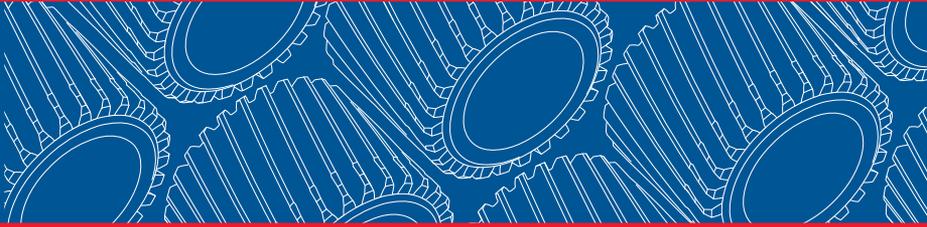




Allison
Transmission



Operator's Manual

**MT(B), HT(B), CT Series
On-Highway Transmissions
Electronic Controls**

OM1957EN

Operator's Manual

Allison Transmission

MT, MTB 648

HT 746, HT, HTB 741, 748

HT, HTB 755CR, CLT, CLBT 755

HT, HTB 755DR; HT, HTB 755DR DB

CLT, CLBT 755



Allison Transmission, Inc.

P.O. Box 894 Indianapolis, Indiana 46206-0894

www.allisontransmission.com

September 1995
Rev. 1 19991028

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. Consequently, Allison Transmission has not undertaken any such broad evaluation. Accordingly, **ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION MUST** first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service methods selected.

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

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



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



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



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

TRADEMARK INFORMATION

DEXRON[®] is a registered trademark of General Motors Corporation.

TABLE OF CONTENTS

	Page
Warnings, Cautions, and Notes	ii
Trademark Information	ii

INTRODUCTION

Keeping That Allison Advantage	1
Typical MT, HT, CT Series Transmission Models	2
A Brief Description of the Allison Automatic	5
Electronic Control	5
Torque Converter	5
Lockup Clutch	7
Planetary Gears and Clutches	7
Output Retarder	8
Input Retarder	8
Cooler, Filter Circuits	8
Transfer Gear Housing (Dropbox)	8
Manual Disconnect Clutch	8

SHIFT SELECTORS

Shift Selectors	9
Range Selection — MT, MTB 648; HT, HTB 741, 748	10
Range Selection — HT, HTB 755CR; CLT, CLBT 755	11
Range Selection — HT 755DR; HT 755DR DB; CLT, CLBT 755	12

DRIVING TIPS

Status Lights	14
Hold-In-Gear	15
Reset Procedure	15
Throttle Control	15
Downshift Control	15
Downshift or Reverse Inhibit Feature	16
Using the Engine to Slow the Vehicle or Equipment	16
Using the Retarder	16
Two-Speed Axle	17

DRIVING TIPS (cont'd)

Cold Weather Starts	17
Driving on Ice or Snow	18
Rocking Out	19
High Fluid Temperature	19
Parking Brake	20
Towing or Pushing	20

POWER TAKEOFF OPERATION

Converter-Driven PTO	21
Engine-Driven PTO	22

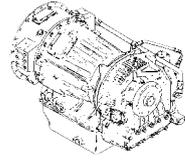
CARE AND MAINTENANCE

Periodic Inspections	23
Prevent Major Problems	23
Importance of Proper Fluid Level	23
Fluid Check Procedure	24
Cold Check	24
Hot Check	25
Dropbox Check	25
Fluid Recommendations	25
Keeping Fluid Clean	26
Fluid and Internal Filter Change Intervals	26
External Filter Change	27

CUSTOMER SERVICE

Owner Assistance	28
Service Literature	30

INTRODUCTION



KEEPING THAT ALLISON ADVANTAGE



V01724

ALLISON AUTOMATICS provide many advantages for the driver whose vehicle may encounter vigorous, tough use and sometimes abuse. Driving is easier, safer, and more efficient.

These AUTOMATICS are rugged and are designed to provide long, trouble-free service. This handbook will help you gain maximum benefits from your ALLISON-equipped vehicle.

TYPICAL MT, HT, CT SERIES TRANSMISSION MODELS



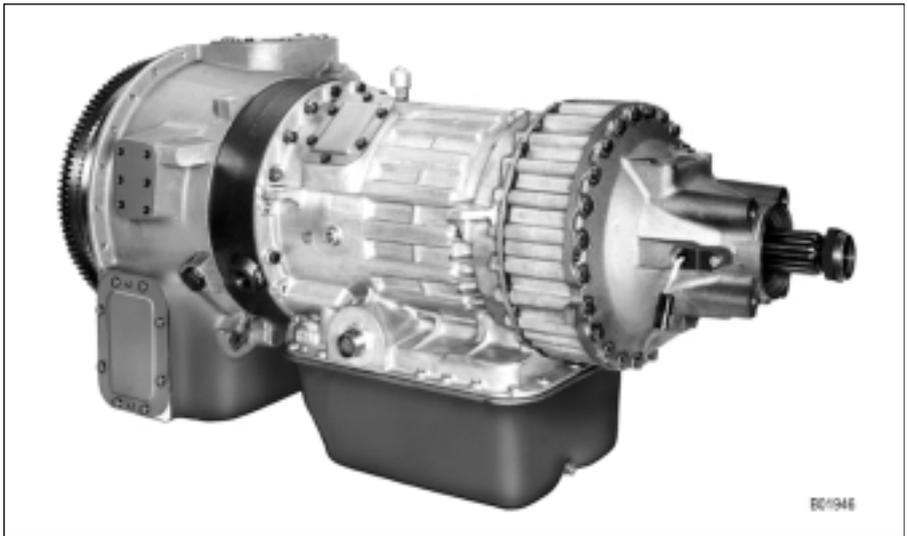
MTB 648 Transmission — Left-Front View



HT 741, 748 Transmission — Left-Rear View



HT 755CR Transmission — Left-Rear View



HT 755DR Transmission — Left-Rear View



CLBT 755 Transmission — Left-Front View



HT 746 Transmission — Left-Rear View

A BRIEF DESCRIPTION OF THE ALLISON AUTOMATIC

The transmissions described in this handbook include an Allison Transmission Commercial Electronic Control System, a torque converter, a lockup clutch, and a planetary gear train. Some transmissions also include an input or output retarder and/or transfer gear housing (dropbox).

ELECTRONIC CONTROL

The Allison Transmission Commercial Electronic Control System consists of five major components connected by wiring harnesses — Electronic Control Unit (ECU), throttle position sensor, speed sensor, range selector, and control valve body. The throttle position sensor, speed sensor, and range selector transmit information to the ECU. The ECU processes this information and then sends signals to actuate specific solenoids located on the control valve body in the transmission. The action of the solenoids affects hydraulic circuits which in turn control the upshifts, downshifts, and lockup functions.

In addition to controlling the operation of the transmission, the ECU monitors the system for conditions that could affect transmission and vehicle operation. When one of these conditions is detected, the ECU is programmed to automatically respond in a manner which will ensure safe operation of the vehicle and the transmission.



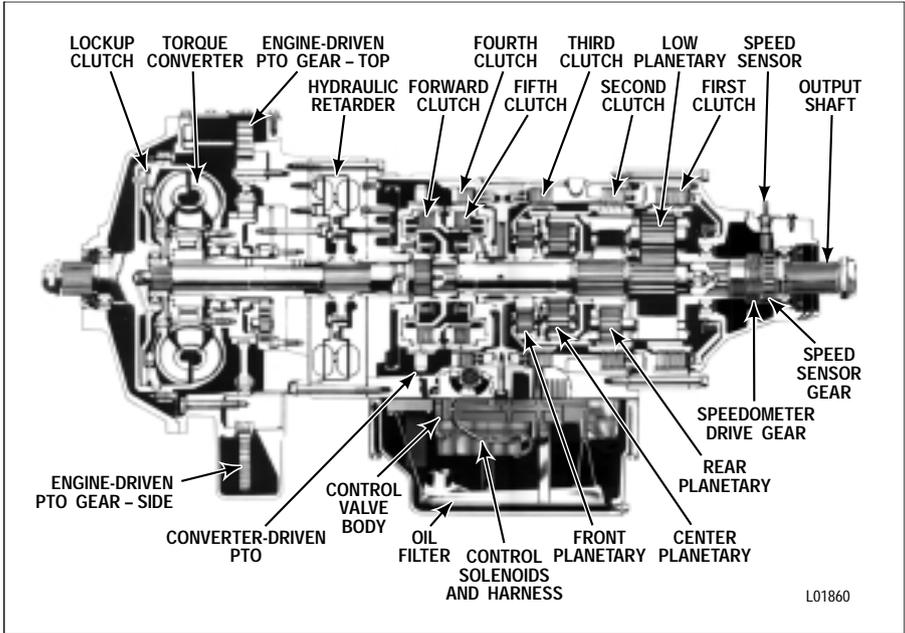
NOTE:

Allison MT, HT, and CT Series transmissions commercial 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.

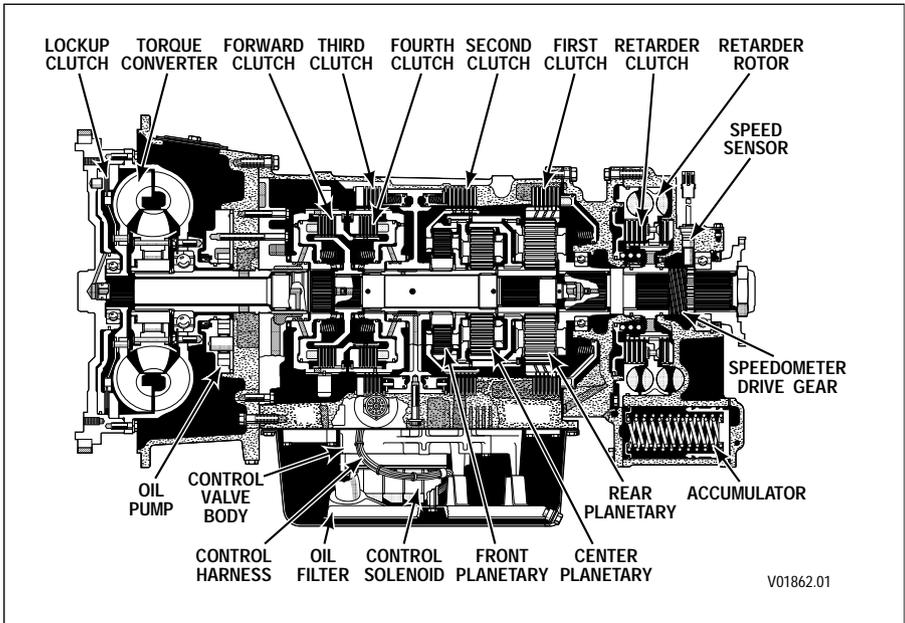
The ECU is programmed at the factory to provide the most suitable operating characteristics for a specific application. This handbook does not attempt to describe all of the possible combinations. The information contained herein describes only the operating characteristics most frequently requested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

TORQUE CONVERTER

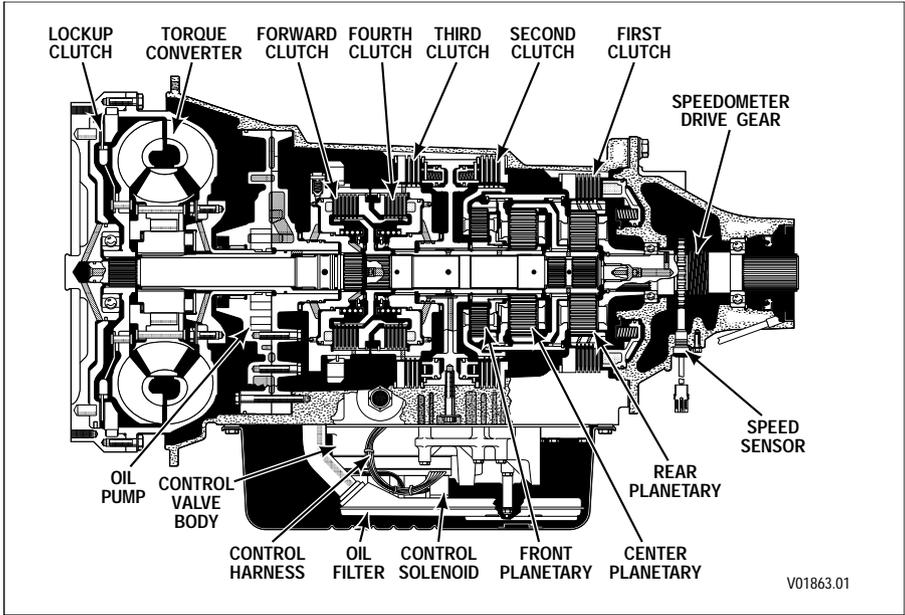
The torque converter consists of three elements — pump, turbine, and stator. The pump is the input element and is driven directly by the engine. The turbine is the output element and is hydraulically driven by the pump. The stator is the reaction (torque multiplying) element. When the pump turns faster 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.



Cross Section of CLBT 755



Cross Section of HTB 748



Cross Section of MT 648

LOCKUP CLUTCH

The lockup clutch is located inside the torque converter and consists of three elements — piston, clutch plate, and backplate. The piston and backplate are driven by the engine. The clutch plate, 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. The lockup clutch engages when the vehicle reaches a predetermined speed. Engagement of the lockup clutch provides a direct drive from the engine to the transmission gearing. This eliminates converter slippage to provide maximum fuel economy.

The lockup clutch releases at lower speeds. When the lockup clutch is released, drive from the engine is transmitted hydraulically through the converter to the transmission gearing. The lockup clutch also releases when the ECU detects certain undesirable conditions.

PLANETARY GEARS AND CLUTCHES

A series of planetary gears and shafts provide the gear ratios and direction of travel for the vehicle. Power flow through the planetaries is controlled by pairs of multiplate clutch packs. The clutches are applied and released hydraulically in response to electronic signals from the ECU.

OUTPUT RETARDER

The output retarder is located in the rear of the transmission and consists of a multiplate clutch pack and a vaned rotating element. When the retarder is applied, a control valve instantly releases fluid to fill the retarder cavity and applies the retarder clutch. The clutch and the rotating element act together to quickly slow the vehicle.

INPUT RETARDER

The input retarder is located between the converter housing and the transmission main housing. The retarder consists of a vaned rotating element that is splined to the input shaft. When the retarder is applied, a control valve fills the retarder cavity with fluid and slows the vehicle.

COOLER, FILTER CIRCUITS

The transmission fluid is cooled by a separate oil cooler or connection to the engine cooling system. Connections for the cooler circuit are located on the right side of the transmission. On non-retarder models, the TO COOLER port is located on the upper right side of the converter housing and the FROM COOLER port is located on the lower right side of the transmission housing. Retarder models have the TO COOLER and FROM COOLER ports located on the front of the retarder control valve. An auxiliary oil filter may be installed in the cooler return line on non-retarder models.

Connections for the externally-mounted, primary oil filter are located on the left side of the transmission. The TO FILTER port is located on the upper left side of the converter housing and the FROM FILTER port is located on the lower left side of the converter housing. When an input retarder is used, the FROM FILTER port is located on the lower left side of the retarder housing.

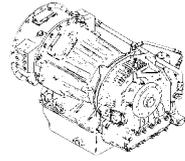
TRANSFER GEAR HOUSING (DROPBOX)

HT 755DR (DB) transmissions and some CL(B)T 700 transmissions are equipped with a dropbox. The dropbox is a vertical transfer gear case mounted to the rear of the transmission adapter housing. It can be mounted in any one of four positions, other than vertical. It provides a 1.00:1 gear ratio at three specific output locations. The top rear location is in line with the input. The bottom rear and bottom front are extensions of the drive, idler, and driven gears in the dropbox.

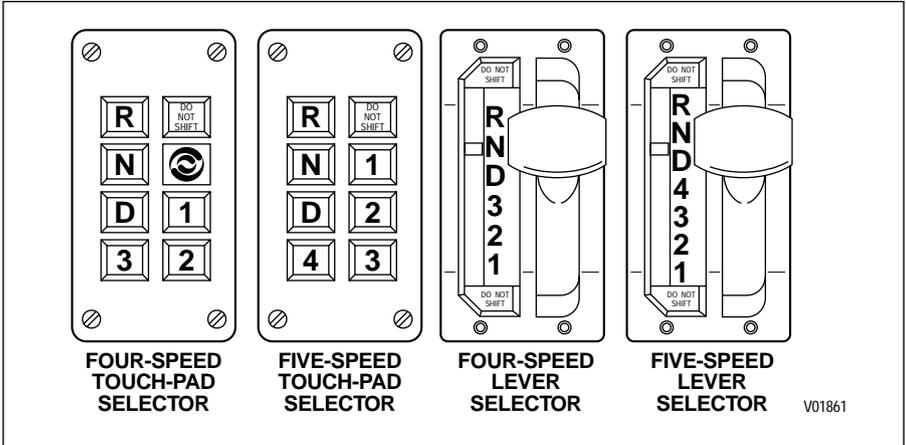
MANUAL DISCONNECT CLUTCH

Transmissions equipped with a dropbox may have a disconnect clutch mounted at any one or all three output locations of the dropbox. The clutch is engaged or disengaged by movement of the shifter shaft that extends from the clutch housing.

SHIFT SELECTORS



SHIFT SELECTORS



Typical MT, HT, CT Shift Selectors

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

The pushbutton shift selector is an electronic control unit with membrane-type push-button switches. Each pad (R, N, D, 4, 3, 2, and 1) is a switch. Just push on the pad for the desired operating range. A slight click will be felt, the pad will light up, and a “beep” tone will let you know the transmission is ready to operate within the selected range.

The optional lever selector is an electro-mechanical control. The pattern of positions can vary according to the shift selector installed. Positions (R, N, and D) are selected by releasing a position holding button and choosing the desired range. It is possible to move between drive positions without releasing the position holding button.

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

RANGE SELECTION — MT, MTB 648; HT, HTB 741, 748, HT 746

	<p>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 Neutral, set the parking brake and/or emergency brakes, and chock the wheels.</p>
<p>R</p>	<p>Use this to back the vehicle. Completely stop the vehicle before shifting from forward to reverse or from reverse to forward. The reverse warning signal is activated when this range is selected.</p>
	<p>WARNING: Do not allow the vehicle to coast in neutral. This practice can result in severe transmission damage. Also, no engine braking is available in neutral.</p>
<p>N</p>	<p>Use this position when starting the engine, when checking vehicle accessories, and for extended periods of engine idle operation. The transmission will automatically select Neutral when the master switch is turned on. If the engine starts in any other selected range, the neutral start circuit is malfunctioning and should be repaired immediately. Use Neutral when the vehicle will be left unattended with the engine running — always apply the parking brake. Neutral is also used during stationary operation of the power takeoff (if your vehicle is equipped with a PTO).</p>
<p>D</p>	<p>The vehicle will start in first (or second) range, and as the speed increases, the transmission will automatically upshift through each range to fourth range operation. As the vehicle slows down, the transmission will automatically downshift to the correct range.</p>
<p>3 2</p>	<p>Occasionally, the road, load, or traffic conditions will make it desirable to restrict the automatic shifting to a lower range. These positions also provide progressively greater engine braking for going down medium grades (the lower the range the greater the braking effect).</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. Low range provides the vehicle with its maximum driving power. Also, low range provides maximum engine braking power.</p>
	<p>NOTE: Some transmissions are programmed to always start in second range. For these units, to get first range operation, you must select first range.</p>

RANGE SELECTION — MT, MTB 648; HT, HTB 741, 748 (cont'd)

	<p>WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, however, the transmission may upshift above the highest selected range when the engine governed speed is exceeded and damaging engine overspeed is a possibility. Use the vehicle brakes or retarder to prevent exceeding governed speed in the held range.</p>
---	--

RANGE SELECTION — HT, HTB 755CR; CLT, CLBT 755

	<p>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 Neutral, set the parking brake and/or emergency brakes, and chock the wheels.</p>
<p>R</p>	<p>Use this to back the vehicle or equipment. Completely stop the vehicle or equipment before shifting from forward to reverse or from reverse to forward. The reverse warning signal is activated when this range is selected.</p>
	<p>WARNING: Do not allow the vehicle to coast in neutral. This practice can result in severe transmission damage. Also, no engine braking is available in neutral.</p>
<p>N</p>	<p>Use this when starting the engine, when checking vehicle or equipment accessories, and for extended periods of engine idle operation. The transmission will automatically select Neutral when the master switch is turned on. If the engine starts in any other selected range, the neutral start circuit is malfunctioning and should be repaired immediately. Use Neutral when the vehicle or equipment will be left unattended with the engine running — always apply the parking brake. Neutral is also used during stationary operation of the power takeoff (if your vehicle or equipment is equipped with a PTO).</p>
<p>D</p>	<p>The vehicle or equipment will start in first (or second) range, and as the speed increases, the transmission will automatically upshift through each range to fifth range operation. As the vehicle or equipment slows down, the transmission will automatically downshift to the correct range.</p>
<p>4 3 2</p>	<p>Occasionally, the road, load, or traffic conditions will make it desirable to restrict the automatic shifting to a lower range. These positions also provide progressively greater engine braking for going down medium grades (the lower the range, the greater the braking effect).</p>

RANGE SELECTION — HT, HTB 755CR; CLT, CLBT 755 *(cont'd)*

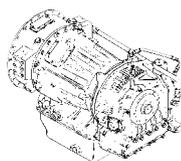
1	Use this range when pulling through mud and deep snow, when maneuvering in tight spaces, or while driving up or down steep grades or when maximum output power is required. Low range provides the vehicle or equipment with its maximum driving power. Also, low range provides maximum engine braking power.
	<p>NOTE: Some transmissions are programmed to always start in second range. For these units, to get first range operation, you must select first range.</p>
	<p>WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, however, the transmission may upshift above the highest selected range when the engine governed speed is exceeded and damaging engine overspeed is a possibility. Use the vehicle brakes or retarder to prevent exceeding governed speed in the held range.</p>

RANGE SELECTION — HT 755DR; HT 755DR DB; CLT, CLBT 755

	<p>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 Neutral, set the parking brake and/or emergency brakes, and chock the wheels.</p>
R	Use this to back the vehicle or equipment. Completely stop the vehicle or equipment before shifting from forward to reverse or from reverse to forward. The reverse warning signal is activated when this range is selected.
	<p>WARNING: Do not allow the vehicle to coast in neutral. This practice can result in severe transmission damage. Also, no engine braking is available in neutral.</p>
N	Use this when starting the engine, when checking vehicle or equipment accessories, and for extended periods of engine idle operation. The transmission will automatically select neutral when the master switch is turned on. If the engine starts in any other selected range, the neutral start circuit is malfunctioning and should be repaired immediately. Use neutral when the vehicle or equipment will be left unattended with the engine running — always apply the parking brake. Neutral is also used during stationary operation of the power takeoff (if your vehicle or equipment is equipped with a PTO).

RANGE SELECTION — HT 755DR; CLT, CLBT 755 *(cont'd)*

<p>D</p>	<p>The vehicle or equipment will start in second range, and as the speed increases, the transmission will automatically upshift to third, fourth, and fifth range. As the vehicle or equipment slows down, the transmission will automatically downshift to the correct range.</p>
<p>4 3 2</p>	<p>Occasionally the road, load, or traffic conditions will make it desirable to restrict the automatic shifting to a lower range. The vehicle or equipment will start in second range and automatically upshift to the highest selected range. These positions also provide progressively greater engine braking for going down medium grades (the lower the range, the greater the braking effect).</p>
<p>1</p>	<p>This is the creeper range — select this range for off-highway operations. Also, use this range when pulling through mud and deep snow, when maneuvering in tight spaces, or while driving up or down steep grades or when maximum output power is required. This range provides the vehicle or equipment with its maximum driving power and maximum engine braking power. The Commercial Electronic Control system will inhibit full power upshifts from first to second. Engine speed must be reduced before an upshift can be made.</p>
	<p>WARNING: The transmission incorporates a hold feature to prohibit upshifting above the range selected during normal driving. For downhill operation, however, the transmission may upshift above the highest selected range when the engine governed speed is exceeded and damaging engine overspeed is a possibility. Use the vehicle brakes or retarder to prevent exceeding governed speed in the held range.</p>



DRIVING TIPS

When programmed operating parameters have been exceeded, the ECU automatically takes action to protect the vehicle and the transmission. If this occurs, the **CHECK TRANS** light on your instrument panel, or the **CHECK TRANS** light and the **DO NOT SHIFT** light, which is located on your shift selector, will turn on. When the **DO NOT SHIFT** light comes on, a buzzer is also sounded for a moment to tell you there is a problem. Whenever either one of these lights come on, the transmission will respond to ensure the safest possible operation of the vehicle.

STATUS LIGHTS

Every time the engine is started, the status lights come on. They go off after a few seconds. This momentary lighting is to show that the light bulbs are working properly. If either status light does not come on during engine start, immediately replace the bulb.

	<p>Illumination of this light will notify the driver that the transmission is not performing as designed. No audible alarm will alert the driver that CHECK TRANS has been illuminated. Although the transmission can continue to operate, service advice should be sought promptly. The vehicle may continue to be driven to complete the desired mission if conditions can be negotiated safely. However, in some cases the ECU will take action, such as restricting operation to one range only.</p>
	<p>Illumination of this light, accompanied by ten seconds of short beeps from the shift selector, indicates that shifts are being restricted. Operation may continue in order to reach service assistance. The ECU may not respond to shift selector requests since operating limitations are being placed on the transmission; i.e., upshifts and downshifts may be restricted. Direction changes will not occur. If the shift lever is moved while DO NOT SHIFT is indicated, a continuous alarm will be sounded. The alarm will stop when the lever is moved back to the previous position where DO NOT SHIFT was first indicated. For pushbutton shift selectors, the ECU will not respond to operator requests. The ECU will cause the transmission to Hold-In-Gear and disengage the lockup clutch.</p>

HOLD-IN-GEAR

The hold-in-gear feature prevents upshifts and downshifts when a problem is detected in the operation of the transmission. The hold-in-gear circuit permits the transmission to continue to operate in the range it was in at the time the DO NOT SHIFT light and buzzer came on. Selection of a different range will have no effect on the transmission. The transmission will not upshift or downshift but will remain in the range it was in when the ECU detected the problem. The hold-in-gear circuit is released when the engine is shut off. If the problem causing the hold-in-gear condition is still present when the engine is started, the transmission will be in neutral and will remain held in neutral until the problem is corrected.

RESET PROCEDURE

When the status light (or lights) comes on, a reset procedure can be performed to clear the system.

- To reset the ECU, bring the vehicle to a stop at a safe location and shut off the engine. Wait 10 seconds and restart the engine.
- If the problem is temporary, the status light (or lights) will not come back on and your vehicle will operate in a normal manner.
- If the problem is not temporary, the status light (or lights) will come back on and the transmission may stay in neutral, operate in only the lower ranges, or operate in a normal manner. The type of operation permitted by the ECU will depend on the type of problem.

THROTTLE CONTROL

The position of the throttle influences the speed at which automatic shifting occurs. At wide open throttle, upshifts will occur automatically at high engine speeds. At part throttle, upshifts will occur at lower engine speeds. Throttle position is sensed by the throttle position sensor, which is connected to the engine throttle lever.

DOWNSHIFT CONTROL

Downshift control means selection of a lower range to match driving conditions you encounter or expect to encounter. Learning to take advantage of a downshift will give you better control on slick or icy roads and on steep downgrades. Downshifting to lower ranges increases engine braking. The selection of lower range often prevents cycling between a range and the next higher range on a series of short up-and-down grades.

DOWNSHIFT OR REVERSE INHIBIT FEATURE

Although there is no safety speed limitation on upshifting, there is on downshifting and reverse. Downshifting should be avoided when the vehicle is above the maximum speed attainable in the next lowest range. However, the ECU is designed to protect against these improper shifts. If a downshift or reverse shift is selected at too high a speed, the ECU will prevent the shift from taking effect until a safe lower speed is reached.

USING THE ENGINE TO SLOW THE VEHICLE



WARNING: Do not use the retarder when roads are slick or hazardous. The retarder braking effect will occur only at the driving axle and could make vehicle control difficult. On vehicles equipped with an integral retarder control, place the control bypass switch to OFF until road conditions improve.

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 retarder (if equipped) or service brakes to slow the vehicle. When a safe lower speed is reached, the ECU will automatically downshift the transmission. Engine braking provides good speed control for going down hills. When the vehicle is heavily loaded, or the hill is steep, it may be desirable to preselect a lower range prior to cresting the top of the hill.

USING THE RETARDER

The MTB 600/HTB 700 Series output retarder is effective over a wide range of speeds. Use the retarder any time you want to slow down. The HT 700 input retarder is most effective during high retarder rotor speed. Selecting a lower hold range position when using this type of retarder is recommended for maximum effect.

Depending on the vehicle control system used, partial retarder application is available when maximum application is not needed.



CAUTIONS: Observe the following cautions when driving a vehicle equipped with an input or output retarder.

- **APPLY AND OPERATE THE RETARDER WITH ENGINE AT CLOSED THROTTLE ONLY.**
- **DO NOT USE THE RETARDER WHEN ROAD SURFACES ARE SLIPPERY.** De-energize the system at the master control switch.
- **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, DECREASE VEHICLE SPEED TO REDUCE RETARDATION POWER REQUIREMENTS.**
- **OBSERVE THE RETARDER “ALERT LIGHT”** to ensure that the vehicle control system is functioning properly.
- **DO NOT OPERATE THE INPUT OR OUTPUT RETARDER SIMULTANEOUSLY WITH AN ENGINE EXHAUST BRAKE.** Extreme torque loads can be produced in the range section, damaging the transmission.

TWO-SPEED AXLE

The two-speed axle may be shifted from low to high or high to low while the vehicle is moving without damaging the transmission. 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 to prevent a transmission shift from coinciding with an axle shift.

COLD WEATHER STARTS

Most transmissions are programmed to restrict operation to neutral, reverse, and the lowest range in the **D** (Drive) range until the following temperatures are reached.

Sump Oil Temperature	DO NOT SHIFT Light	CHECK TRANS Light	Operation*
25°F (-32°C) and below	ON	ON	Neutral only
-24°F (-31°C) to +19°F (-7°C)	OFF	OFF	Neutral, first, second, or reverse
20°F (-7°C) and above	OFF	OFF	Full operation in all ranges

* Transmissions used in emergency vehicles do not have programmed temperature restrictions.

Listed below are the minimum fluid temperatures below which preheating is required. If auxiliary heating equipment is available, preheat the fluid to the minimum temperature limit. If not available, run the engine in neutral to raise the fluid temperature.

Fluid	Minimum Fluid Temperature
DEXRON®-III	- 17°F (-27°C)
C-4 SAE 10W	- 4°F (-20°C)
C-4 SAE 30	32°F (0°C)

DRIVING ON ICE OR SNOW



WARNING: Do not use the retarder when roads are slippery. De-energize the retarder at the master control switch.

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. This will ensure a smooth downshift to the lower range. Also, it is important that you reach the lower range selected before attempting to accelerate. This will avoid an unexpected downshift during acceleration.

ROCKING OUT



CAUTION: DO NOT make neutral-to-range or directional shift changes when the engine rpm is above idle. If the wheels are stuck and not turning, do not apply full power for more than 30 seconds. Full power for more than 30 seconds under these conditions will cause the transmission to overheat and the CHECK TRANS light will come on. If the CHECK TRANS light comes on due to overheating, shift to neutral and operate the engine at fast idle until the CHECK TRANS light goes off.

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 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 drive and reverse if each directional shift continues to move the vehicle a greater distance. Never make neutral-to-range or directional shift changes when the engine rpm is above idle.

HIGH FLUID TEMPERATURE

If the sump fluid temperature reaches 270°F (132°C) in non-emergency vehicle applications, the CHECK TRANS light will come **on** and the ECU will inhibit operation in higher ranges. In emergency vehicle applications, the CHECK TRANS light will not come **on**, and the ECU will not inhibit operation in higher ranges.

If the transmission overheats during normal operations, check the fluid level in the transmission. (Refer to the fluid check procedure as described in the CARE AND MAINTENANCE section of this handbook.)

Extended operations at low vehicle speeds with the engine at full throttle can cause excessively high fluid temperatures in the transmission. These temperatures may tend to overheat the engine cooling system as well as cause possible transmission damage.

If the CHECK TRANS light comes on and 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 neutral. This should reduce the transmission and engine temperatures to normal operating levels in two or three minutes.



CAUTION: The engine should never be operated for more than 30 seconds at full throttle with the transmission in gear 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 gauge indicates a high temperature and the CHECK TRANS light is not **on**, 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

There is no **P** (Park) position on the shift selector. Therefore, always select **N** (Neutral) and apply the parking brake to hold the vehicle when it is parked.

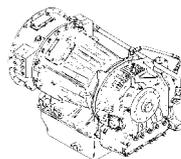
TOWING OR PUSHING

The engine cannot be started by pushing or towing. Before pushing or towing a vehicle, the driveline should be disconnected or the drive wheels should be lifted off the road. If the vehicle is a motor coach, remove the axle shafts from the drive wheels. Then cover the wheel openings to prevent loss of lubricant and entry of dust and dirt. An auxiliary air supply will usually be required to actuate the vehicle brake system.



CAUTION: Failure to disconnect the driveline or remove the axle shafts before pushing or towing can cause serious transmission damage.

POWER TAKEOFF OPERATION



CONVERTER-DRIVEN PTO

A power takeoff may be mounted onto the mounting pad on the side of the transmission. The PTO drive gear is converter-driven and thus provides infinitely variable speeds. The power takeoff can be operated when the vehicle is either moving or stopped. However, on some applications the PTO can only be operated when the transmission is in the neutral mode.

To operate the power takeoff while the vehicle is moving, follow these instructions:

- Stop the vehicle, set the brakes, and idle the engine.
- Select the desired range and engage the PTO.
- Depress the accelerator as required. The speed of the power takeoff during this type operation will be affected by the range selected and speed of the vehicle.



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

To operate the power takeoff with the vehicle stopped, follow these instructions:

- Set the parking brake and idle the engine.
- Place the shift selector in a drive range.
- Engage the PTO.
- Select **N** (Neutral) and depress the accelerator to the desired speed.

To disengage the power takeoff:

- Stop the vehicle.
- Idle the engine and set the brake.
- Select a drive range and disengage the PTO.
- Select **N** (Neutral).

ENGINE-DRIVEN PTO

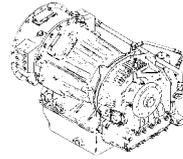


CAUTION: Do not exceed the drive speed limits of the driven equipment.

Some models provide PTO mountings on the top and side of the torque converter housing. The type of PTO installed will determine the operating procedures.

If the PTO driven gear is in constant mesh with the drive gear in the converter housing, and a friction clutch is used to connect the PTO load, the PTO can be engaged or disengaged at any time (except at engine speeds that exceed drive speed limits imposed on the driven equipment). If the PTO is engaged by either a sliding gear or dog clutch, the vehicle engine must be stopped to engage or disengage the PTO.

CARE AND MAINTENANCE



PERIODIC INSPECTIONS

The ALLISON AUTOMATIC requires 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 Commercial Electronic Controls monitor the operation of the transmission. Minor problems can be kept from becoming major problems if you notify maintenance personnel when one of these conditions occur:

- Shifting feels odd
- Transmission leaks fluid
- Unusual transmission-related sounds (changes in sound caused by engine thermostatic fan cycling are normal)
- CHECK TRANS 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 will not receive an adequate supply of fluid — if the level is too high the fluid will aerate and the transmission will overheat.

An improper fluid level may cause the electronic controls to do two things:

- Turn on the CHECK TRANS light
- Prevent operation in higher ranges

When the fluid level is corrected, the transmission will return to normal operation.

The DO NOT SHIFT and CHECK TRANS lights should not be used to replace regular fluid level checks. Check the level at the intervals specified in your vehicle service instructions, and prevent a problem on the road.

FLUID CHECK PROCEDURE



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 Neutral, set the parking brake and/or emergency brakes, and chock the wheels.

Clean around the end of the fill tube before removing the dipstick.



CAUTION: Dirt or foreign matter must not be permitted to enter the fluid system because it can cause valves to stick, cause 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.

Always check the transmission fluid level a minimum of two times. Consistency is important in maintaining accurate readings. If inconsistent readings persist, check the transmission breather and the vent hole in the fill tube to ensure that they are clean and free of debris.

An accurate fluid level check cannot be made unless the engine is idling in neutral, the transmission fluid is at the proper temperature, and the vehicle is on a level surface.

The transmission and transfer case have separate fluid systems. Each system uses a different grade of fluid.

COLD CHECK



NOTE:

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

- If the engine has been shut down for an extended time, park the vehicle on a level surface and apply the parking brake.
- Run the engine for at least one minute. Shift to **D** (Drive) and then **R** (Reverse) to clear the fluid system of air. Then shift to **N** (Neutral) and allow the engine to idle.

- After wiping the dipstick clean, check the fluid level. If the fluid level is not within the COLD RUN band, add or drain fluid as necessary to bring the level to the middle of the COLD RUN band.
- Perform a hot check after normal operating temperature (160–220°F; 71–105°C) is reached.

HOT CHECK

The fluid must be hot to ensure an accurate check. The fluid level rises as temperature increases.

- Operate the transmission in **D** (Drive) until normal operating temperature (160–220°F; 71–105°C) is reached.
- Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake and allow the engine to idle.
- 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 to the middle of the HOT RUN band.

DROPBOX CHECK

The fluid must be hot to ensure an accurate check.

- To check the fluid level in the dropbox, turn off the engine. If the dropbox has a fill tube, remove the fill tube plug. The fluid should be at the top of the tube. If the dropbox has a dipstick, remove it, wipe it clean, and insert the dipstick. Safe level for the dropbox is any level between the ADD and FULL marks on the dipstick.

FLUID RECOMMENDATIONS

Hydraulic fluids used in the transmission are important influences on transmission reliability and durability. DEXRON®-III and C-4 fluids (Allison approved SAE 10W or SAE 30) are recommended. C-4 fluid is the only one approved for use in off-highway applications. Use C-4 SAE 30 where ambient temperature is consistently above 85°F (30°C).

Some DEXRON®-III fluids are also qualified as C-4 fluids and may be used in off-highway applications. However, a DEXRON® fluid which is not a qualified C-4 fluid must never be used in off-highway applications. Consult your local Allison Transmission dealer or distributor to determine if a DEXRON®-III fluid is also a qualified C-4 fluid.

Before using C-4 fluids, consult the vehicle manufacturer to ensure that materials used in tubes, hoses, external filters, seals, etc., are compatible with C-4 fluids. Also, consult your local Allison Transmission dealer or distributor to determine if the fluid you have selected is an approved C-4 fluid.

KEEPING FLUID CLEAN

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.



CAUTION: Containers that have been used for any antifreeze solution should not be used for transmission fluid.

FLUID AND INTERNAL FILTER CHANGE INTERVALS

Change the fluid and internal filter at the intervals specified in Table 1. More frequent changes may be required when operations are subject to high levels of contamination and temperature.

Table 1. Fluid and Internal Filter Changes

Transmission	Fluid and Internal Filter Change Interval	External Filter Element(s)
MT(B) 600 Series (On-Highway)	25,000 miles (40 000 km) or 12 months*	After first 5000 miles (8 000 km); thereafter, every 25,000 miles (40 000 km) or 12 months*
MT(B) 600 Series (Off-Highway)	1000 hours max** or 12 months*	After first 500 hours; thereafter, 1000 hours max***
HT(B) 700 Series CL(B)T 700 Series (All Applications)	50,000 miles (80 000 km) or 12 months or 1200 hours* (internal sump at overhaul)	After first 5000 miles (8 000 km); thereafter, every 25,000 miles (40 000 km) or 6 months or 600 hours***
<p>* Whichever occurs first.</p> <p>** Fluid may require change sooner depending on operating conditions. Fluid must be changed whenever there is evidence of dirt or high temperature condition indicated by discoloration, strong odor, or fluid analysis.</p> <p>*** Local conditions, severity of operation, or duty cycle may dictate more or less frequent service intervals</p>		

EXTERNAL FILTER CHANGE

Most external oil filters should be changed after the first 5000 miles and thereafter as shown in Table 1.

Allison high-efficiency external oil filters, which have a change filter indicator, do not need to be changed when the fluid is changed unless restriction is indicated. There is no mileage limitation with the use of Allison high-efficiency filters.

An Allison high-efficiency external oil filter element must be changed if the engine and transmission are at operating temperature (over 160°F;71°C) and the Change Filter light is illuminated for any length of time or the element has not been changed for three years, whichever occurs first.

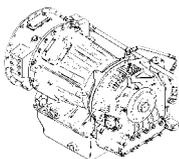
Fluid need not be changed at the time of filter replacement unless the fluid:

- Has been used 12 months or 25,000 miles (MT)
- Has been used 12 months or 50,000 miles (HT)
- Is visibly contaminated
- Analysis shows it to be oxidized beyond the limits listed in Table 2

Table 2. Fluid Oxidation Measurement Limits

Measurement	Limit
Viscosity	+/-25% change from new fluid
Carbonyl absorbance	+0.3 A*/0.1 mm change from new fluid
Total acid number	+3.0 change from new fluid
Solids	2% by volume maximum
* Note: A = Absorbance units.	

Consult your local yellow pages for fluid (oil) analysis firms. Use one fluid analysis firm. Results between firms cannot be accurately compared. Refer to GN2055EN, Technician’s Guide for Automatic Transmission Fluid, for additional information.



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).

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 you have a problem that 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 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 your problems originate 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: (317) 242-3538

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 that 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. 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, see your dealer or distributor for the following publications.

Check the telephone directory for the Allison Transmission distributor or dealer nearest you. If you are unable to obtain these publications from your local Allison distributor, please contact:

Manager, Product Training and Technical Publications – A01
 Allison Transmission
 P.O. Box 894
 Indianapolis, IN 46206
 Phone: (317) 242-0236

Table 3. Service Literature

Publication	MT, MT(B)	HT, HTB	CLT, CLBT
Service Manual	SM1546EN SM1995EN**	SM2004EN	SM1314EN SM1992EN**
Parts Catalog	PC1996EN	PC1965EN	PC1993EN
Troubleshooting Manual	TS2712EN	TS2712 EN TS1960EN****	TS2712EN
Mechanic’s Tips	MT1997EN	MT1958EN	MT1958EN
Technician’s Guide	GN2009EN* GN2055EN****	GN2033EN GN2009EN* GN2055EN****	GN2009EN* GN2055EN****
* Hydraulic Output Retarder Technician’s Guide ** CEC Service Manual Supplement *** CEC Troubleshooting Manual **** Automatic Transmission Fluid, Technician’s Guide			

