has signaled a diagnostic code. Poor performance may activate a code without illuminating the **DO NOT SHIFT** light. Up to five diagnostic codes can be recorded. Diagnostic codes can be read and cleared by two methods: by using the Allison DOCT™ or Pro-Link® 9000 Diagnostic Tool or by using the shift selectors shown below. Use of the Allison DOCT™ or Pro-Link® 9000 Diagnostic Tool is described in the instruction manual furnished with each tool. Code reading, clearing methods, and complete code descriptions are written in the applicable Troubleshooting Manual.



**SHIFT
SELECTOR**



**DIAGNOSTIC
READER / TOOL**

V01294.02

Shift Selector/Pro-Link® 9000 Diagnostic Tool



CUSTOMER SERVICE

OWNER ASSISTANCE

The satisfaction and goodwill of the owners of Allison transmissions are of primary concern to Allison Transmission Division (ATD), 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).

Reference the Sales and Service Directory (SA2229EN) for the current listing of Allison Transmission authorized distributor and service dealers.

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 the problem with a member of management from the distributorship or dealership. Frequently, complaints are the result of a breakdown in communication and can quickly be resolved by a member of management. If you have already discussed the problem with the Sales or Service Manager, contact the General Manager. All ATD dealers are associated with an ATD 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 ATD distributor's name, address, and telephone number on request.

Step Two — When it appears the problem cannot be resolved readily at the distributor level without additional assistance, **contact the Allison Transmission Regional Office responsible for the local distributor.** You will be assisted by a member of the Regional Service Manager’s staff, depending on the nature of your problem.

For prompt assistance, please have the following information available.

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

Step Three — If you contacted a regional office and you are still not satisfied, **present the entire matter to the Home Office by writing to the following address or calling the phone number below:**

Manager, Warranty Administration – PF9
Allison Transmission
P.O. Box 894
Indianapolis, IN 46206-0894
Phone: (800) 524-2303

The inclusion of all pertinent information will assist the Home Office in expediting the matter. If an additional review by the Home Office of all the facts involved indicates that some further action can be taken, the Regional Office will be advised.

When contacting the Regional or Home Office, please keep in mind that ultimately the problem will likely be resolved at the distributorship or dealership utilizing their facilities, equipment, and personnel. Therefore, it is suggested the above steps be followed in sequence when experiencing a problem.

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

SERVICE LITERATURE



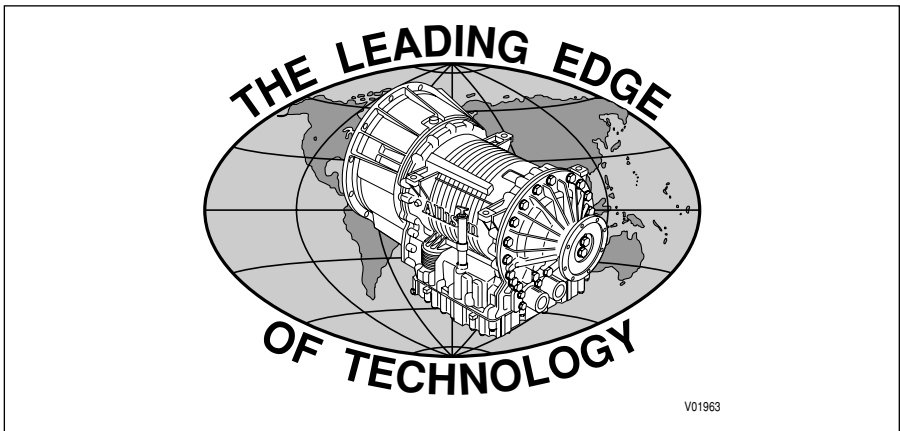
Additional service literature is available as shown in Table 7. This service literature provides fully illustrated instructions for the operation, maintenance, service, overhaul, and parts support of your transmission. To ensure that you get maximum performance and service life from your unit, you may order publications from:

SGI, Inc.
 Attn: Allison Literature Fulfillment Desk
 8350 Allison Avenue
 Indianapolis, IN 46268
 TOLL FREE: 888-666-5799
 INTERNATIONAL: 317-471-4995

Table 7. MD, HD, and B Series Service Literature

Transmission Model	MD/B 300/B 400	MD 3070	HD/B 500
Service Manual	SM2148EN	SM2148EN	SM2457EN
Parts Catalog	PC2150EN	PC2150EN	PC2456EN
Parts Catalog CD-ROM	CD2150EN	CD2150EN	CD2456EN
Troubleshooting Manual	TS2470EN	TS2470EN	TS2470EN
Principles of Operation	PO2454EN	PO2454EN	PO2454EN
*Operator's Manual	OM2157EN	OM2683EN	OM2157EN
*Mechanic's Tips	MT2159EN	MT2923EN	MT2159EN
Job-Aid Card	JA2506EN	JA2506EN	JA2685EN

* Also Available On The Internet At www.allisontransmission.com



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ALLISON TRANSMISSION DISTRIBUTORS

EASTERN REGION

Atlantic Detroit Diesel-Allison, LLC
180 Route 17 South
Lodi, NJ 07644
201-489-5800

Penn Detroit Diesel-Allison, Inc.
8330 State Road
Philadelphia, PA 19136-2986
215-335-0500

Covington Detroit Diesel-Allison
8015 Piedmont Triad Parkway
Greensboro, NC 27409
336-292-9240

Western Branch Diesel, Inc.
3504 Shipwright Street
Portsmouth, VA 23703
757-673-7000

Johnson & Towers, Inc.
2021 Briggs Road
Mount Laurel, NJ 08054
856-234-6990

Williams Detroit Diesel-Allison
Southeast, Inc.
2849 Moreland Avenue, S.E.
Atlanta, GA 30315-0037
404-366-1070

New England Detroit Diesel-Allison, Inc.
90 Bay State Road
Wakefield, MA 01880-1095
781-246-1810

CENTRAL REGION

Caribe Detroit Diesel-Allison
Division of GT Corporation
Ceramic Ind. Park, Campo Rico Ave.,
Block C
Carolina, Puerto Rico 00982
787-750-5000

Inland Diesel, Inc.
13015 West Custer Avenue
Butler, WI 53007-0916
262-781-7100

Central Detroit Diesel-Allison, Inc.
9200 Liberty Drive
Liberty, MO 64068
816-781-8070

Interstate Detroit Diesel
2501 East 80th Street
Minneapolis, MN 55425
952-854-5511

Clarke Detroit Diesel-Allison, Inc.
3133 East Kemper Road
Cincinnati, OH 45241
513-771-2200

Inland Detroit Diesel-Allison, Inc.
210 Alexandra Way
Carol Stream, IL 60188
630-871-1111

Florida Detroit Diesel-Allison, Inc.
5105 Bowden Road
Jacksonville, FL 32216
904-737-7330

Williams Detroit Diesel-Allison
Midwest, Inc.
1176 Industrial Parkway, North
Brunswick, OH 44212-2342
330-225-7751

SOUTHWESTERN REGION

Detroit Diesel-Allison De Mexico S.A.
De C.V.
Av. Santa Rose No. 58
Col. Ampliacion Norte, Tlalnepantla
C.P. 54160, Estado de Mexico
525-5-5333-1800

United Engines, LLC
5555 West Reno Avenue
Oklahoma City, OK 73127
405-947-3321

Stewart & Stevenson Power, Inc.
5840 Dahlia Street
Commerce City, CO 80022
303-287-7441

Stewart & Stevenson Services, Inc.
2707 North Loop West
Houston, TX 77008
713-868-7700

WESTERN REGION

Pacific Detroit Diesel-Allison Company
7215 South 228th Street
Kent, WA 98032
253-854-0505

Valley Detroit Diesel-Allison, Inc.
425 South Hacienda Boulevard
City of Industry, CA 91745-1123
626-333-1243

Smith Detroit Diesel/Allison, Inc.
250 West 3900 South
Salt Lake City, UT 84107
801-415-5000

Williams Detroit Diesel-Allison
Southwest, Inc.
2602 S. 19th Avenue
Phoenix, AZ 85009
602-257-0561

Stewart & Stevenson
1755 Adams Avenue
San Leandro, CA 94577-1001
510-635-8991

CANADIAN REGION

Detroit Diesel-Allison
British Columbia Ltd.
9300 - 192nd Street
Surrey, British Columbia V4N 3R8
604-888-1211

Midwest Detroit Diesel-Allison Ltd.
1460 Waverley Street
Winnipeg, Manitoba R3T 0P6
204-452-8244

Detroit Diesel-Allison Canada East
(Div. of Integrated Power Systems Corp.)
2997 Rue Watt
Ste. Foy, Quebec G1X 3W1
418-651-5371

Waterous Detroit Diesel-Allison (Div.
of Integrated Power Systems Corp)
10025 51st Avenue
Edmonton, Alberta T6E 0A8
780-437-3550

Harper Detroit Diesel Ltd.
10 Diesel Drive
Toronto, Ontario M8W 2T8
416-259-3281

ALLISON TRANSMISSION REGIONAL OFFICES

EASTERN REGION

P. O. Box 400
Columbus, NJ 08022-0400
609-298-2541

WESTERN REGION

39465 Paseo Padre Parkway
Suite 3510
Fremont, CA 94538
510-498-5208

CENTRAL REGION

P. O. Box 894, Speed Code PF06
Indianapolis, IN 46206
317-242-2327

CANADIAN REGION

P. O. Box 5160, Station A
London, Ontario N6A 4N5
519-452-5256

SOUTHWESTERN REGION

Av. Ejercito Nacional No. 843
Colonia Granada
C.P. 11520
Mexico, DF
525-901-3057
Texas Office: Phone: 936-321-4248
Fax: 936-321-4278

