Chapter 2
Transmission

Notes

2. Improper Sequence.

A. LED module not operational.	A. Replace LED module.

3. Light Flickering When Shifter Is Properly Adjusted.

A. Loose ground connection at transmission.	A. Reconnect ground strap or, in older models bend ground strap in linkage to increase tension, thus ensuring a good ground.

CATEGORY II: LINKAGE

1. Over-Or Under-Shift.

A. Not properly adjusted.	A. Adjust.

2. Shifter Will Adjust at One End of Range But not the Other.

A. Wrong links, links too short or too long, wrong lever or wrong offset lever.	A. Check installation bulletin and replace incorrect part with correct parts.

3. Shifter Will Adjust But Will Not Stay Adjusted.

A. Shifter loose in ratchet so that it unscrews at every shift causing increasing maladjustment.	A. Tighten shaft in rachet, using "Locktite" if necessary. Re-adjust the shifter

4. Shifter Will Not Adjust.

A. Transmission range selector is worn, allowing play in the shaft either at the shift lever or inside the oil pan.	A. Requires transmission repair.

CATEGORY III: MECHANICAL

1. Shifter Does Not Operate When Air is Applied.

A. Piston is stuck to end of cylinder by end sealant.	A. Insert rod, screwdriver or similar through air inlet hole and push on piston to break it free.
B. Pilot valve main air not connected.	B. Trace air plumbing and connect all lines.

C. Air lines not properly connected.	C. Trace air plumbing and connect all lines.

2. Shifts In One Direction But Erratically in Other Direction.

A. Improperly adjusted.	A. Adjust.
B. Dirt, water, or excess oil or grease in one cylinder	B. Clean and adjust the cylinder.
C. Pawl spring broken.	C. Replace with new spring (Requires disassembly of the shifter).
D. Insufficient air from pilot valve.	D. Clean or replace valve.
E. Pawl broken or worn on leading edge.	E. Replace with new spring. (Requires disassembly of shifter).

3. Shifts in Both Directions But Sticks at End Ranges.

A. Cylinders squeezed together causing cylinders to enlarge.	A. Loosen end plate and spread bind on ratchet to enlarge cavity to provide room for the ratchet to move.

4. Shifts Erratically In Both Directions.

A. Insufficient air pressure.	A. Check pressure gauge. Drain air tanks. Raise pressure to 90-125 PSI.
B. Dirt in ratchet cavity causing ratchet to stick or drag.	B. Clean, reassemble and readjust.
C. Cylinder worn from ratchet action on cylinder.	C. Replace cylinder or replace wall.

5. Air Leaks Around Shaft Seal, Back Plate, or Cover Plate.

A. O-rings on one or both pistons worn or broken.	A. Disassemble shifter, replace broken o-rings, reassemble and adjust.
B. Cylinder worn or scored.	B. Replace cylinders and o-rings.

CATEGORY IV: VALVES

1. Air Leaking from Valve Continuously.

A. Worn or cut o-rings	A. Replace defective o-rings.
B. Spool not seating properly.	B. Clean and lubricate valve.

2. Valve Sticks In One or Both Directions.

A. Dirt or corrosion inside valve.	A. Disassemble, clean, and lubricate.

3. Insufficient Air to Operate Shifter.

A. Valve inlet or outlet plugged with dirt.	A. Disassemble, clean, and lubricate.

TRANSMISSION MOUNTS

Rubber mounts are used to mount the transmission and the engine, at their mating point, to the chassis. These combination mounts are solid rubber with an inner steel sleeve.

Each of the three mounts (one on each side) should be visually inspected periodically for splits in the rubber or any deterioration along the top mount seal. When removing the transmission for repair or replacement, and at least by the fourth 12,000 mile service check (48,000 miles), the inner steel sleeve of each mount should be closely inspected for excess wear and the mount replaced if necessary.

Any excess vibration of the transmission may be caused by wear of the rubber mounts. This possibility should be considered when inspecting the transmission to determine the source of vibration.

UNIVERSAL JOINTS

The simple universal joint is basically two U-shaped yokes connected by a cross member called a spider. The spider is shaped like an X. The arms that extend from it are called trunions (see Figure 2.5). The spider allows the yokes to operate at an angle to each other.

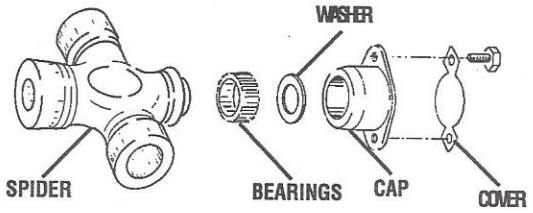

Figure 2.5. U-Joint

CA-02-031

DRIVE SHAFT

The driveshaft is a steel tube which is used to transmit rotary power from the transmission output to the differential. A universal joint and companion flanges are located at the transmission end of the shaft and bolted together. The slip yoke permits fore and aft movement of the driveshaft as the differential assembly moves up and down. The spline is lubricated through a fitting which requires periodic greasing. An oil seal protects the slip yoke from dust, dirt and other harmful debris (see Figure 2.6.) Since the driveshaft is a balanced unit, it should be kept completely free of undercoating and other foreign material which would upset shaft balance.

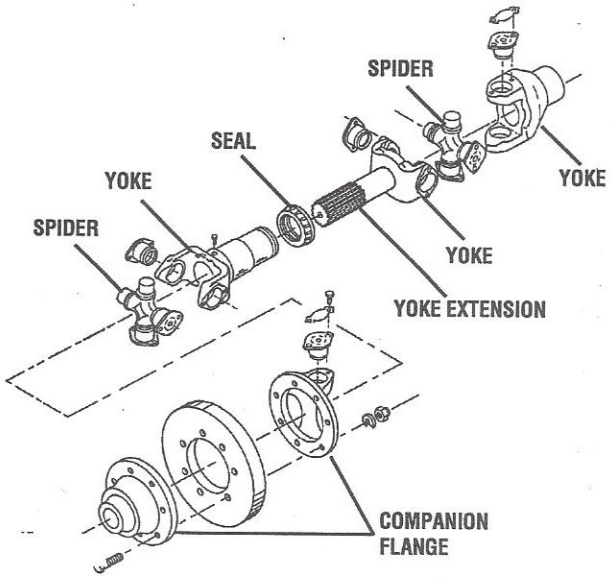

Figure 2.6.Driveline

PA-02-030

Chapter 2 Transmission

The transmission is mounted between the engine and the rear axle (Figure 2.1). The function of the transmission is to convert the power output of the engine into usable power for the drive wheels of the vehicle. By activating different gears within the transmission, the speed at which the output shaft of the transmission turns in relation to the speed of the engine crankshaft can be changed to meet the driving and load conditions.

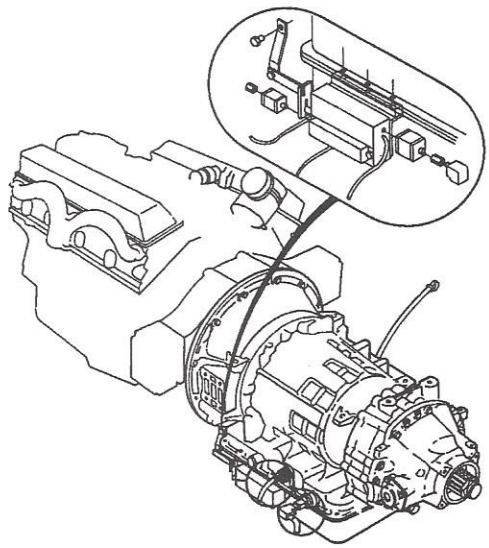

Figure 2.1 Transmission and Shifter SB-02-038

Transmission Components

The Gillig MHM 3116 motor home chassis is equipped with an Allison MT 643 automatic transmission. The MT 643 is a four speed, fully automatic transmission which uses a three element torque converter, three planetary gear sets and other friction elements to transmit power to the rear axle and wheels. The torque converter, which always rotates at engine speed, couples the engine to the planetary gears through the fluid and provides hydraulic torque multiplication as required.

Aside from the torque converter, the hydraulic system within the transmission is pressurized by a gear pump which provides the working pressure required to operate the friction elements and automatic controls.

TRANSMISSION OPERATION

Transmission gear selection is accomplished thru the shifter control mounted in the driver console at the driver's left. This transmission uses a Bennett Shifter with an LED display and a multi-position toggle lever (See Fig 2.2).

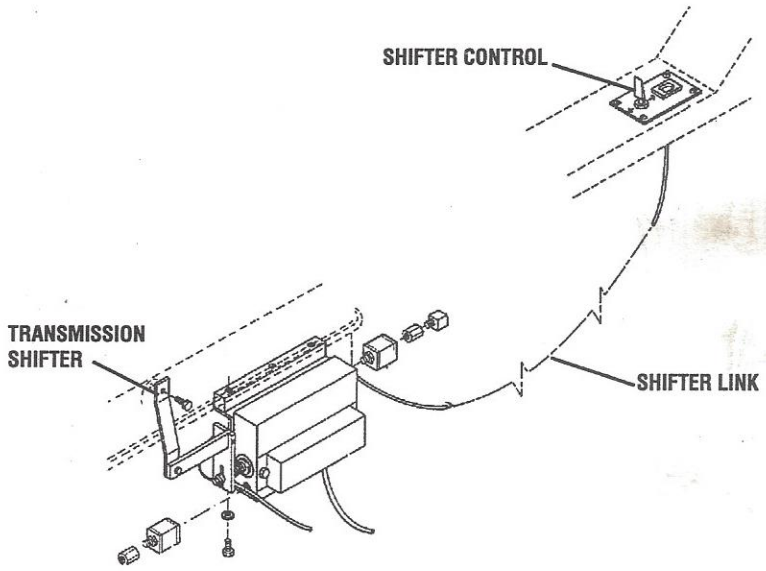

Figure 2.2 Shifter Controls - Bennett PA-09-004

CAUTION
Do not allow the coach to coast in neutral. Doing so can result in severe transmission damage and eliminates the engine braking action.

Reverse (R)

Select the button, key pad spot, or lever position designated with an "R" for backing the coach. Bring the coach to a complete stop before selecting Reverse or moving the shifter from Reverse to a forward gear. **An audible back-up alarm horn is designed to sound whenever Reverse (R) is selected.**

Neutral (N)

Select "N" when starting the engine. A neutral start safety switch has been designed into the system to prevent starting the engine if any selection other than Neutral (N) has been made.

Drive (D)

This is the most commonly used forward range. Select this position for normal driving conditions. When in this range, the transmission starts in first gear and then automatically upshifts to second, third, and fourth. To drive in this range, simply depress the accelerator. Downshifting also occurs automatically.

Drive 3 (D-3 or 3)

Select this range for descending grades to provide some engine braking and for limiting vehicle speed to mid-range operation. In this range the transmission starts in first gear and automatically upshifts to second and third. Further upshift does not occur unless engine governed speed is exceeded.

Drive 2 (D-2 or 2)

Select this range for additional engine braking when descending steeper grades and when it is desired to limit vehicle speed to low mid-range operation. In this range the transmission starts in first gear and automatically upshifts to second. No further shifts will be made unless engine governed speed is exceeded. Drive 2 is an appropriate range for use in heavy traffic.

Drive 1 (D-1 or 1)

Select this range when driving on steep grades and when an automatic upshift would take the engine out of its most favorable operating range. Upshifts do not occur unless engine governed speed is exceeded.

Parking The Coach

CAUTION
Always place the shift selector in Neutral (N) and apply the parking brake before leaving the driver's seat so that the coach will not move if the throttle treadle is accidently activated or the coach is on a grade. Always place the selector in Neutral (N) before stopping the engine, and then apply the parking brake to prevent the coach from moving while shut down.

There is no Park (P) range in the shift selector. Therefore, the transmission must always be placed in the Neutral (N) position and the parking brake applied before parking the coach and stopping the engine.

TOWING

The engine cannot be started by pushing or towing. Propeller shaft rotation will not drive the pump within the transmission that produces clutch apply pressure and lubrication. To help prevent transmission damage, remove the axle shafts and cover the hub openings to prevent loss of lubricant and entry of dust and dirt as explained in **Chapter 3 Suspension** before towing the coach. Connect an auxiliary air supply to the coach to release the parking brake and/or provide coach braking.

TRANSMISSION MAINTENANCE AND INSPECTION

The transmission fluid level should be checked regularly, including at each engine oil change, and changed at the intervals recommended in the Maintenance Schedule for your vehicle (Appendix D). The recommended interval for changing the transmission fluid should be viewed as maximums; change the fluid and filters more frequently if the vehicle is subject to severe use.

The fluid cooler lines, electrical lines, control linkage, and transmission body should be inspected periodically for leaks, damage, or deterioration.

NOTICE
Transmission problems can be the result of poor engine performance. If the engine requires a tune-up, it should be done prior to servicing the transmission.

Transmission Fluid Level and Appearance

It is important to know the correct appearance of the transmission fluid. Many times a malfunction can be traced to an incorrect fluid level or improper reading of the dipstick. A fluid level which is too high or too low can cause overheating and clutch plate damage. Overheating can also be caused by excessive clutch plate slippage resulting from improperly installed plates, or from the manner in which the vehicle is operated. The transmission fluid currently in use may be dark colored and have a strong copper odor. This is normal and is not a sign of required maintenance or transmission failure.

When the dipstick is removed, the fluid should be checked for air bubbles or discoloration. Air bubbles in the fluid are an indication of an air leak in the internal suction lines which can cause erratic operation and slippage. Water or ethylene glycol antifreeze in the fluid imparts a milky gray or pink cast to the fluid and can cause spewing of fluid from the transmission breather. Coolant in the fluid, whether water or antifreeze, can cause damage to the nylon parts or clutch plates in the transmission. The most common cause of contamination is a leaking transmission heat exchanger core. In addition to finding and fixing the leak, the transmission should be disassembled and cleaned and the clutch plates replaced with new ones.

Glycol test kits on the market can be used to detect antifreeze in the transmission fluid. While generally reliable, certain kits may produce positive test results because of additives used in some transmission fluids. The kit manufacturer's instructions should be followed closely. Routine fluid analysis services are available through your Allison dealer at nominal charge. Check with an Allison dealer for details and prices.

Transmission Fluid Level Checks

Maintaining the proper fluid level is very important. Your automatic transmission is designed to operate with the fluid on the "FULL HOT" mark on the dipstick at normal operating temperatures of 190°-200°F and should be checked at these temperatures. Always check the level on the dipstick at least twice. If inconsistent readings occur, look for proper venting of the transmission breather and fluid filler tube. The normal operating temperature is attained only after at least fifteen miles of highway type operation.

When checking the fluid, apply the parking brake and run the engine at least one minute at 1000-1200 RPM to clear the system of air.

WARNING
At normal operating temperatures the dipstick will be extremely hot to the touch. Use care to avoid burns.

Cold Fluid Check: Idle the engine until the temperature reaches 60-120°F (16-49° C). With the engine idling and the transmission in neutral, remove the dipstick and check the fluid level. Fluid registering in the COLD RUN band indicates enough fluid to operate safely until the temperature reaches 160-200°F (71-93°C).

Hot Fluid Check: Be sure the temperature has reached 160-200°F (71-93°C). With the engine idling and the transmission in neutral, remove the dipstick and check the transmission fluid level. If the level registers in the HOT RUN band (Figure 2.2), thequantity of oil is safe for operating the vehicle. If it registers on or below the bottom line of the HOT RUN band, add enough fluid to bring the level up to the middle of the HOT RUN band. Approximately one quart of fluid is required to move the level from the bottom to the middle of the HOT RUN band.

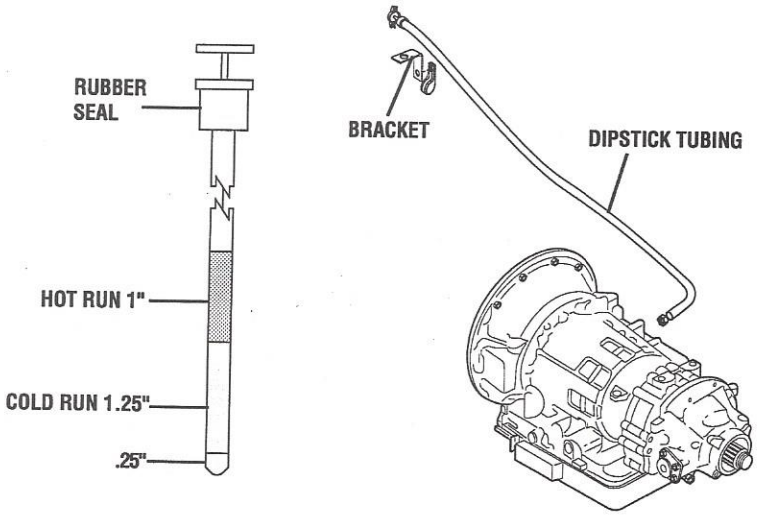

Figure 2.2. Transmission Dipstick 02-005-00

Automatic transmissions are frequently overfilled because, when the fluid is cold, the dipstick indicates fluid should be added. The low reading when cold is normal; the level will rise as the fluid temperature increases (a level change of over 3/4 inch will occur as the fluid temperature rises from 60° to 180°F).

Transmission performance will be affected when the oil foams or aerates. Foaming or aeration is normally caused by underfilling, overfilling, or a defective seal ring on the intake pipe. Aeration changes the oil viscosity and color to a thin milky liquid. Slippage and transmission failure can result.

A fluid level which is too low can result in transmission charging pump cavitation, a loss of fluid pressure and clutch plate damage. Low fluid can cause slipping, particularly when the transmission is cold or the vehicle is on a hill.

If the vehicle has recently been operated for an extended period at high speed, in city traffic during hot weather, or if the vehicle has been used to pull a trailer, an accurate fluid level cannot be determined until the fluid has cooled down, usually about thirty (30) minutes after the vehicle has been parked.

Changing Transmission Fluid

The transmission fluid will drain best if warm.

1. With a drain pan placed under the transmission oil pan, remove the oil pan drain plug.
2. Drain the fluid from the oil pan. Replace the drain plug and tighten to 15-20 lb ft.
3. Remove the dipstick and add the proper amount (18 qts.-MT 643) of DEXRON II® automatic transmission fluid through the dipstick tube.
4. With the selector lever in the neutral position, apply the parking brake, start the engine and let it run at idle. DO NOT RACE THE ENGINE.
5. Move the selector lever through each range and, with the selector lever in NEUTRAL, check the fluid level.
6. Add additional fluid to bring the level between the COLD RUN and HOT RUN marks on the dipstick.

TRANSMISSION FLUID COOLING PIPING

The transmission fluid is piped through a heat exchanger mounted below the radiator. The fluid is thus cooled and proper operating temperatures within the transmission are maintained. The fittings, filter, and tubing are illustrated in Figures 2.3 and 2.4. If replacement of any of the fittings or tubing is required, make sure to use original equipment or equivalent replacement parts. The materials must have satisfactory fatigue durability to withstand normal vehicle vibrations.

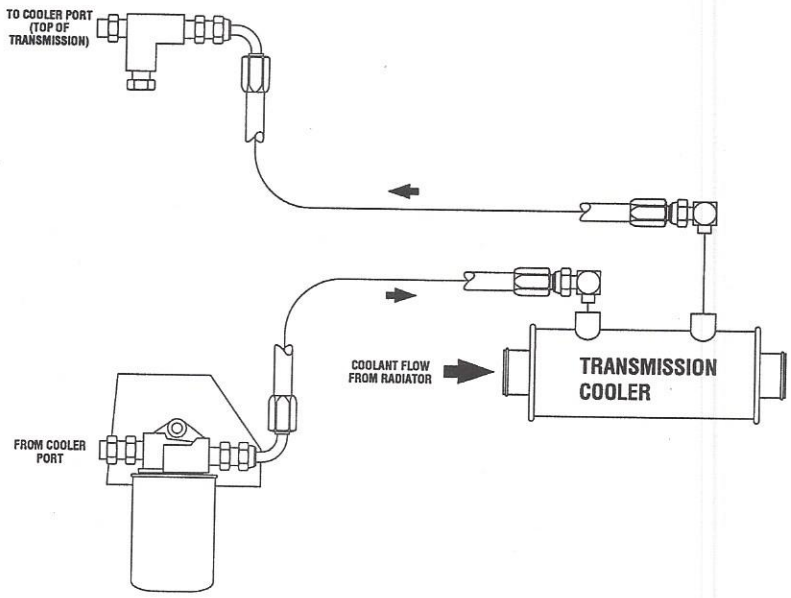

Figure 2.3. Transmission Cooling System

02-003-00

TRANSMISSION SHIFTER LINKAGE

An electrical cable links the control module in the front dash with the shifter assembly mounted on the right side of the transmission (Figure 2.1). The shifter assembly is operated by compressed air provided by the accessory air system. It is through this shifter assembly that the driver can control the transmission operation and select the desired operating range.

TRANSMISSION SHIFTING

There are two major causes of malfunction in the transmission control system: adjustment and contamination inside the shifter. Any preventive maintenance program must be oriented toward these two causes.

Correction of misadjustment is very simple and requires only minor checks and adjustment of the linkage. Correction of .i.contamination requires the owner to make sure the air dryer functions properly and the accessory tank is regularly purged of all moisture. The cover plate of the shifter should be removed periodically to eliminate any dirt or moisture inside the shifter. Any moisture inside the shifter mechanism will eventually run down into this cylinder and will be trapped there until the shifter is opened and cleaned.

Shifting Transmission With No Air Pressure

The transmission must be in neutral for the engine to start. To put the transmission into neutral when all air pressure is lost, push the shifter linkage on the transmission all the way forward (toward the front of the vehicle). The shifter linkage is mounted on the right side of the transmission with the same bolt that secures the oil pan. After pushing the lever all the way forward, carefully pull it back one notch. This is the neutral position.

TRANSMISSION ADJUSTMENT TROUBLESHOOTING

The control system is divided into four (4) categories for the purpose of this troubleshooting guide:

CATEGORY I: Lights
CATEGORY II: Linkage
CATEGORY III: Mechanical
CATEGORY IV: Valves

CATEGORY I: LIGHTS

POSSIBLE CAUSES	REMEDY
1. No Light Illuminated.	
A. Ground wire disconnected at transmission.	A. Check ground system and connect all wires and groundstraps.
B. Indicator not working (LED).	B. Replace LED module.