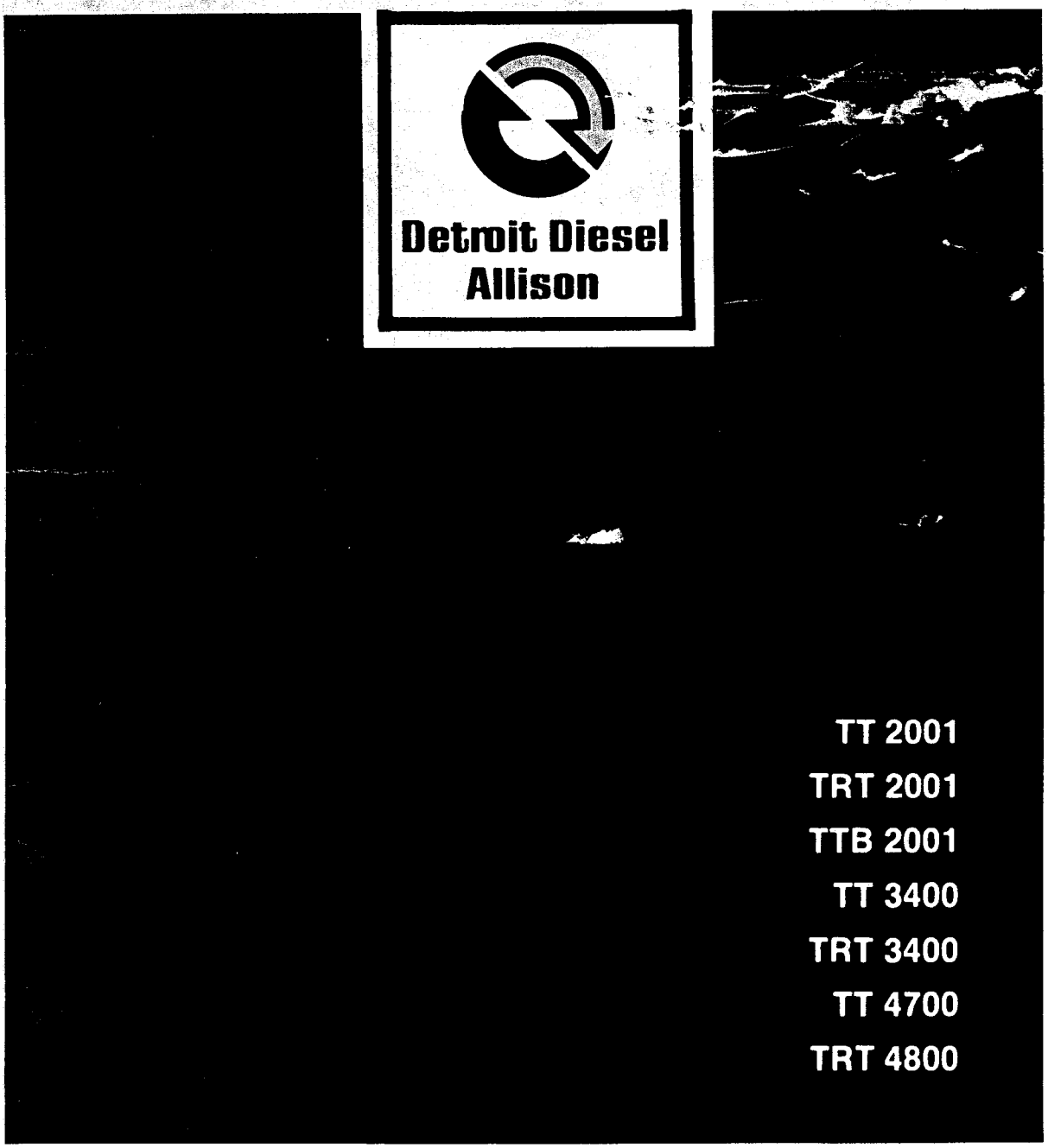
Allison Powershift Transmissions

Operators Manual

(Twin-Turbine Models)



TT 2001
TRT 2001
TTB 2001
TT 3400
TRT 3400
TT 4700
TRT 4800

OPERATING INSTRUCTIONS

MAINTENANCE INSTRUCTIONS

THE TWIN-TURBINE TRANSMISSIONS

Allison manufactures twin-turbine transmissions for a broad range of cycling or range-reversing vehicles. Each transmission is controlled by one shift lever—no separate foot pedal is required. The twin-turbine torque converter produces the equivalent of two torque ranges for each operating gear. One turbine provides the high torque necessary for starting heavy loads—the other turbine automatically takes over after the load is rolling to produce more speed.

A planetary gear system, driven by the twin-turbine converter, provides the additional operating gear ratios. Thus, the available operating ranges are the result of the ratios automatically produced by the twin turbines and the operator-selected ratios produced by the planetary system.

OPERATING INSTRUCTIONS

TRANSMISSION NAMEPLATE

The model number, part number (assembly number), and serial number are stamped in the transmission nameplate. These three numbers describe the transmission and all of its components. Use *all three* numbers when you are seeking information or ordering replacement parts for the transmission. Location of the nameplate varies with the particular type of transmission used in the vehicle. An illustration shows the nameplate and its location on various models.

For a handy, ready-reference, record the nameplate information onto the nameplate in the illustration.

Model Number

The model number is coded to define the operating characteristics and major components of the transmission. The code for these series of transmissions represents the following features.

Prefix Designation

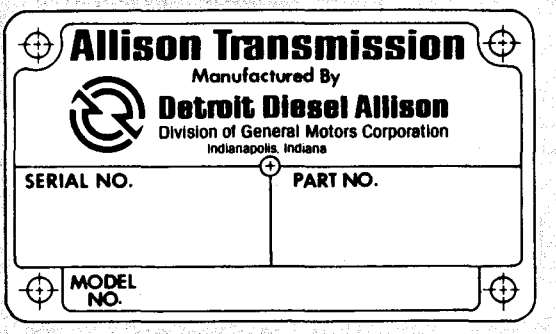
TT—Twin Turbine transmission
TRT—Twin Turbine transmission, equal speeds forward and reverse.

Model Designation

2, 3, or 4—Transmission Series
2, 4, 7 or 8—Torque Converter Series
1 or 2—Basic Speed Ranges
0 or 1—Standard duty or major model change.

Suffix Designation

1—Long center distance (long drop)
3—Short center distance (short drop)



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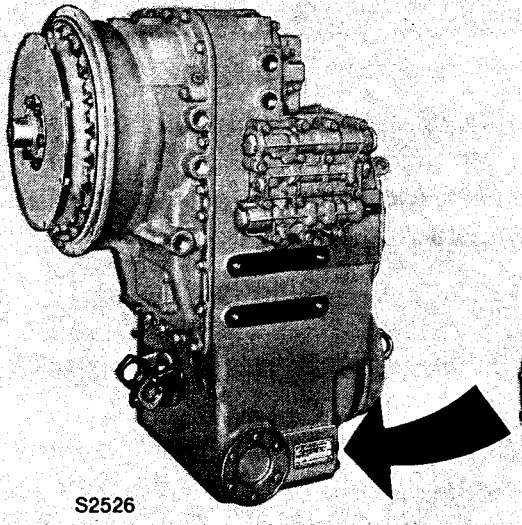

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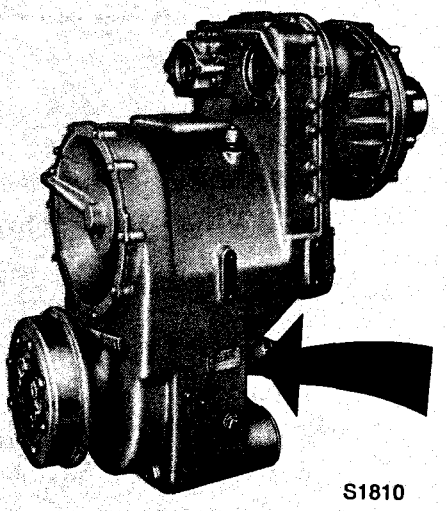
TT, TRT, TTB 2001-1,
TT, TRT 3420-1



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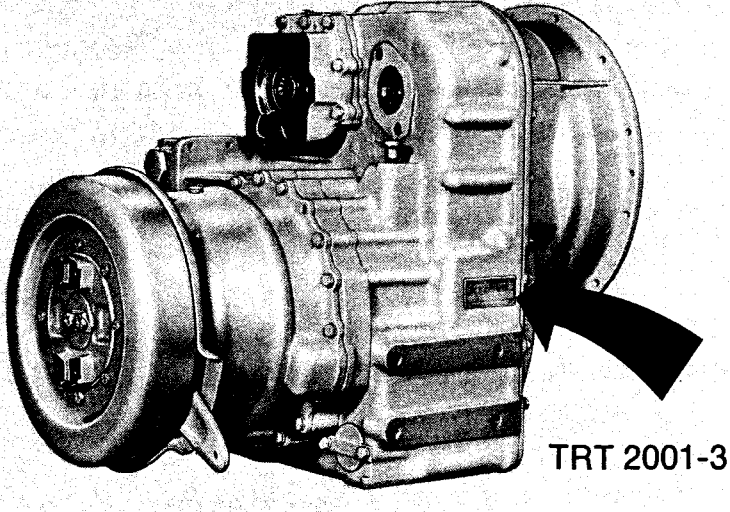
TT 4700-1
TRT 4800-1



TRT 2001-3

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JOB-MATCHED FEATURES

The manufacturer of this vehicle has selected, from the TWIN-TURBINE family, the specific transmission to match the vehicle duty cycle and travel requirements. To match the duty cycle, the transmission is equipped with one or more of the following features.

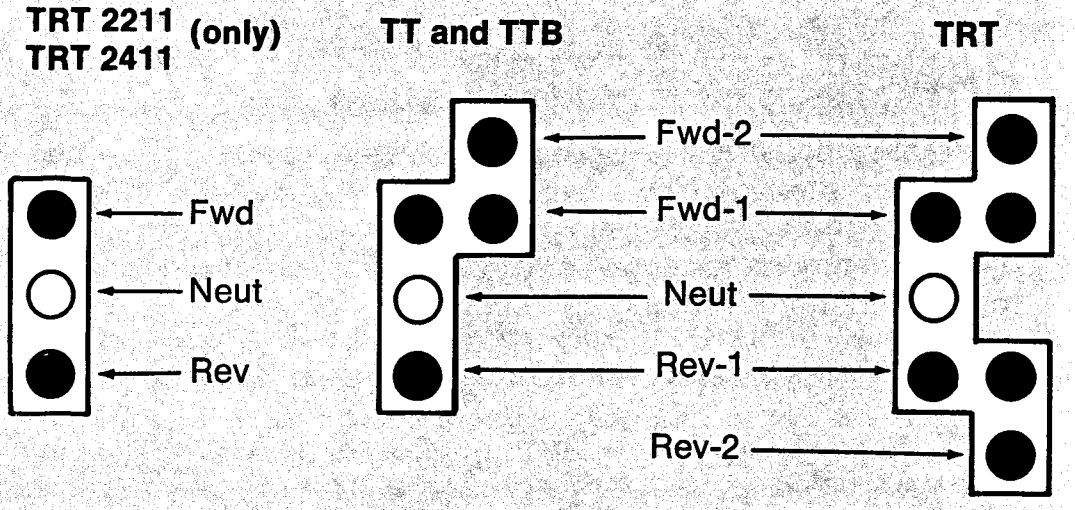
- Drive line disconnect—permits the operator to select two-wheel or four-wheel drive as desired (not used with short-drop applications).
- Clutch cutoff—permits the operator to divert engine power to the PTO-driven equipment.
- Inching control—permits the operator to maneuver vehicle in confined areas.
- Internal service brake—permits operator to work in dense brush, woods or mud without concern of fouling brake mechanism (used with TTB models only).
- Full power direction shifts—permits full power and/or full speed directional range shifts without harsh shift shocks .

To match the travel requirements, the transmission has one of the following shift patterns.

- The TT shift pattern provides two gears (2 range selections) in forward operation and one gear (1 range selection) in reverse.
- The TRT shift pattern provides equal range capability in either direction—two gears (2 range selections) in either forward or reverse operation or single range selection in either forward or reverse.

A single lever controls the functions of the transmission. Movement of the shift lever produces the selected gear ratio and direction. The shift patterns illustrated below are typical for the twin-turbine transmissions.

Soft Shift Patterns



OPERATING INSTRUCTIONS

STARTING

To start the engine, place the shift control lever in neutral position, and actuate the starter. A neutral start switch (if used) will prevent the engine from starting if the control lever is in any other position.

RANGE SELECTION

Generally, satisfactory operation of the vehicle depends largely on the operator's judgment in selecting the proper range for the various operating conditions. There are, however, recommended range selections which match the torque to the working or roading conditions.

- Select the working range (Fwd-1 or Rev-1) when starting the vehicle in motion and for moving heavy loads. The working ranges produce a high torque at low speeds.
- Select the roading ranges (Fwd-2 or Rev-2) when distances and load permits. The roading ranges produce a lower torque at higher speeds.

Full-Power Shifts

- Any shift to a higher speed ratio (Fwd-1 to Fwd-2 or Rev-1 to Rev-2), in the same direction, can be made at full throttle and load. Best performance can be obtained by making the shifts at near engine governed speed.

- Any downshift to a lower speed ratio (Fwd-2 to Fwd-1 or Rev-2 to Rev-1) can also be made at full throttle and load, but not at a speed higher than the maximum speed attainable in the low range.

Directional Shifts

- Directional shifts can be made under full power and/or full speed conditions within the working ranges (Fwd-1 to Rev-1 or Rev-1 to Fwd-1). Directional shifts should not be made between the roading ranges; shifts of this nature will adversely affect clutch life.

CLUTCH CUTOFF CONTROL

Some transmissions are equipped with a clutch cutoff control. This control eliminates the need to shift to neutral when full engine power is required to drive the PTO-driven equipment. The clutch cutoff is actuated whenever the operator applies the service brake. After the brake pedal passes through the initial portion of the stroke (some linkage has a detent), the clutches are completely released—when the brake pedal is released, the clutches are re-applied.

Because this feature would not be required for all operations, some vehicles include an override switch. This switch allows the operator to bypass the clutch cutoff control, whereby the transmission clutches are not affected by the service brakes. Also, some vehicles have two brake pedals, one applies the service brake only, the other pedal works in conjunction with the clutch cutoff.

INCHING CONTROL

Some transmissions are equipped with an inching control. This control permits better maneuverability—"inching" or "creeping" in confined areas while maintaining full throttle and hydraulic efficiency. The inching control is manually

actuated by the operator. Full application of the control will completely release the drive clutch; lesser application will allow partial slipping of the drive clutch. Thus, very slight or slow movements of the vehicle can be made with this control.

Although inching in high gear is permitted with some transmissions, the use of the inching control above creeping speed is not recommended. Refer to the following chart for the specific transmission model and the ranges in which inching is permitted.

Model	Inching ranges
TT,TTB 2001	Fwd-1 and Rev-1
TT 4700	Fwd-1 and Rev-1
TRT 2001	Fwd-1, Fwd-2, Rev-1 and Rev-2
TRT 2001 (underdrive)	Fwd-1 and Rev-1
TRT 4800	Fwd-1, Fwd-2, Rev-1 and Rev-2

DRIVELINE DISCONNECT

Some transmissions are equipped with a driveline disconnect. This feature permits the operator to select either a 4-wheel drive or 2-wheel drive as desired. Use the 2-wheel drive for roading on streets and highways. Use the 4-wheel drive for working off-the-road or when extra traction is required, such as operation in mud, snow, sand, etc.

The disconnect control should never be shifted while the vehicle is moving. However, when shifting from 2-wheel to 4-wheel drive, it may be necessary to move the vehicle slightly to align the driveline splines for positive engagement.

NOTE: The parking brake will only hold the wheels of one driveline when the vehicle is in 2-wheel drive. To hold the additional wheels, shift the control of the 4-wheel (engaged) position.

ENGINE-DRIVEN POWER TAKEOFFS

Any pumps or accessories which need to operate any time the engine is running can be driven by the two power takeoffs on the transmission housing. These pumps or accessories are driven at or near engine speed.

CONVERTER-DRIVEN POWER TAKEOFF

Some TT and TTB 2001 models have a power takeoff located 12 inches above the output driveline at the rear of the transmission. The speed of the PTO-driven equipment is independent of any shifts. This permits the PTO drive gear to rotate at converter output speed regardless of the range selector position. The PTO-driven equipment can be operated when the vehicle is stationary and in neutral range, or when the vehicle is moving and in any operating range. When the transmission is in gear, application of the vehicle brakes will also stop the PTO-driven equipment. When the transmission is in neutral operation or clutch cutoff is included, application of the brakes will not affect the PTO operation.

TEMPERATURES

The normal operating temperature range for twin-turbine transmissions is 180-220°F (82-104°C). This temperature is indicated by the transmission oil temperature gage. When a continuous over-temperature condition (above 250°F (121°C), or in the red band *on oil temp gage)* is indicated, stop the vehicle and determine the cause.

The most common and easily remedied cause of overheating is due to extended operation under severe loading conditions. When this occurs, shift to neutral and run the engine for several minutes at 1200-1500 rpm until the temperature returns to normal. If the temperature does not return to normal, refer to the Troubleshooting portion in this manual for the other possible causes and remedies for overheating.

PRESSURES

The clutch pressure range for most twin-turbine transmissions is 165 to 195 psi (1138-1344 kPa). Some selected applications have a pressure range of 138 to 165 psi (951-1138 kPa).

If the vehicle is equipped with a transmission clutch (oil) pressure gage, the gage will indicate the clutch apply pressure. During normal operation, the pressure will fluctuate during range shifts and will drop below normal during inching or clutch cutoff operation. If abnormal pressures are observed, refer to the Troubleshooting portion in this manual.

PUSHING OR TOWING

If a disabled vehicle must be pushed or towed farther than .5 mile (.8 km), it is imperative that BOTH drive line shafts be disconnected. Failure to comply with the .5 mile (.8 km) limit may result in serious damage requiring complete overhaul of the transmission. If the distance is less than .5 mile (.8 km), the drive line shafts may remain connected, and the vehicle must travel at a LOW speed.

PARKING BRAKE

There is no "park" position in the transmission shift pattern. Therefore, always apply the parking brake to hold the vehicle when it is unattended. Be sure the shift lever is in the neutral position.

SERVICE BRAKES (TTB models only)

TTB models are equipped with an internal, multidisk dynamic service brake which is controlled by the operator's foot pedal. The brake is self-adjusting and flow-cooled during application.

MAINTENANCE INSTRUCTIONS

A LOOK INSIDE

These transmissions include a twin-turbine torque converter, a planetary gear train, and a hydraulic control system which responds to the operator's movement of the range selector.

TWIN-TURBINE TORQUE CONVERTER

The twin-turbine torque converter extends the torque multiplication of the converter, in each gear range, providing broad torque coverage equal to two normal planetary gear ratios. This extended coverage is accomplished automatically and efficiently.

During operation, the first and second turbines function jointly or separately, depending upon the load demand and speed of the vehicle. The turbines are able to function jointly or separately by means of a freewheel clutch. At high-load demand and low speed, the freewheel clutch is engaged, causing both turbines to drive, and providing maximum input torque to the range gearing. As vehicle speed increases and load demand decreases, the second-turbine speed exceeds the first-turbine speed. The first turbine then freewheels, and the second turbine produces the power. Upon an increase in load demand and the resulting decrease in vehicle speed, the freewheel clutch automatically re-engages, causing both the first turbine and second turbine to again provide the necessary torque multiplication.

RANGE GEARING

The range gearing consists of a series of planetary gear sets. Each set includes an inner *sun gear,* four or more planet *pinion gears* united in a carrier, and an outer *ring gear.* Each planetary gear set is controlled by a clutch. Application of the clutch causes an interaction within the gear set which produces the selected speed ratio and direction of travel.

LOW-RANGE (TT). The low-range clutch holds the ring gear stationary, and the sun gear is the driving member. Thus, the planetary pinions drive the carrier at a reduced speed.

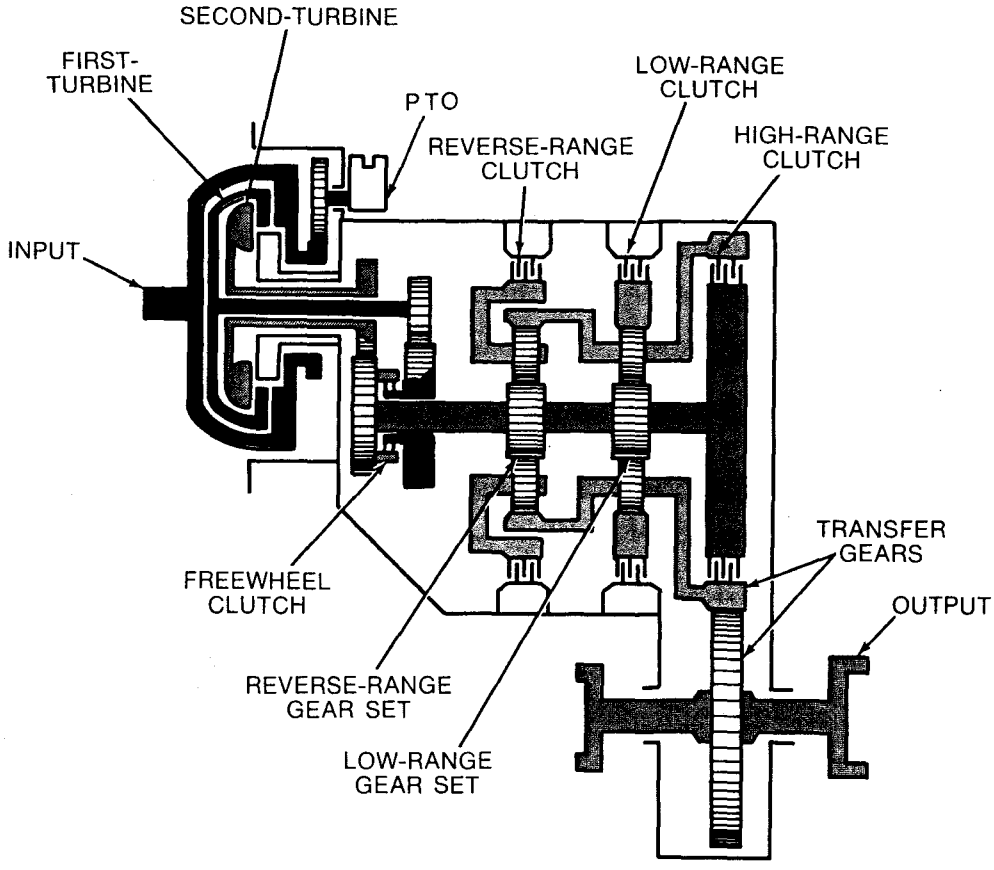
HIGH-RANGE (TT). The high-range clutch connects the transfer gears to the high-range clutch hub which is connected to the input shaft. Thus, a simple direct drive is produced from the input to the output.

REVERSE-RANGE (TT). The reverse-range clutch holds the planetary carrier, and the sun gear is the driving member. Thus the planetary pinions drive the ring gear in a reverse direction. This reverse torque drives the rest of the rotating members in a reverse direction.

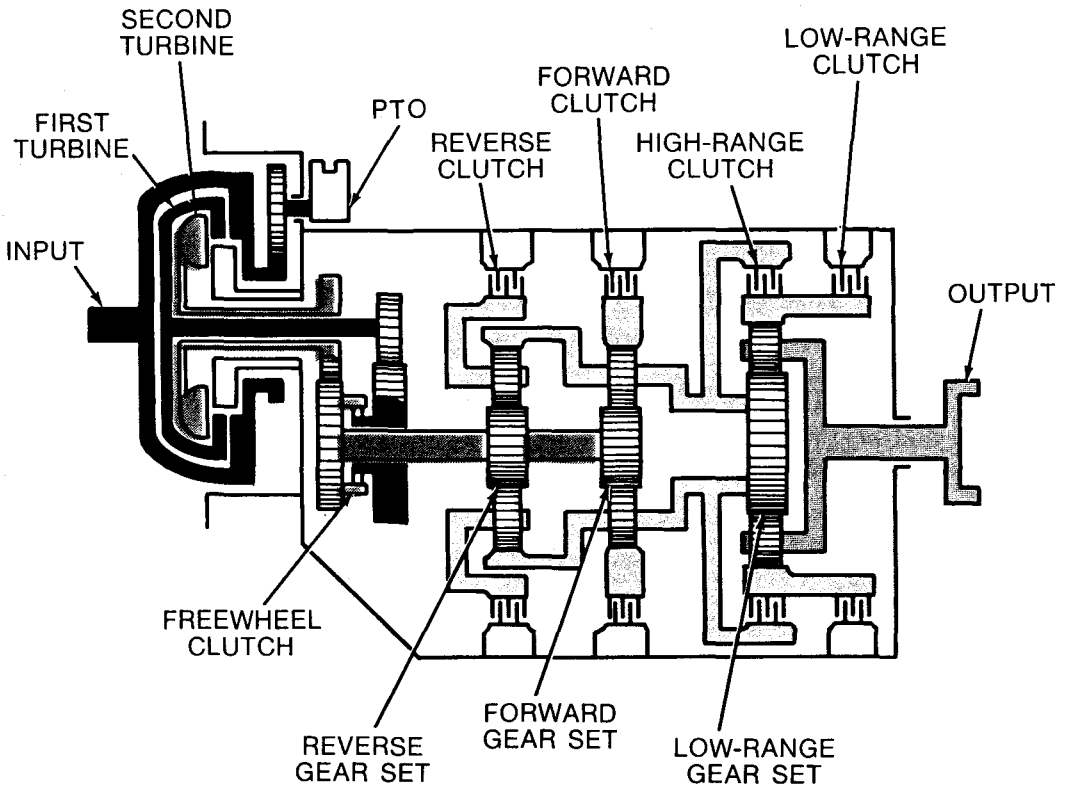
FORWARD, LOW-RANGE (TRT). Both the forward clutch and low-range clutch are engaged. The forward clutch holds the ring gear stationary, and the sun gear is the driving member. Thus the planetary pinions drive the carrier at a reduced speed. The low-range clutch holds the ring gear stationary, and therefore the identical action occurs in the low-range planetary set as in the forward planetary. Thus, the reduced speed from the forward is reduced again to provide low-range at the output.

FORWARD, HIGH-RANGE (TRT). Both the forward clutch and high-range clutch are engaged. The forward clutch components perform in the same manner as in low-range operation. The high-range clutch locks the ring gear to the driving sun gear. This causes the carrier to rotate at the same speed as the driving sun gear. Thus, no speed increase or decrease occurs at this planetary gear set, and high-range is produced at the output.

REVERSE, LOW- OR HIGH-RANGE (TRT). The reverse clutch holds the planetary carrier, and the sun gear is the driving member. Thus, the planetary pinions drive the ring gear in a reverse direction. This reverse torque drives the rest of the rotating members in a reverse direction.



TYPICAL TT, LONG DROP TRANSMISSION



TYPICAL TRT, SHORT DROP TRANSMISSION

HYDRAULIC SYSTEM

The hydraulic system generates, directs, and controls the pressure and flow of the hydraulic fluid within the transmission. The hydraulic fluid is the power transmitting medium in the torque converter. Its flow lubricates and cools the transmission components, its pressure applies the clutches, and its velocity drives the converter turbines.

CARE AND FIELD MAINTENANCE

PERIODIC INSPECTION

The twin-turbine ALLISON POWERSHIFT requires little maintenance; however, careful attention must be given to the oil level and the control linkage .

For easier inspection, the transmission should be kept clean. Make periodic checks for loose bolts and leaking oil hoses and splitlines. Check the engine cooling system occasionally for evidence of transmission oil which would indicate a faulty oil cooler. Report any abnormal conditions to your maintenance personnel—a faulty oil cooler requires immediate attention (refer to paragraph on oil contamination). Regularly check the control linkage to the range selector valve, front disconnect (if used), and the inching valve (if used).

IMPORTANCE OF PROPER OIL LEVEL

Because the transmission oil cools, lubricates, and transmits power, it is important that the proper oil level be maintained at all times. If the level is too low, the converter and clutches will not receive an adequate supply. This can result in poor performance or transmission failure. If the level is too high, the oil will become foamy. This will result in overheating during normal operation. Check the oil level at intervals specified in your vehicle service instructions or more frequently, if indicated by operating conditions.

OIL LEVEL CHECK PROCEDURE

Several procedures are used for checking the oil level in the various models. Selection of the correct procedure is dependent on whether the oil level is checked with the check plugs or a dipstick, and how the dipstick is marked.

Check Plugs

On the TT and TRT 2001 long-drop models and TT and TRT 3420 models, the plugs are located on the front of the housing near the lower-right side; on the short-drop models, the plugs are at the rear near the lower-left side. On all TT 4700 and TRT 4800 models the plugs are located on the lower-right side of the housing.

Cold Check with Plugs

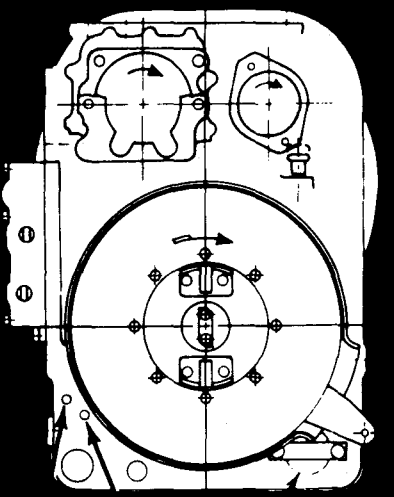
- Before starting the engine, remove the Full (upper) plug. If oil flows from the plug opening, the transmission has sufficient oil to permit safe starting of the engine. If no oil flow is present, add sufficient oil to cause a flow from the opening, and replace the plug.

- Shift the range selector to neutral, and start the engine. Accelerate to 1000 to 1500 rpm. Operate at this rpm for approximately one minute to charge the hydraulic system, then check for flow from the Add (lower) plug. Make sure to hold the rpm during this check. If the check is made at a lower rpm, it may result in a low oil level during normal operation.

- Add oil, if necessary, to bring the level to the Add (lower) plug. Note that the Add plug level is used for the Cold Check. When the transmission reaches operating temperature, thermal expansion will raise the oil level to the Full plug.

OIL LEVEL CHECK PLUG LOCATIONS

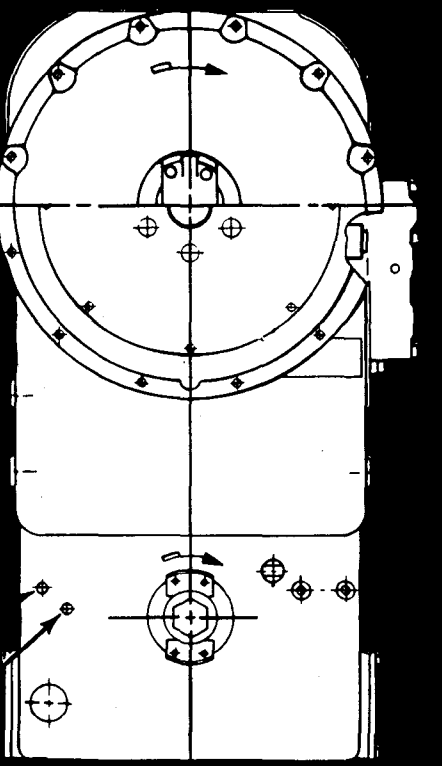
TT, TRT 2001-Short-Drop Model (rear view)



FULL

ADD

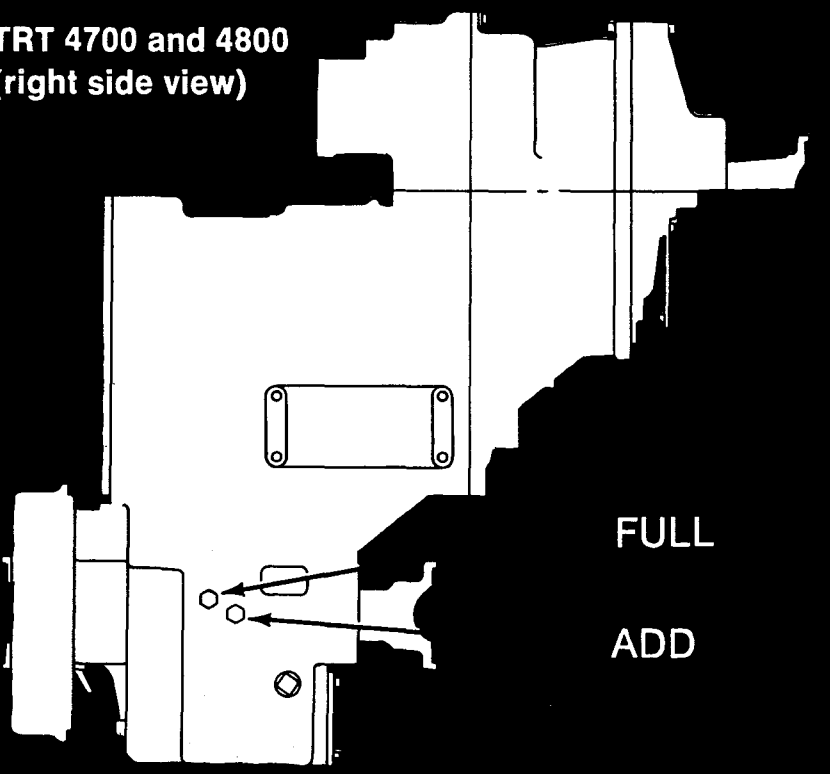
TT, TRT 2001-Long-Drop and TT, TRT 3420 Models (front view)



FULL

ADD

TT, TRT 4700 and 4800 (right side view)



FULL

ADD

Hot Check with Plugs

- Shift the range selector to neutral, and start the engine. Operate the vehicle until the transmission reaches a normal operating temperature of 180-220°F (82-104°C). Then idle the engine and apply the parking brake. Shift through all range positions slowly to ensure that all areas of the system are filled with oil.

- Shift to neutral and set the engine speed at 1200 to 1500 rpm. Remove the Full (upper) plug. The oil should be at or near the level of the plug opening. Add or drain oil as necessary to bring it to the Full plug level. (The transmission may be operated safely as long as the oil level is above the Add plug.)

NOTE: Observe the type of flow from the plug opening. Foaming or spurting may indicate a false level.

Dipsticks

Two kinds of dipsticks are used to indicate the oil level within the transmission sump. One type is calibrated to the same levels as indicated by the Add (lower) and Full (upper) plugs. This type is used to check the oil level when the engine is running at 1200 to 1500 rpm. The other type has a greater distance between the Add (Cold) and Full (Hot) marks. This greater distance is usually defined on the dipstick as OPERating RANGE. This type is used to check the oil level when the engine is running at idle speed.

1200 to 1500 rpm check

Idle rpm check

Cold Check with Dipstick (Idle rpm)

- Check the oil level before starting the engine. It is safe to start the engine if the oil is within the OPERating RANGE (between the marks). It is not safe to start the engine if the oil level is above the Hot mark or below the Cold mark. If the level is not within the OPERating RANGE, add or drain the oil as necessary to bring it between the two marks.

- Shift the range selector to neutral and start the engine. Allow the engine to idle (500-750 rpm) for approximately two minutes to completely charge the hydraulic system.

- If necessary, add oil as required to establish the oil level at the Cold (lower) mark. Note that the Cold mark is used for this check. When the transmission reaches operating temperature, thermal expansion will raise the oil level sufficiently to be within the OPERating RANGE.

Hot Check with Dipstick (Idle rpm)

- Shift to neutral and start the engine. Operate the vehicle until the transmission reaches an operating temperature of 180-220°F (82-104°C).

- Check the oil level while the engine is idling—the oil level should be within the OPERating RANGE and must not be above the Hot (full) mark.

- If the level is above the Hot mark or below the Cold mark, drain or add oil as necessary to bring the level within the OPERating RANGE.

Cold Check with Dipstick (1200-1500 rpm)

- Before starting the engine, check the oil level. If the level is at or above the Full (top) mark, the transmission has sufficient oil to permit safe starting of the engine. If the

level is below the Full (top) mark, add sufficient oil to bring the level up to the Full mark.

- Shift the range selector to neutral, and start the engine. Accelerate to 1000 to 1500 rpm. Operate at this rpm for approximately one minute to charge the hydraulic system, then check the oil level again—it should be at the Add (lower) level. Make sure to hold the rpm during this check. If the check is made at a lower rpm, it may result in a low oil level during normal operation.

- Add oil, if necessary, to bring the level to the Add (lower) mark. Note that the Add mark is used for the Cold check. When the transmission reaches operating temperature, thermal expansion will raise the oil level to the Full mark.

Hot Check with Dipstick (1200-1500 rpm)

- Shift the range selector to neutral, and start the engine. Operate the vehicle until the transmission reaches a normal operating temperature of 180-220°F (82-104°C). Then idle the engine and apply the parking brake. Shift through all range positions slowly to ensure that all areas of the system are filled with oil.

- Shift to neutral and set the engine speed at 1200 to 1500 rpm. Remove the dipstick and check the oil level. The level should be at or near the Full (top) mark. Add or drain oil as necessary to bring the level to the Full mark. (The transmission may be operated safely as long as the oil level is above the Add mark.)

OIL SPECIFICATION—TYPE C3

Fluid viscosity and grade	Ambient temperature below which preheat is required.
30	32°F (0°C)
15W—40	15°F (—9°C)
10W, 10—10W	—10°F (—23°C)
5W—20	—30°F (—34°C)

NOTE: Only certain C-3 fluids have been approved for Allison Powershifts. Check with the Detroit Diesel Allison Distributor in your area to make sure that you are using an approved brand.

OIL AND OIL FILTER CHANGE

Frequency

Generally, the oil and filter should be changed every 1000 hours of operation. However, if the vehicle operates under severe dust and dirt conditions, the oil and filter should be changed more frequently. Change the oil immediately if it has been subjected to severe overheating. Change the oil any time it shows evidence of contamination.

Oil Contamination

At each oil change examine the oil which is drained for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during operation of the transmission. However, if there is evidence of water, check the cooler (heat exchanger) for leakage between the water and oil areas. Oil in the water side of the cooler (or vehicle radiator) is another sign of leakage. This, however, may indicate leakage from the engine oil system.

Metal particles in the oil (except for the minute particles normally trapped in the oil filter) indicate damage has occurred in the transmission. When these particles are found in the sump, the transmission must be disassembled and closely inspected to find the source. Metal contamination will require complete disassembly of the transmission and cleaning of all internal and external circuits, cooler, filter, and all other areas where the particles could lodge.

If engine coolant containing ethylene glycol leaks into the transmission oil system, immediate action must be taken to prevent malfunction and possible serious damage. The transmission must be completely disassembled, inspected and cleaned. All traces of the coolant, and varnish deposits resulting from coolant contamination, must be removed.

Draining Oil

The transmission should be at operating temperature when the oil is drained.

- Remove the drain plug from the transmission housing. Remove the oil filter element from the remote-mounted filter. Remove the oil strainer cover and strainer from the transmission housing.

- While the oil is draining, check for evidence of contamination. (Refer to the preceding paragraph for the danger signs.) Any accumulation of sludge or soft dirt in the sump should be removed with flushing oil.

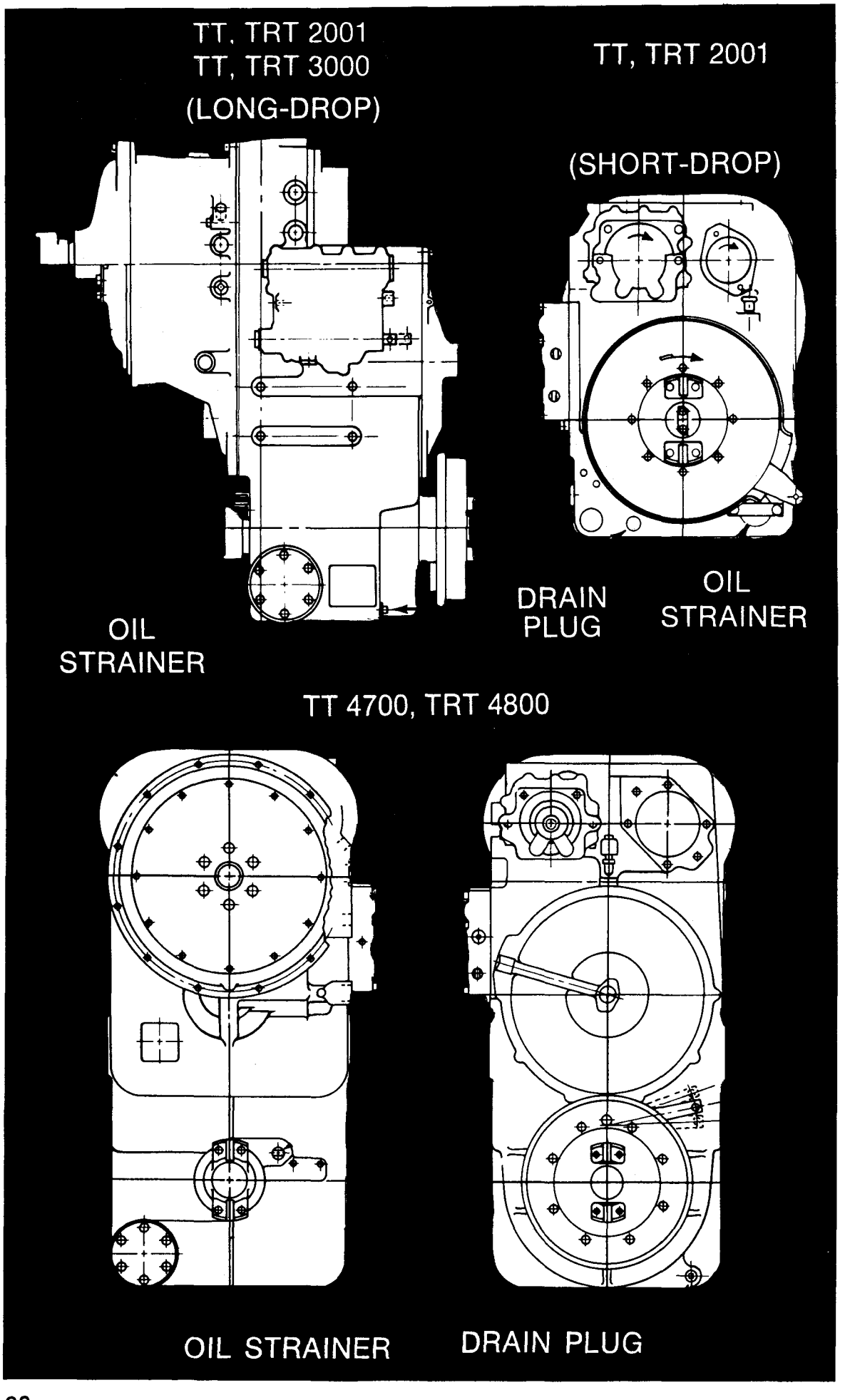
- Clean the oil strainer by agitating it in mineral spirits or solvent. Flush all residue and foreign particles from the screen mesh. Dry the strainer with compressed air—do not use linty shop towels.

- Should it become necessary to use a different transmission fluid, thoroughly flush the SYSTEM with the fluid to be used before refilling.

Refilling Oil Sump

- *ON ALL MODELS,* install the oil drain plug, and tighten it sufficiently to prevent leakage. Install a new filter element and gasket into the remote-mounted filter.

- *ON THE LONG-DROP MODELS,* install the oil strainer and gasket. Slip the open end of the strainer onto the suction tube within the housing, then rotate the strainer cover as necessary to locate the strainer at its lowest point. Install the six bolts, and tighten them to 26-32 lb ft (35.3-43.3 N m).


TT, TRT 2001
TT, TRT 3000
(LONG-DROP)
TT, TRT 2001
(SHORT-DROP)
OIL
STRAINER
DRAIN
PLUG
OIL
STRAINER
TT 4700, TRT 4800
OIL STRAINER
DRAIN PLUG

- *ON THE SHORT-DROP MODELS,* install the oil strainer into the transmission housing. Then install the strainer cover and sealring. Retain the strainer cover with the two bolts, and tighten the bolts to 26-32 lb ft (35.3-43.3 N m.)

Refill Capacity

Transmission	U.S. Gallons	Litres
TT, TTB 2001 (long-drop models) and TRT 3420-1	7½	28
TRT 2001 (long-drop models)	6½	25
TRT 2001 (short-drop models)	4½	17
TT, TRT 4000	8	30

NOTE: The volume of oil listed above does not include the amount required to fill the external filters and circuits. The oil capacities of earlier models are the same as above.

Add the required amount of oil, and check for leaks at the oil strainer, and drain plug locations. Conduct the oil level checks (cold and hot), as previously described, and inspect the filter for leaks.

CHECKING AND ADJUSTING LINKAGE

Refer to the vehicle manual for specific instructions. The design of control linkages for the range selector, output disconnect, inching control (when used), and parking brake depends on the particular installation. Control linkages are provided by the vehicle manufacturer. Therefore only general instructions for linkage adjustments can be provided in this manual.

Range Selector and Inching Control Linkage

The range selector linkage must be adjusted so that the operator's control and selector valve are both in the desired range at the same time. Make the initial adjustment in neutral. Then shift through all range positions to make sure that the selector valve is in full detent position in each range. Adjust the inching valve control linkage so that the valve has full travel from retracted to extended positions. Linkage must be kept clean and well lubricated. Bent or damaged linkage must be repaired or replaced.

Driveline Disconnect (Long-Drop Models Only)

The adjustment of the disconnect is a two-step procedure. The disconnect shaft must be adjusted first, then the control linkage must be adjusted to the position of the disconnect shaft.

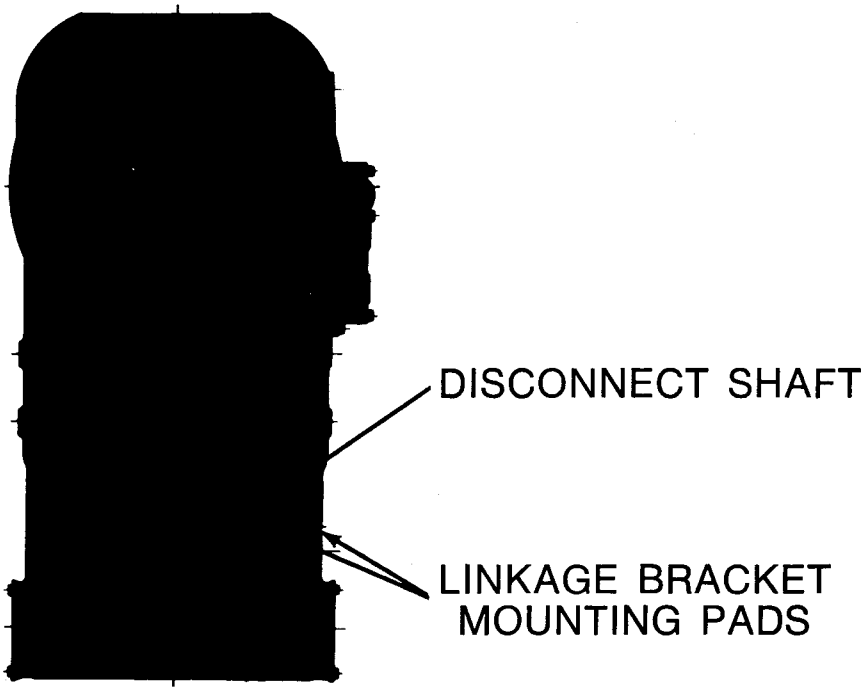
- Move the control lever to the disconnect position. Then remove the control linkage from the disconnect shaft.
- Push the disconnect shaft inward (toward transmission housing) to the engaged position. A spring-loaded detent will indicate the engaged position.
- Adjust the distance the shaft protrudes from the transmission housing by rotating the shaft.

  FOR THE 2001 SERIES, rotate the shaft, as necessary, until the center of the clevis pin hole is 13/32 inch from the linkage mounting pads.

  FOR THE 3000 SERIES, rotate the shaft as necessary, until the center of the clevis pin hole is 5/8 inch from the linkage mounting pads.

  FOR THE 4700, 4800 SERIES, rotate the shaft, as necessary, until the center of the clevis pin hole is 15/16 inch from the linkage mounting pads.

- Pull the disconnect shaft outward (away from transmission housing) to the disengaged position. A spring-loaded detent will indicate the disengaged position; the shaft will travel approximately 1-11/16 inches. Attach the control linkage, and adjust it so that engaged and disengaged positions of the operator's control correspond exactly with the detent positions of the disconnect shaft.



Parking Brake (not TTB 2001 models)

The internal, expanding shoe-type brake, which is attached to the transmission housing and output flange, requires periodic adjustment. The procedure for adjusting this type of parking brake follows.

- Adjust the brake shoes for proper drum clearance by inserting a screwdriver or adjusting tool into one of the openings at the rear of the brake drum and turning the

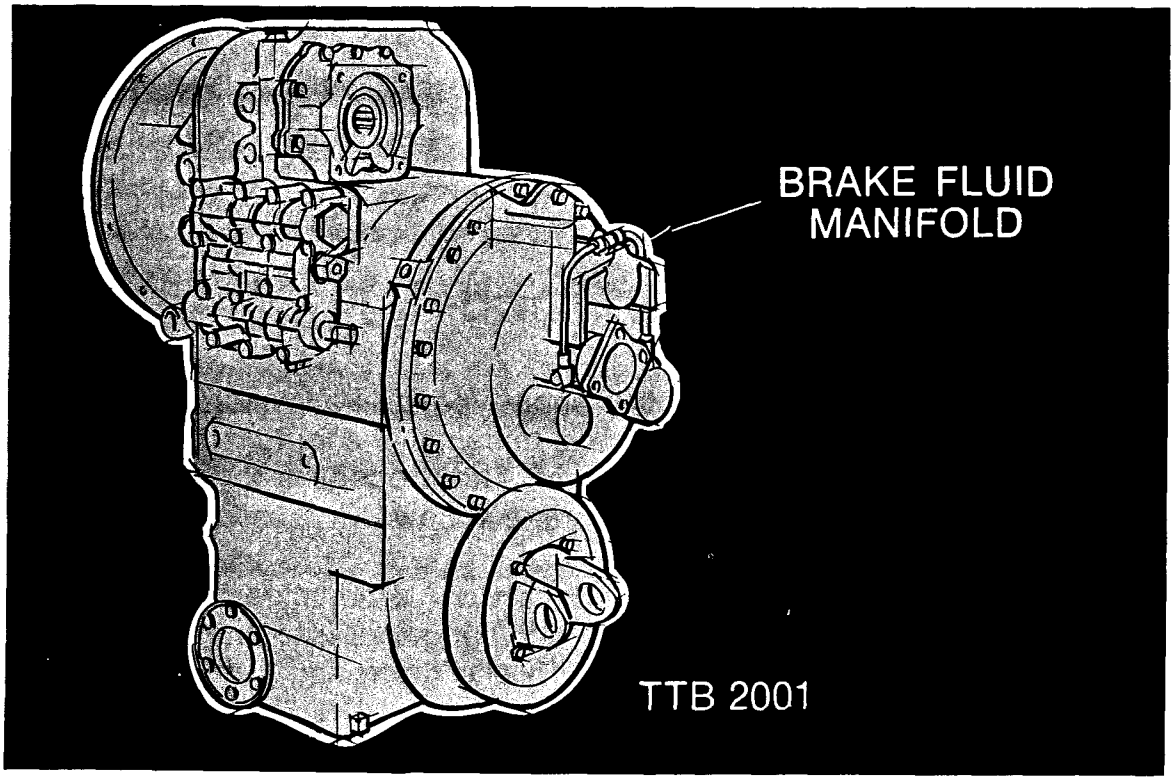
star wheel. The brake linkage should be disconnected during this adjustment. The star wheel should be rotated until 0.010-inch (0.25 mm) thickness gages are held snugly between the adjustment ends of the shoes and the drum (use two gages simultaneously—one at each shoe).

- Adjust the vehicle linkage by releasing the hand lever fully and adjusting the connecting rod so that it can be connected to the brake assembly actuating lever. During adjustment, the brake assembly actuating lever must be held so that all slack is removed (without applying the brakes).

BLEEDING INTERNAL BRAKE (TTB Model Only)

All air must be bled out of the hydraulic system before the brake will apply properly. Air in the system will cause the brake apply action to feel soft and springy. Also, air in the system may allow the brake pedal to completely depress without applying the brake.

To bleed the air from the system, additional brake fluid is added under presure through the master cylinder. This pressure is produced by either one of two methods: (1) Using a



pressure bleeder inserted into the master cylinder, or (2) pumping the brake pedal while maintaining adequate fluid in the master cylinder. This pressure (air and brake fluid) is then allowed to escape through a bleeder valve or plug. The bleeder valve or plug is located directly opposite the point to which the tube from the master cylinder is connected at the brake fluid manifold (right or left side).

- Open the bleeder valve or plug. Flush brake fluid through the system with a pressure bleeder, or pump the brake pedal slowly through complete strokes, and observe the flow from the bleeder valve.

NOTE: When the brake pedal is being used, always keep the master cylinder reservoir full of brake fluid, and close the bleeder valve or plug before each release (upstroke) of the brake pedal.

- When flow from the bleeder valve shows no more air in the system, close the valve. If difficulty is experienced in obtaining a firm, solid feel when the brake is applied, loosen one of the tube nuts at the upper portion of the brake manifold, and bleed the system of the remaining air.

Brake Fluid Specification

Use hydraulic brake fluid SAE J70, Type 70R1 or 70R3 for maintaining the proper level in the master cylinder reservoir and for bleeding the system.

CARE OF BREATHER

The prevalence of dust and dirt will determine the frequency at which the breather requires cleaning. Clean the area around the breather stem before removing the breather. Wash the breather thoroughly by agitating it in mineral spirits or cleaning solvent. Dry it thoroughly with compressed air after cleaning. Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench will crush or damage it and produce metal chips which could enter the transmission.

TROUBLESHOOTING

The operator must be alert to evidences of poor performance of the vehicle. In some cases, the remedy may be beyond the on-site technical skills or tool inventory. When this occurs, report the condition to the appropriate maintenance personnel as soon as possible—don't let little problems become big ones.

The following chart lists the possible causes of, and remedies for, transmission troubles. As indicated in the chart, the engine and transmission must be considered as a single package when searching for the trouble.

TROUBLESHOOTING CHART

Ⓐ LOW CLUTCH APPLY PRESSURE (transmission oil pressure gage)

Cause	Remedy
1. Low oil level	1. Add oil to correct level
2. Clogged oil strainer	2. Clean strainer
3. Clogged oil filter	3. Replace filter element
4. Inching control adjustment not fully retracted	4. Check, adjust linkage
5. Air leak at intake side of oil pump	5. Check pump mounting bolts
6. External oil leakage	6. Tighten bolts or replace gaskets
7. Brake hydraulic (or air) pressure applying clutch cutoff valve	7. Check brake residual pressure (brakes released); check brakes for full release
8. Internal failure	8. Overhaul transmission, or repair subassembly

Ⓑ OVERHEATING

Cause	Remedy
1. High oil level	1. Restore proper oil level
2. Clutch failed	2. Rebuild transmission
3. Vehicle overloaded	3. Reduce load
4. Low clutch apply pressure	4. Refer to Ⓐ
5. Engine water over-heated	5. Correct engine over-heating
6. Cooler oil or water line kinked or clogged	6. Clean or replace line

Ⓒ AERATED (foaming) OIL

Cause	Remedy
1. Incorrect type oil used	1. Change oil; use proper type
2. High oil level	2. Restore proper oil level
3. Low oil level	3. Restore proper oil level
4. Air entering suction side of oil pump	4. Check oil pump bolts and gasket
5. Air entering at clutch cutoff valve (air actuated)	5. Check plug seal and sealring of valve

Ⓓ VEHICLE WILL NOT TRAVEL

Cause	Remedy
1. Low clutch apply pressure	1. Refer to Ⓐ
2. Selector linkage broken or disconnected	2. Repair or connect linkage
3. Internal mechanical failure	3. Overhaul transmission

Ⓔ VEHICLE TRAVELS IN NEUTRAL WHEN ENGINE IS ACCELERATED

Cause	Remedy
1. Selector linkage out of adjustment	1. Adjust linkage
2. Clutch failed (won't release)	2. Overhaul transmission

Ⓕ VEHICLE LACKS POWER AND ACCELERATION AT LOW SPEED

Cause	Remedy
1. Low clutch apply pressure	1. Refer to Ⓐ
2. Turbine freewheel clutch failed	2. Overhaul transmission
3. Engine malfunction	3. Check engine; refer to engine service manual
4. Aerated oil	4. Refer to Ⓒ

Ⓖ SERVICE BRAKE MALFUNCTION—TTB

Cause	Remedy
1. Brake slips when pedal is fully applied	1. Rebuild brake
2. Spongy brake pedal	2. Bleed hydraulic brake system
3. Brake pedal bottoms when brake is applied	3. Check for leaks in hydraulic brake lines and for broken linkage. Bleed brake hydraulic system. Check master cylinder.

(H) CLUTCH CUTOFF VALVE INEFFECTIVE

Cause	Remedy
1. Valve or plug sticking	1. Rebuild control valve body assembly
2. Brake apply hydraulic pressure incorrect	2. Check pressure at control valve (min-max limits—130-2000 psi)
3. Brake apply air pressure not reaching air cylinder	3. Check air cylinder (35 lb force required to stroke valve)
4. Plunger sticking in air cylinder	4. Check operation of air cylinder
5. Air entering at valve (air actuated)	5. Check operation of air cylinder (seals)

PRESERVATION AND STORAGE

PRESERVATIVE SELECTION

When the transmission is to be stored or remain inactive for extended periods of time, specific preservative methods are recommended to prevent rust and corrosion damage. The length of storage will usually determine the preservative method to be used. Various methods are described as follows.

Month to Six Weeks Storage

- Drain the oil and remove the transmission oil filter element(s). Install the drain plugs and new filter element(s) and sealrings.
- Fill the unit to operating level with an commercial preservative oil which meets U.S. Military specifications MIL-L-21260, Grade 1, to latest specifications.
- Operate the unit for at least five minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil.

WARNING: Prior to stalling the converter, advise all personnel in the area to stay clear of the vehicle path.

- Stall the converter to raise the oil temperature to 225°F (107°C) *(on oil temp gage)*

- To stall the converter, shift to the highest operating range, and *prevent rotation* of the vehicle drive wheels. Then, advance the throttle sufficiently to raise the transmission oil temperature.

CAUTION: Do not allow temperature to exceed 250°F (107°C). If the unit does not have an oil temperature gage, do not stall for more than 30 seconds (at full throttle).

- Stop the engine. As soon as the unit is cool enough to touch, seal all openings and breathers with moisture-proof tape. Coat all exposed, unpainted surfaces with a good grade of preservative grease, such as Petrolatum (MIL-C-11796) Class 2.

- Repeat the last two operation at monthly intervals for indefinite storage.

One-Year Storage Without Oil

- Drain the oil. Remove the transmission oil filter element(s). Install new filter element(s) and sealrings.

- Seal all openings and breathers, except oil drain hole, with moisture-proof tape. Coat all exposed, unpainted surfaces with a good grade of preservative grease.

- Atomize or spray two ounces of Motorstor*, or equivalent, into the transmission through the oil drain hole. Install the drain plug.

- If additional storage time is required, repeat the last two operations at yearly intervals.

* *Motorstor is a preservative additive manufactured by the Daubert Chemical Company, Chicago, Illinois. Motorstor (under the designation of "Nucle Oil") is covered by US Military Specifications MIL-L-46002 (ORD) and MIL-I-23310 (WEP).*

One-Year Storage With Oil

- Drain the oil, and remove the transmission oil filter element(s). Then, install the drain plugs and new filter element(s).

- Fill the transmission to operating level with a mixture of 30 parts hydraulic transmission fluid, Type C3, to 1 part Motorstor preservative, or equivalent.

- Operate the unit for approximately five minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil.

WARNING: Prior to stalling the converter, advise all personnel in the area to stay clear of the vehicle path.

- Stall the converter to raise the oil temperature to 225°F (107°C) (*on oil temp gage*). To stall the converter, shift to the highest operating range, and *prevent rotation* of the vehicle drive wheels. Then, advance the throttle sufficiently to raise the transmission oil temperature.

CAUTION: Do not allow temperature to exceed 250°F (107°C) (on oil temp gage). If the unit does not have an oil temperature gage, do not stall for more than 30 seconds (at full throttle).

- Stop the engine. As soon as the unit is cool enough to touch, seal all openings and breathers with moisture-proof tape. Coat all exposed, unpainted surfaces with a good grade of oil preservative grease.

- If additional storage time is required—just add the Motorstor, or equivalent, and repeat the last two operations.

Restoring Units to Service

- Remove the tape from openings and breather. Wash off all the external grease with mineral spirits.

NOTE: It is not necessary to drain C3 oil and Motorstor mixture from the transmission.

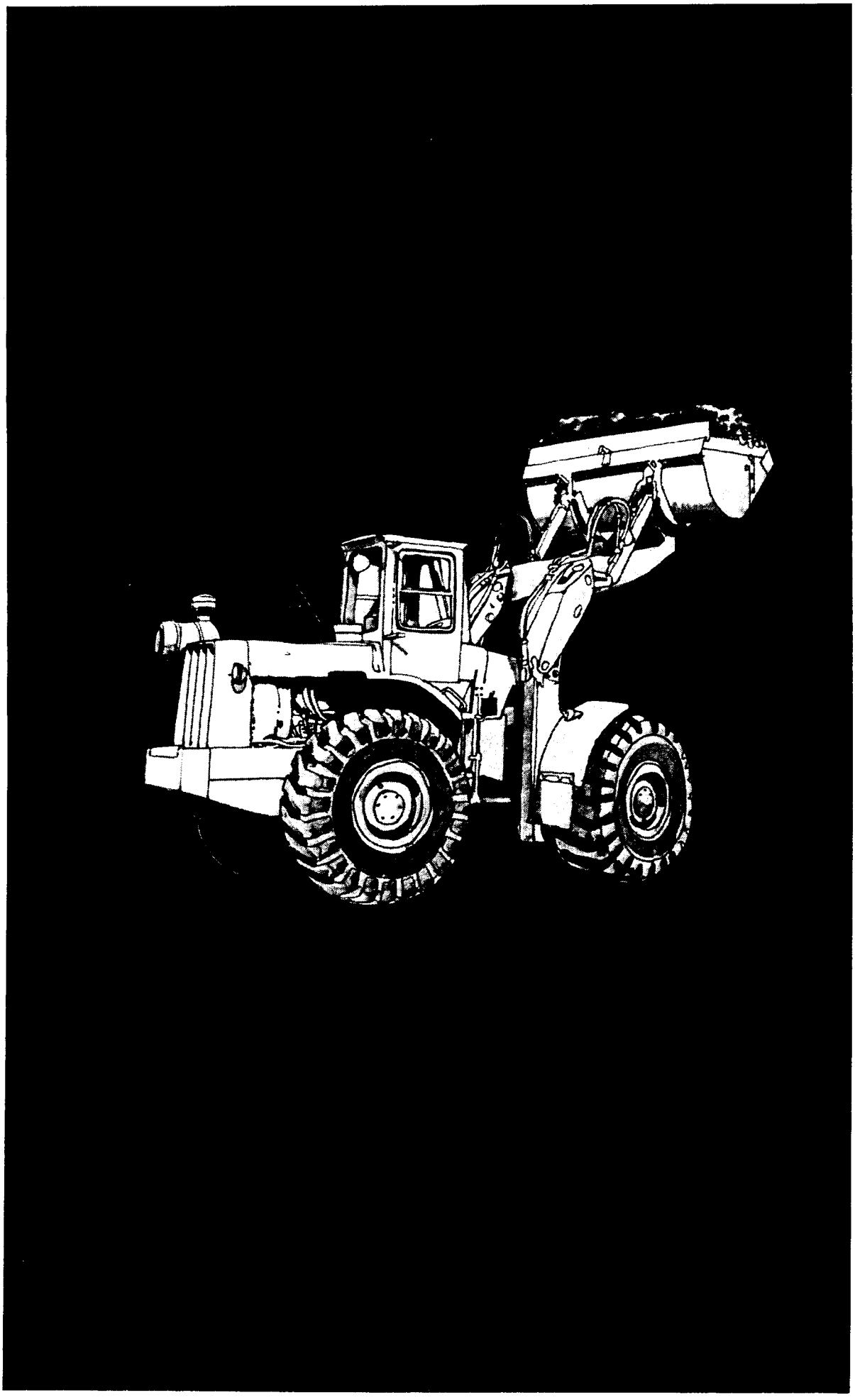
- If Motorstor or equivalent, was used in preparing the transmission for storage, add hydraulic transmission fluid Type C3 to the proper level.

- If Motorstor or equivalent, was not used in preparing the transmission for storage, drain the oil and refill transmission with Type C3 hydraulic transmission fluid to the proper level.

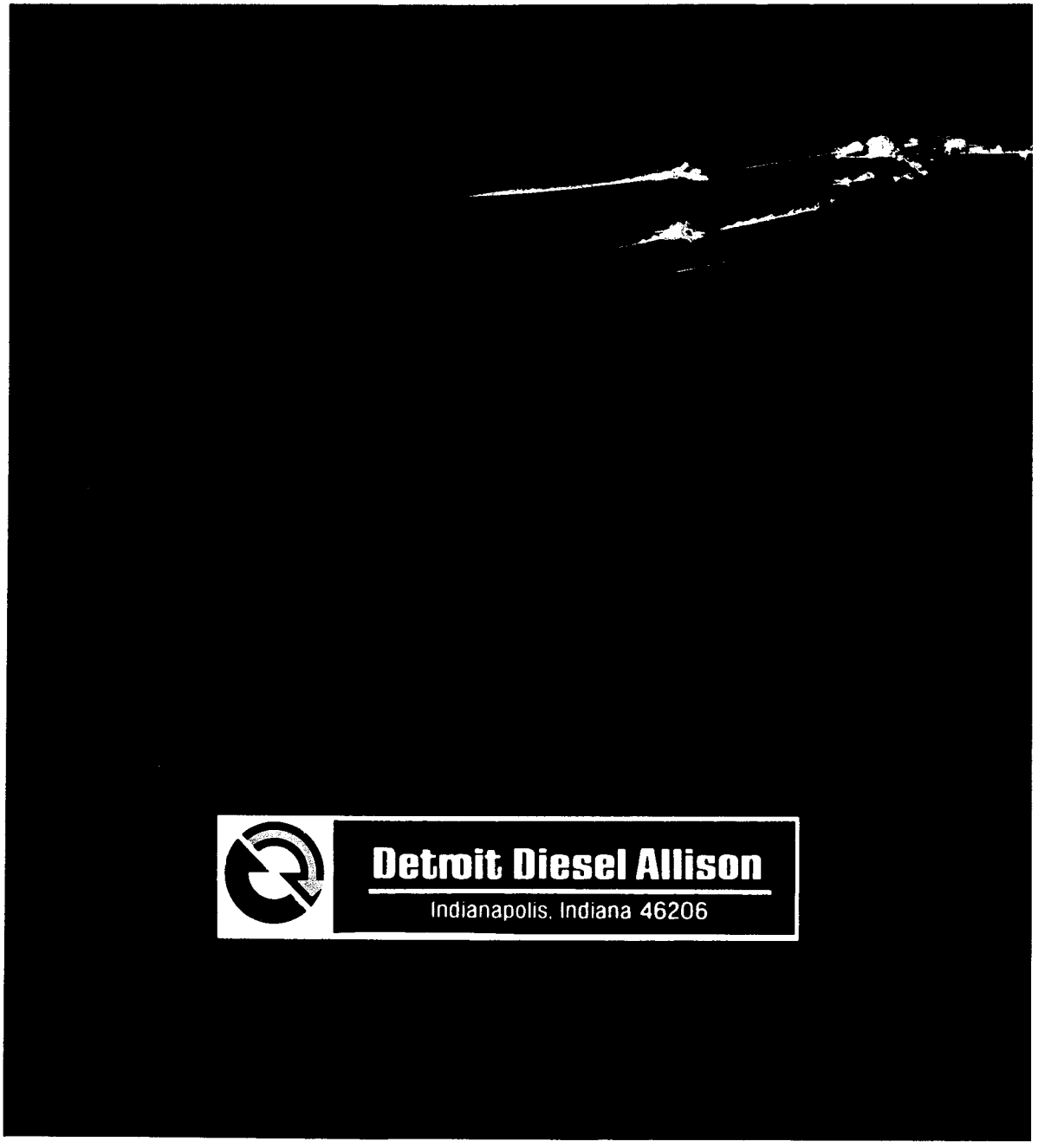
SERVICE LITERATURE

The following publications describe the operation, servicing, overhaul, and replacement parts for your Allison transmission. These publications can be obtained from the dealer or distributor.

Service Manuals	Publication No.
TT, TTB 2001	SA 1277
TRT 2001	SA 1280
TT 3000	SA 1584
TRT 3000	SA 1727
TRT 4000	SA 1171
TT4700	SA 1362
TRT 4800	SA 1363
Parts Catalogs	**Publication No.**
TT, TTB, TRT 2001 and 2000	SA 1248
TT, TRT 3000	SA 1519
TT, TRT 4000	SA 1158



The Allison Powershifts



Detroit Diesel Allison

Indianapolis, Indiana 46206

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