

DRIVERS MANUAL

INSTRUCTIONS

ON

DRIVING - OPERATION - CARE

OF THE

ALLISON FULLY AUTOMATIC

MT SERIES TRANSMISSION

ALLISON DIVISION

GENERAL MOTORS CORPORATION

TABLE OF CONTENTS

Section

- I. General Description
- II. Operating Instructions
- III. Maintenance and Lubrication

THINGS YOU SHOULD KNOW ABOUT THE ALLISON AUTOMATIC TRANSMISSION

The transmission fluid level in your Allison automatic transmission should be checked and if necessary, fluid added as outlined herein, every 1,000 miles of operation.

The transmission fluid should be drained and a new filter element installed, after the unit has been in operation for 2,000 miles. Thereafter, under normal conditions, the fluid and filter element should be changed every 12,000 miles or every six months, whichever occurs first.

The brand and type of transmission fluid originally selected for use in your Allison equipped Blue Bird Chassis is: _____
The continued use of this brand and type is recommended; although any good brand of Type "C" Hydraulic Transmission Fluid, or Type "A" Automatic Transmission Fluid can be used if the original brand and type of fluid is not available.

In emergency cases, a good grade of SAE 10W engine oil may be used temporarily. Whenever it is necessary to do this, or to mix brands and types of fluid, the fluid and the filter should be replaced just as soon as possible.

Mixing of brands and types of fluid is not recommended as this tends to cause a varnish condition and therefore, can result in damage to the transmission.

CHECKING FLUID LEVEL:

1. With the vehicle standing level, start engine, fully apply the parking brake and warm the transmission fluid to its normal operating temperature of 160° fahrenheit, or more.

CAUTION:

Do not operate the hydraulic retarder in order to warm up the transmission fluid. This procedure, when the vehicle is not moving, tends to aerate the fluid thereby making an accurate fluid level check impossible.

2. After normal temperatures of the engine and transmission have been reached, move the selector lever through all ranges so that the warm fluid is distributed throughout the transmission.
3. Remove any dirt or foreign matter from the dipstick cap and filler tube, which is located on the right hand side of the engine compartment.
4. With the selector lever at "N" adjust the engine speed to 800-1000 rpm.
5. Unlock the dipstick from the tube, wipe clean, re-insert it into the tube and withdraw again. Add fluid only when level reaches "L" (Low) mark on the dipstick as this mark indicates fluid to be one (1) quart low. DO NOT OVERFILL.

6. Reinstall dipstick in filler tube and turn clockwise to lock. Failure to lock cap can result in fluid leakage during operation of the hydraulic retarder.

TRANSMISSION FLUID AND FILTER REPLACEMENT:

Under normal operating conditions the transmission fluid and the filter element should be changed every 12,000 miles or every six months, whichever occurs first. The following procedures should be followed when making this change.

1. The fluid should be drained while it is still warm or at normal operating temperature.
2. Loosen the acorn nut which secures the filter cover to the transmission oil pan, but do not remove completely as this will cause the fluid to "gush" out.
3. When drainage has been completed, carefully separate the filter cover from the bottom edge of the oil pan. Remove the acorn nut, copper washer, cover and retainer. Discard the fluid and filter element.
4. Install a new AC type, Part No. PF-133 filter element. Install the retainer, cover, a new copper washer and the acorn nut. Torque the nut to 8-10 foot-pounds.
5. Prior to installing new fluid, make certain the container, spout or funnel to be used is clean. Slowly pour eight (8) quarts of fluid into the transmission.
6. Apply parking brake securely, place selector lever in "N" position and adjust engine speed to 800-1000 rpm.
7. Check transmission fluid level and add sufficient amount of fluid (approximately 1 quart) to bring fluid to the "L" (Low) mark on the dipstick. Apply the service brakes and shift transmission through all ranges.
8. Continue to run engine at 800-1000 rpm until normal operating temperature is reached, then place the selector lever in "N" position and recheck the fluid level. If necessary, add sufficient amount of fluid to bring fluid level to the full mark on the dipstick.

IMPORTANT:

If the transmission has been overhauled, replace fluid and filter element at the time of overhaul and again after 500 miles of operation.

CAPACITIES:

Approximately nine (9) quarts of fluid is required to refill the transmission when the oil pan has been drained.

Approximately ten (10) quarts of fluid is required, if the oil pan has been removed.

Approximately thirteen (13) quarts of fluid is required if the oil pan and valve body have been removed.

The capacity of transmission when dry, or completely drained, is approximately nineteen (19) quarts.

HYDRAULIC RETARDER:

The function of the hydraulic retarder is to assist the service brakes in relieving them of excessive heat and wear caused during prolonged downhill braking, or in stop and go traffic. The hydraulic retarder is not a substitute for the service brakes and should not be used over a prolonged period as this will tend to overheat the transmission fluid.

When the temperature of the transmission fluid reaches 380° farenheit, a red warning light on the dash panel will light up. The retarder pedal should then be released until the fluid can be cooled at which time the light will go out. The retarder can then be used again, if need be.

The best retarder action can be obtained at engine speeds of 2600 rpm or over, and with the selector lever in the 3-4 and 1-2 positions.

The transmission fluid is cooled by means of a cooler tank located at the bottom of the vehicle radiator. It is very important to check the coolant level of the radiator often, so that the proper level can be maintained, thereby eliminating a severe heat problem which would be detrimental to both, the transmission and engine in your Blue Bird chassis.

TOWING OR PUSHING VEHICLE:

Do not tow or push vehicle unless drive shaft has been disconnected, or rear axle shafts have been removed.

Should you encounter any problems with your Allison transmission which cannot be handled satisfactorily by your local Ford, Chevrolet or GMC dealership, please write or call the Service Department at our home office in Fort Valley, Georgia.

SECTION I

GENERAL DESCRIPTION

The Allison automatic transmission is hydraulically operated with six forward gear ratios and one reverse gear ratio. Basically, it consists of a torque converter, planetary gear train and a hydraulic control system to automatically change gear ratios and supply oil under pressure to the converter, retarder, and lubrication circuits.

The hydraulic torque converter multiplies engine torque and acts as a fluid coupling between the engine and gear train when gear ratio changes are made. The converter functions as a torque multiplier to assist the engine when moving from a standstill or when load and grade demand slows the vehicle down. When torque multiplication is not required and the fluid coupling phase is not needed, an automatic lockup clutch in the converter is activated and locks the engine directly to the gear train for greater efficiency. Regardless of the drive range selected, when starting from a standstill, the converter is in operation and the first shift noticed will be the engagement of the lockup clutch. During each gear ratio change, the lockup clutch automatically disengages and the converter is in fluid coupling momentarily. This permits the hydraulic fluid to absorb and cushion shock loads instead of the driveline members.

An oil cooler of some type is located on the vehicle and is connected to the transmission by hose or tubing for cooling the transmission fluid. A high temperature sending unit is installed in the oil line at the transmission and connected to a warning light located on the instrument panel as a signal to indicate overheated transmission oil.

The hydraulic grade retarder is an integral part of the torque converter and gear train. It is a safety device as it assists the service brakes in controlling vehicle speed when descending steep grades or while slowing down or snubbing on the level. It can also be used to a great advantage on slick roads as it will not stop the drive wheels. The retarder when fully applied has a braking effect from 6 to 10 times greater than engine braking alone, however, it is not a brake and will not stop the vehicle completely.

The transmission gear train has four sets of constant mesh planetary gears that are operated by hydraulically actuated disc type clutches. Movement of the piston compensates for wear, thus no adjustments are necessary. All forward gear ratio changes, both upshifts and downshifts, are fully automatic. The shifts are controlled by throttle position and vehicle speed through the valve body located in the transmission pan. Throttle valve linkage to the transmission should be adjusted, so that full throttle shifts will occur 50 RPM below full load engine governed speed. Two separate, fluid velocity-type governors in the transmission provide the fluid pressures required to operate the hydraulic control system and make the shifts. Shifts between creeper (1-2 position, or first and second gear) to third are accomplished manually with the selector lever.

The transmission provides two SAE six-bolt power take-off openings located one on each side of the transmission housing. The transmission usually provides a drum-type parking brake.

SECTION II

GENERAL OPERATING INSTRUCTIONS

The manual controls provided by the vehicle manufacturer consists of a range selector lever, accelerator pedal and a hydraulic retarder pedal located to the left of the steering column in place of a clutch pedal.

The range selector lever assembly is gated for six positions, a neutral position, four forward-speed positions, and a reverse position. The selector lever must be in neutral or (N) to start the engine. When the lever is at 1-2 location the transmission will operate only in the First and Second gear ratio and will have to be manually moved to obtain other gear ratios. The 3-4 position permits use of third and fourth ratio or intermediate gear; while 3-4-5 position will not permit the transmission to shift above fifth gear. The 3-6 position permits automatic shifting between all gears starting with third gear converter. There is one reverse gear ratio with the lever at (R).

The accelerator pedal provides a means to upset the shift pattern and permit the driver to control upshifts and raise the engine RPM for automatic downshifts. This is accomplished by a detent at the full throttle position of the accelerator pedal. When the pedal is pushed through the full-throttle detent position the transmission will remain in the same gear ratio during engine acceleration or will downshift to the next higher gear ratio providing better engine performance for the driving conditions.

Lever Position	Gear	Ratio	Approximate Road Speed
Low	1st	5.296:1	0 to 15 MPH
1-2	2nd	3.810:1	
Int.	3rd	2.691:1	0 to 30 MPH
3-4	4th	1.936:1	
3-5	3rd	2.691:1	0 to 40 MPH
Dr.	4th	1.936:1	
	5th	1.390:1	
3-6	3rd	2.691:1	
Dr.	4th	1.936:1	
	5th	1.390:1	
	6th	1.00 :1	
N			
R		6.042:1	

The highest speed shown opposite each lever position is the maximum road speed for that range. Manual downshifts to that range should not be made when the road speed is higher.

The shift lever must be at (N) neutral to start engine.

(N) - Neutral position of the lever is used to start the engine and during stationary operation of the power take-off. A neutral start switch is used as a safety device to avoid accidents by starting the engine in a drive range.

3-6 position of the selector lever engages the drive range which is used for starting and driving with normal loads on level roads. The transmission starts in converter operation in third gear ratio and then shifts to converter lockup. Automatic upshifts to fourth, fifth, and sixth gear lockup occur as road speed increases. Momentary disengagement of the lockup

clutch occurs during each shift to permit a fluid coupling in the converter for shock free shifting. When road and load conditions demand a gear ratio higher than the gear ratio the transmission is in, it will automatically downshift. By pushing the accelerator pedal through detent the automatic downshift will occur sooner or at a higher engine speed and road speed.

3-5 position of the selector lever provides the same identical operation as the 3-6 position except sixth gear is locked out. This position is used for city and urban driving and highway operation when road and load conditions would cause continuous shifting between fifth and sixth gears. This position is better than 3-6 for retarder operating as fifth gear lockup is more effective than sixth gear lockup.

3-4 position of the selector lever starts the transmission in third gear or intermediate range and will not permit the transmission to shift above fourth lockup. This range is ideal for driving in congested city traffic, descending long grades or heavy pulling on short haul roads. This position permits the most effective use of the hydraulic retarder.

1-2 (low) position engages the highest forward gear ratio for starting extra heavy loads, pulling through mud, sand, or deep snow and driving up steep grades. The transmission starts in converter first gear ratio, then changes to first gear lockup and second gear lockup.

(R) or reverse position of the selector provides one gear ratio and it is the highest ratio in the transmission. This position provides only converter operation, lockup cannot occur.

The shift lever can be placed in any forward position to start the vehicle moving but local driving conditions and load should dictate the

position selected. The 1-2 range should be considered as low-low or creeper gear which would seldom be required. All manual upshifts or downshifts may be made at full throttle; however, downshifts to the next higher gear ratio should not be made if the vehicle speed exceeds the top speed of that gear. Vehicle speeds for the various drive ranges appears on the instrument panel. Manual shifts should not be made when the hydraulic retarder is applied.

When driving on roads that are glazed with ice and snow the shift lever may be placed in any drive range but terrain should be considered when making the selection. If the terrain is hilly, then 3-4 position would be a good range selection and the retarder would be very beneficial in slowing down the vehicle. On a level road and light traffic 3-5 or 3-6 range would be good selections; however, 3-5 would provide more practical use of the hydraulic retarder.

When rocking out of ruts or snow engine speed plays an important part. A rocking action may be created by moving the selector lever between low and reverse with the engine running at a steady speed but not at full throttle. The movement of the lever should be timed to take full advantage of the rocking momentum of the vehicle. Rocking out of mud may be possible but when the drive wheels break traction or spin, further attempts are useless and might result in damage to the drive train.

If it is necessary to tow the truck, the rear wheels should be raised off the ground or the driveline should be disconnected. Due to the hydraulic system in the transmission, the engine cannot be started by pushing or towing the vehicle.

The hydraulic retarder is applied by depressing the retarder pedal which is in the normal clutch pedal location. The pedal, through mechanical linkage, is attached to the retarder valve on the right side of the transmission. This is an on or off valve, on when the pedal is depressed and off when the pedal is released. The retarder was designed only to slow the vehicle down or act as an assist to the service brakes during downhill braking and when slowing down in congested or stop and go traffic. Prolonged operation of the retarder may cause a heat rise in the transmission fluid sufficient enough to cause the high temperature warning light to come on. When this happens, retarder operation should be discontinued momentarily until the fluid cools and the warning light goes out. Manually shifting the transmission during retarder operation should be avoided.

A power take-off can be mounted on either side of the transmission housing. The P.T.O. drive gear in the transmission is converter driven and to engage or disengage the P.T.O. the transmission manual selector lever must be placed in any drive range with the engine at idle. The following steps should be considered as procedure when engaging or disengaging the P.T.O.

1. Stop the vehicle, idle engine and set the brakes.
2. Make sure the selector lever is in a drive range.
3. Engage or disengage P.T.O.
4. If the P.T.O. operation is stationary, (no vehicle movement) shift to neutral (N).
5. If the P.T.O. operation is to be moving, shift to desired position on selector lever for requirements.

SECTION III

MAINTENANCE AND LUBRICATION

The Allison automatic requires minimum maintenance but careful attention should be given to linkage adjustment and oil level. When all linkages are in proper adjustment and oil level is correct you can expect peak performance from both transmission and truck.

Oil Level Check

The transmission oil level should be checked when engine oil is checked or at 1000 mile intervals if oil leaks are not visible. The level is checked in the following manner.

1. The vehicle should be on a level spot, with engine running the hand or service brakes applied and selector lever in neutral. If the oil is cold, move selector lever to a drive range, run engine at 1000 RPM. Do not operate the retarder to warm the transmission oil as this will aerate the oil and make an accurate check impossible.
2. When normal temperatures are reached, idle the engine and move the selector lever through all ranges to distribute the oil throughout the transmission. With the selector lever at (N) Neutral position, adjust the engine speed to 1000 RPM.

NOTE: Some dipsticks are marked to check the level in a drive range. If this is the case, place the selector lever in 3-6 range and adjust engine speed to 1000 RPM.

3. Before removing the dipstick, clear around dipstick cap and then remove. With a clean cloth, wipe dipstick and insert back into fill tube, pushing it all the way down.

4. Remove the dipstick again and check fluid level. If level is low, add the proper oil to raise fluid level to FULL mark on dipstick, if too high (more than 5/16" above FULL mark) drain excess oil to restore proper level.
5. Replace dipstick in tube and lock cap.

NOTE: Failure to lock the cap may result in fluid leakage.

Oil and Oil Filter Change

After 2000 miles operation on a new truck, the oil should be drained and a new filter element installed. Thereafter, oil change intervals vary according to application and vocation of the vehicle. The following recommendations should be followed.

- A. Change oil and filter every 25,000 miles in all trucks and in light trucks in urban service.
- B. Change oil and filter every 10,000 miles (300 hours) or six months, whichever occurs first, in off-highway trucks, heavy-duty trucks in urban operation and in all operations involving heavy use of the retarder.
- C. Change oil and filter at least every 12 months in vehicles which are subject to light duty and low mileage operation.

The transmission oil should be at normal operating temperature before draining. The oil is drained by loosening the filter cover on the left rear side of the transmission pan. To change the fluid and filter follow this procedure.

1. Loosen, but do not remove the filter cover. Separate the cover from the pan at the bottom edge only; the oil will drain here.

2. When drainage is complete, remove the cover, retainer and filter. Discard the fluid, filter and sealrings or gasket.
3. Install a new filter and replace the retainer, sealrings (or gasket) and cover. On some units the cover is retained by installing a copper washer and acorn nut, on others by a steel strap, bolt and square nut. Tighten the acorn nut 8 to 10 foot-pounds torque. The square nut should be tightened full length of the threads.
4. Add 9 quarts of Automatic Transmission Fluid Type-A or Hydraulic Transmission Fluid Type C-1. Apply the parking brake and start engine.
5. Using the procedure for checking oil level, check and add oil if needed to bring level to full mark.

If an internal failure occurs, change the oil and filter after 500 miles or (15 hours) of operation with either a new or rebuilt transmission.

NOTE: If an auxiliary filter was installed in the transmission oil cooler circuit at the time the transmission was replaced, it will be necessary to change only the auxiliary filter element after 500 miles (or 15 hours of operation with either a new or rebuilt transmission).

Periodic Checks and Linkage Adjustments

The transmission should be kept clean to make inspection easy. Check for loose bolts, loose or leaking oil lines, condition of control linkages and oil leakage. Check the oil level at the intervals specified. A frequent engine coolant check should be made and coolant added if necessary. Examine the radiator coolant occasionally for possible leakage of trans-

mission oil to the engine coolant. This condition indicates a faulty heat exchanger.

1. A transmission breather connection is located above the power take-off opening on the left side of the transmission housing. The breather and hose should be inspected and cleaned at intervals, depending upon the severity of operating conditions which involve dust and dirt.
2. If the parking brake is of the external-type, an occasional check should be made for proper clearance between the brake band and brake drum.
3. Checking the transmission oil temperature warning light varies with different vehicles. Some trucks will have the warning light on during cranking and off when the engine is running, others will have a push button switch below the light to check the circuit. The light should not be on during operation unless the transmission oil temperature reaches 380° F.
4. The manual selector lever in the operators compartment and the transmission manual selector lever must be adjusted so that the range positions of both levers coordinate. This should be checked if it is thought positive engagement of a range is not being made or at each regularly scheduled inspection.
5. The throttle (TV) linkage linked to the accelerator pedal is subject to wear due to constant use. If the vehicle has an engine tachometer, a daily check can be made for full throttle shiftpoints at detent. These shifts should occur 50 RPM below full load engine

governed speed. If the vehicle is not equipped with a tachometer, a portable tach should be connected during each scheduled inspection and a road test made. This check should be made anytime shifting feels erratic or the transmission is automatically upshifting or downshifting too soon.

6. The hydraulic retarder linkage check is made by depressing the retarder pedal and observing the travel of the retarder valve on the right side of the transmission housing. The valve must travel a full 1/2-inch to the rear and return the same distance. A partial application of the valve will cause the transmission to overheat during normal operation. If full release is not obtained, readjust as necessary.
7. An engine idle speed of 475-550 RPM should be maintained. This is important as it effects proper operation of the transmission.