

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 linkages.

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 linkages 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, 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.

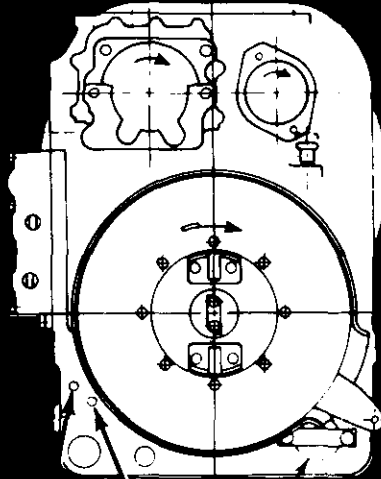
NOTE. Check plugs are in the same locations on earlier models.

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

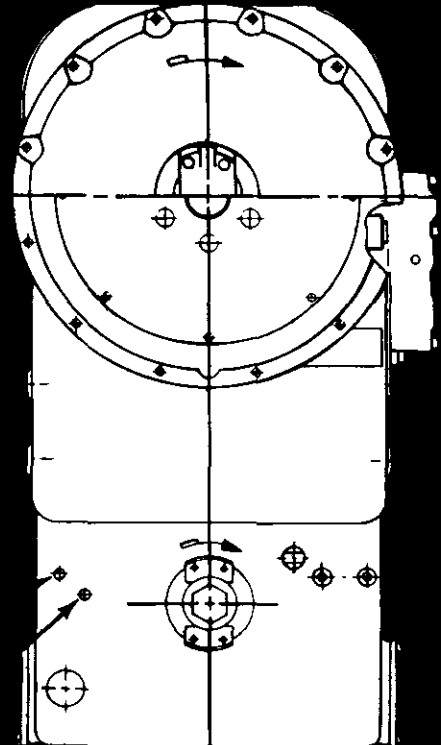
TT, TRT 2001-Short-Drop Model (rear view)



FULL

ADD

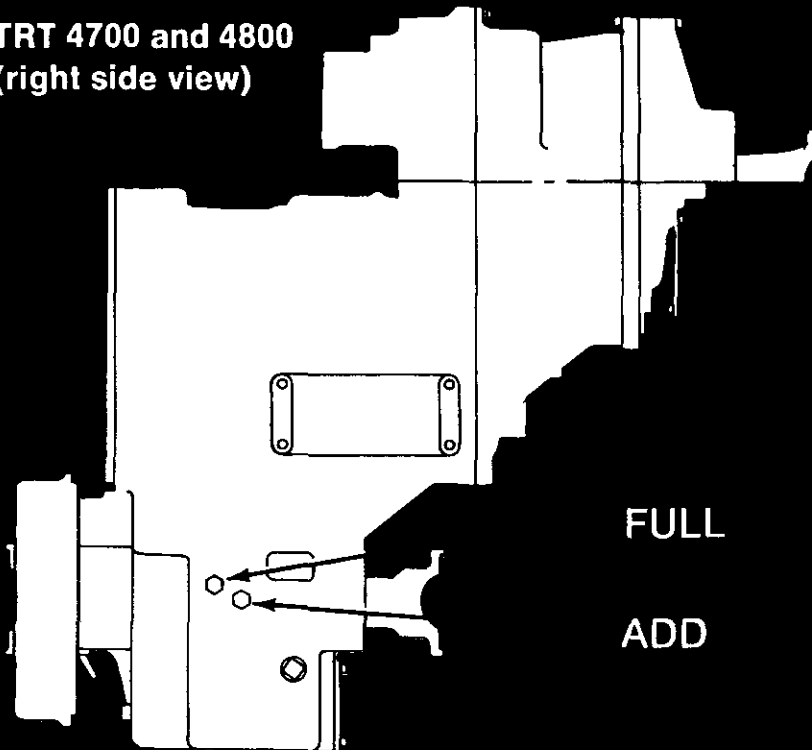
TT, TRT 2001-Long-Drop Model (front view)



FULL

ADD

TT, TRT 4700 and 4800 (right side view)



FULL

ADD

Hot Check with Plugs

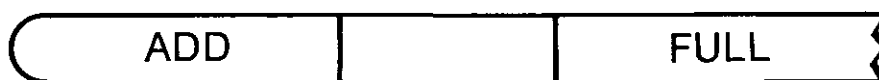
- Shift the range selector to neutral, and start the engine. Operate the vehicle until the transmission reaches normal operating temperature (180-220°F). Then idle the engine and apply the parking brake. Shift through all range positions slowly to insure that all areas of the system are filled with oil.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

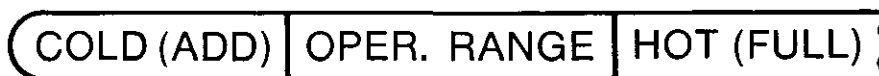
Dipsticks

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 operating temperature (180°-220°F).
- 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 normal operating temperature (180°-220°F). Then idle the engine and apply the parking brake. Shift through all range positions slowly to insure 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

Only Type C-2 hydraulic transmission fluid is recommended for use in these transmissions. However, when the ambient

temperature is below -10°F an auxiliary preheat is required to raise the temperature in the sump to at least -10°F .

NOTE: Only certain C-2 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.

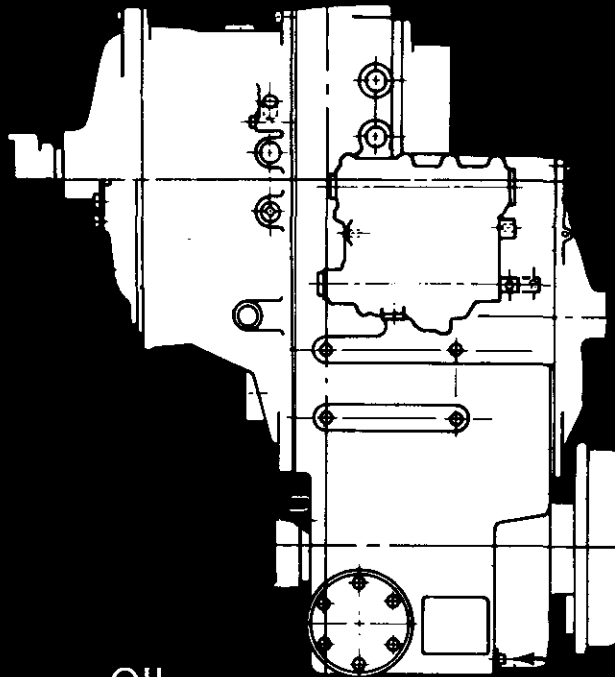
- Remove the drain plug from the transmission housing. Remove the oil filter element from the remote-mounted filter. Remove the oil strainer cover and strainer from the transmission housing.
- While the oil is draining, check for evidence of contamination. (Refer to the preceding paragraph for the danger 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 torque.

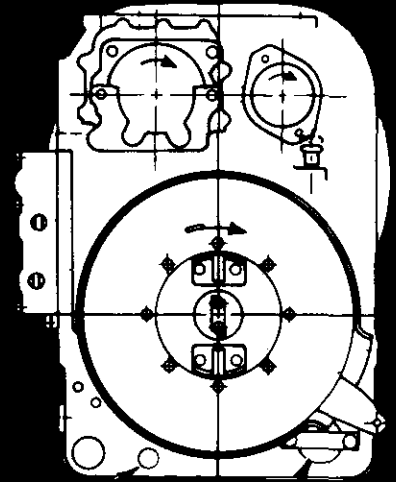
TT, TRT 2001

(LONG-DROP)



OIL
STRAINER

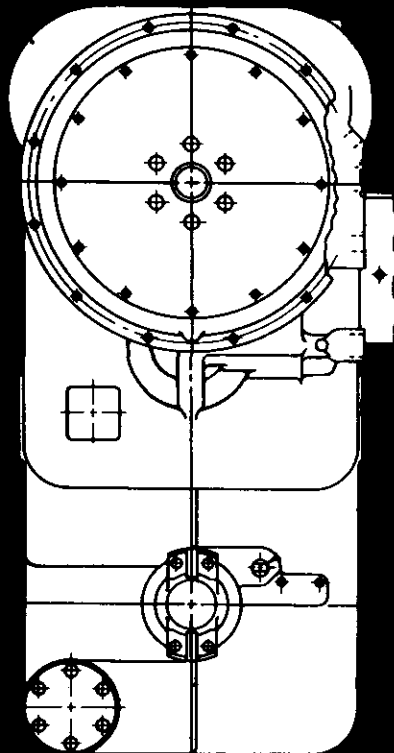
(SHORT-DROP)



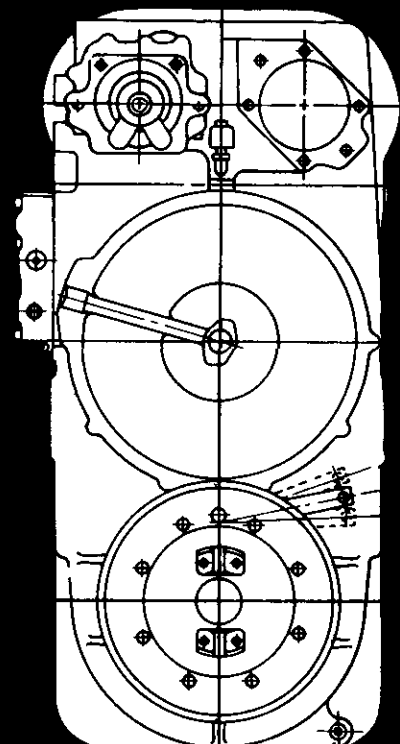
DRAIN
PLUG

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 sealing. Retain the strainer cover with the two bolts, and tighten the bolts to 26-32 lb ft torque.

Refill Capacity

Transmission	US Gallons
TT, TTB, TRT 2001 (long-drop models)	7½
TT, TRT 2001 (short-drop models)	4½
TT 4700, TRT 4800	8

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 (All models)

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.

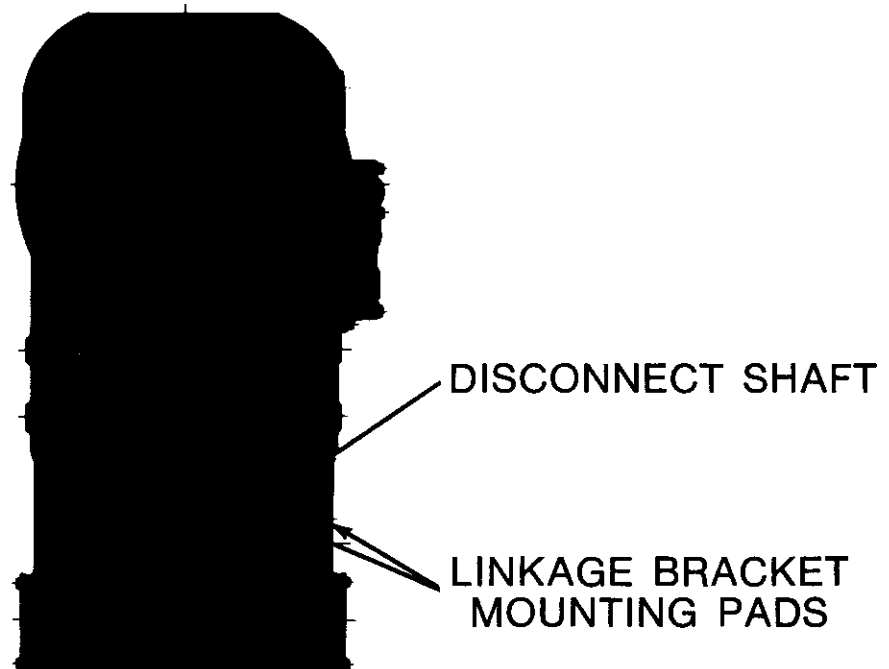
- Move the control lever to the disconnect position. Then remove the control linkage from the disconnect shaft.
- Push the disconnect shaft inward (toward transmission housing) to the engaged position. A spring-loaded detent will indicate the engaged position.
- Adjust the distance the shaft protrudes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

NOTE: Adjustment procedures for earlier models are the same as above.



Parking Brake (4700 and 4800 Series only)

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

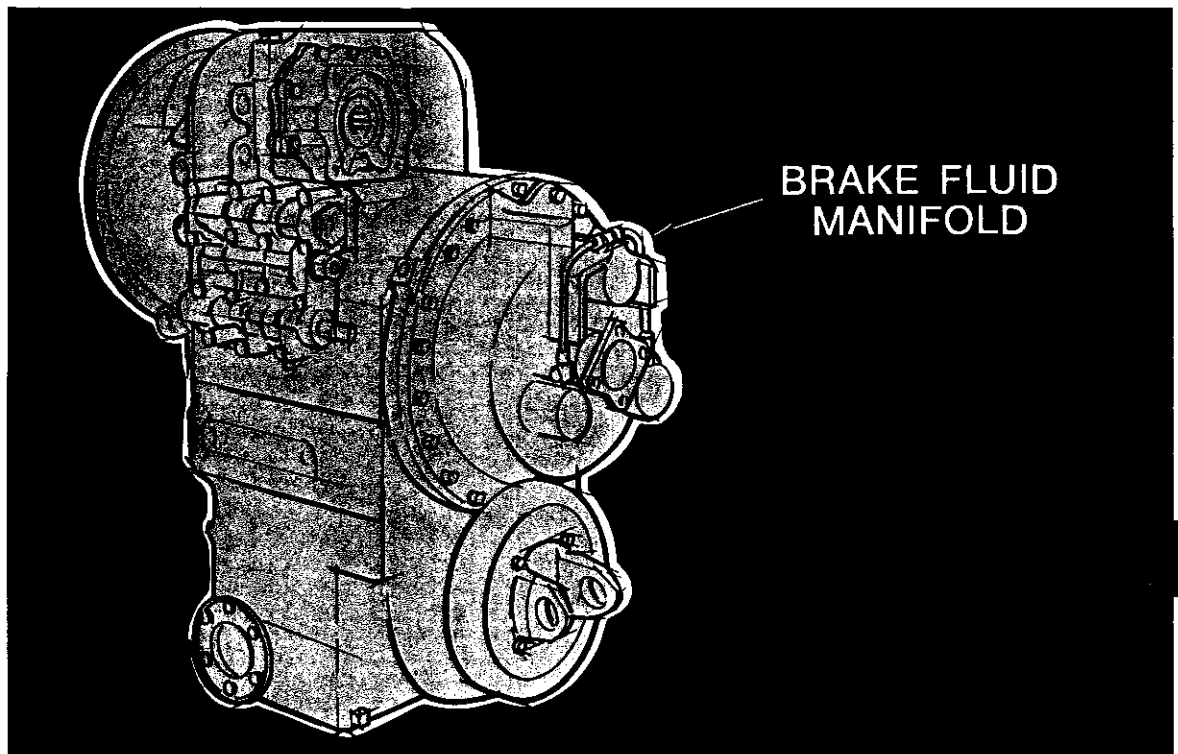
star wheel. The brake linkage should be disconnected during this adjustment. The star wheel should be rotated until 0.010-inch thickness gages are held snugly between the adjustment ends of the shoes and the drum (use two gages simultaneously—one at each shoe).

- 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 pressure 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

1. High oil level
2. Clutch failed
3. Vehicle overloaded
4. Low clutch apply pressure
5. Engine water overheated
6. Cooler oil or water line kinked or clogged

Remedy

1. Restore proper oil level
2. Rebuild transmission
3. Reduce load
4. Refer to Ⓐ
5. Correct engine overheating
6. Clean or replace line

Ⓒ AERATED (foaming) OIL

Cause

1. Incorrect type oil used
2. High oil level
3. Low oil level
4. Air entering suction side of oil pump
5. Air entering at clutch cutoff valve (air actuated)

Remedy

1. Change oil; use proper type
2. Restore proper oil level
3. Restore proper oil level
4. Check oil pump bolts and gasket
5. Check plug seal and sealing of valve

Ⓓ VEHICLE WILL NOT TRAVEL

Cause

1. Low clutch apply pressure
2. Selector linkage broken or disconnected
3. Internal mechanical failure

Remedy

1. Refer to Ⓐ
2. Repair or connect linkage
3. Overhaul transmission



VEHICLE TRAVELS IN NEUTRAL WHEN ENGINE IS ACCELERATED

Cause

1. Selector linkage out of adjustment
2. Clutch failed (won't release)

Remedy

1. Adjust linkage
2. Overhaul transmission



VEHICLE LACKS POWER AND ACCELERATION AT LOW SPEED

Cause

1. Low clutch apply pressure
2. Turbine freewheel clutch failed
3. Engine malfunction
4. Aerated oil

Remedy

1. Refer to (A)
2. Overhaul transmission
3. Check engine; refer to engine service manual
4. Refer to (C)



SERVICE BRAKE MALFUNCTION—TTB

Cause

1. Brake slips when pedal is fully applied
2. Spongy brake pedal
3. Brake pedal bottoms when brake is applied

Remedy

1. Rebuild brake
2. Bleed hydraulic brake system
3. Check for leaks in hydraulic brake lines and for broken linkage. Bleed brake hydraulic system. Check master cylinder.



CLUTCH CUTOFF VALVE INEFFECTIVE

Cause

1. Valve or plug sticking
2. Brake apply hydraulic pressure incorrect
3. Brake apply air pressure not reaching air cylinder
4. Plunger sticking in air cylinder
5. Air entering at valve (air actuated)

Remedy

1. Rebuild control valve body assembly
2. Check pressure at control valve (min-max limits—130-2000 psi)
3. Check air cylinder (35 lb force required to stroke valve)
4. Check operation of air cylinder
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

This procedure will prepare a transmission for a month to 6 weeks storage, depending on the environment.

- Drain the oil and remove the transmission oil filter element(s). Install the drain plugs and new filter element(s).
- Fill the unit to operating level with any commercial preservative oil which meets US Military specifications MIL-L-21260, Grade 1, to latest specifications.
- Operate the unit for at least 5 minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil, then stall the converter to raise the oil temperature to 225°F (*on oil temp gage*)

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

- 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. If the unit does not have an oil temperature gage, do not stall for more than 30 seconds (at full throttle).*

- 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 operations at monthly intervals for indefinite storage.

One-Year Storage Without Oil

- Drain the oil.
- 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 2 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.

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 C-2, to 1 part Motorstor preservative, or equivalent.

- Operate the unit for approximately 5 minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil, then stall the converter to raise the oil temperature to 225°F (on oil temp gage).

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

- 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 (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).

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

Restoring Units to Service

If Motorstor, or equivalent, was used in preparing the transmission for storage, use the following procedures to restore the unit to service.

- Remove the tape from openings and breather. Wash off all the external grease with solvent.
- Add hydraulic transmission fluid Type C-2 to proper level.

NOTE: It is not necessary to drain C-2 oil and Motorstor mixture from the transmission.

If Motorstor, or equivalent, was not used in preparing the transmission for storage, use the following procedures to restore the unit to service.

- Remove the tape from openings and breathers. Wash off all the external grease with solvent, and drain the oil.
- Install a new oil filter element(s), and refill transmission with Type C-2 hydraulic transmission fluid to proper level.

**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).*

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, TTB 2000	SA 1140
TRT 2000	SA 1161
TT4000	SA 1209
TRT 4000	SA 1171
TT4700	SA 1362
Parts Catalogs	Publication No.
TT, TTB, TRT 2001 and 2000	SA 1248
TT, TRT 4000	SA 1158

The Allison Powershifts



Detroit Diesel Allison

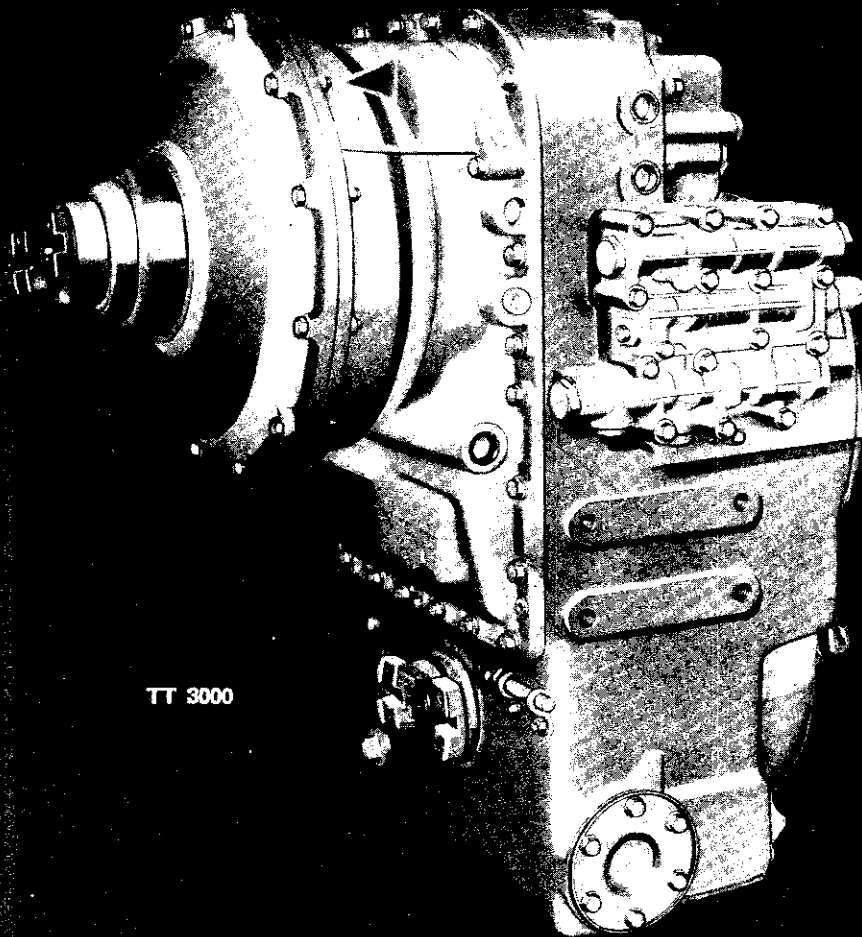
Indianapolis, Indiana 46206

Allison Transmissions

cycling models

TT 3000

150 to 250 hp
(112 to 186 kW)



TT 3000

specifications

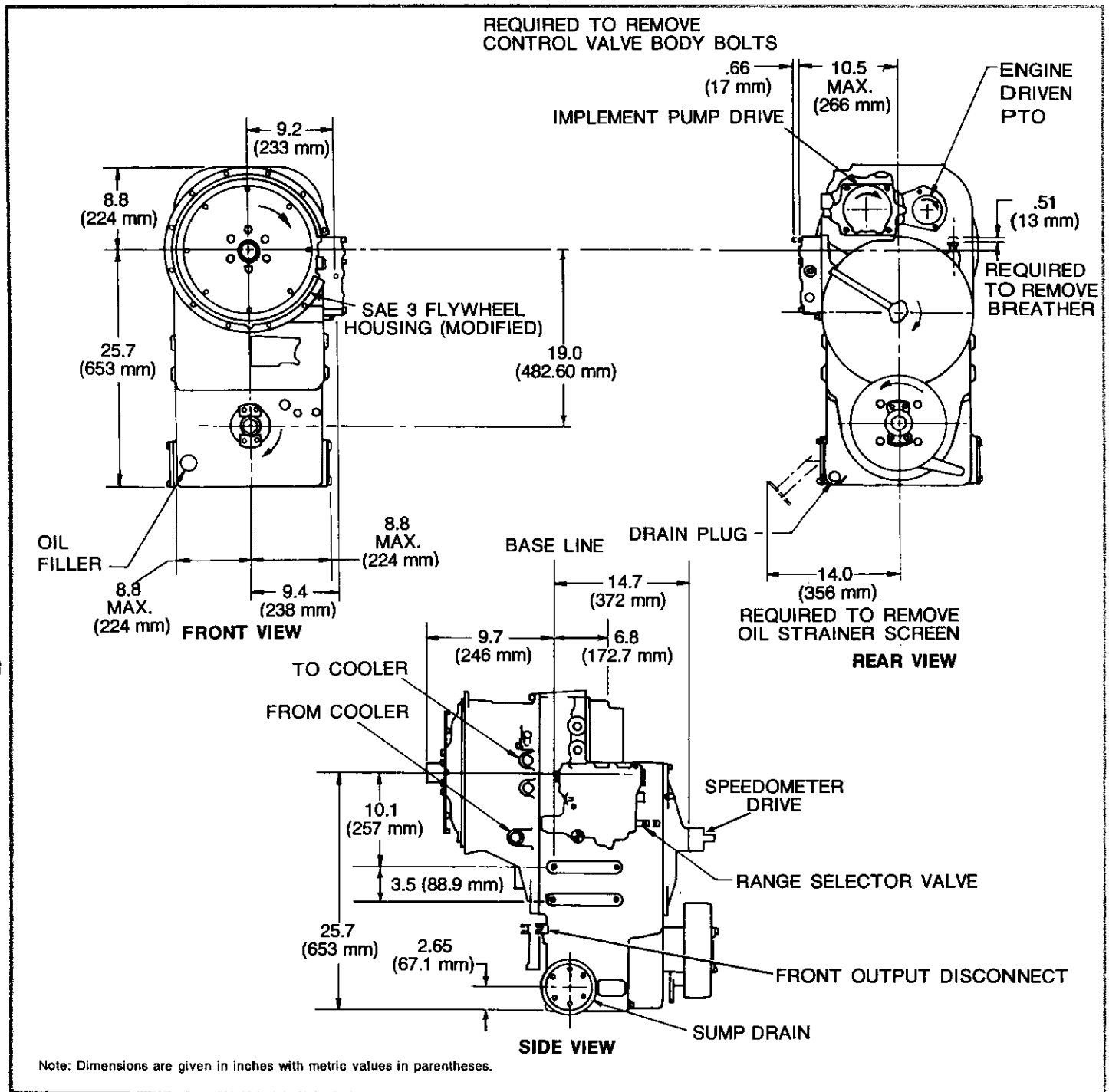
applicable power	Input	150 to 250 hp (112 to 186 kW)																																																											
rating	Input speed (max) Input torque, max (net)	2800 RPM 400 lb ft (542 N·m)																																																											
rotation	Input—right hand Output—right hand (forward ranges)																																																												
speeds	Forward Reverse	4 2																																																											
mounting	Direct mounted (front) Remote mounted (front)	Modified SAE-3 Flywheel Housing with Flex Disk Drive. Four 5/8-11 Tapped Holes inside pads, one pad each side. Input Flange or Torqmatic® Coupling; 2 side mounting pads																																																											
torque converter	Type Stall torque ratio	2-stage, 4-element, twin-turbine <table><tr><th colspan="3">Standard</th><th colspan="3">Optional</th></tr><tr><th colspan="3">0.826 T₂ ratio</th><th colspan="3">1.21 T₂ ratio</th></tr><tr><th>Series</th><th colspan="2">Ratio</th><th>Series</th><th colspan="2">Ratio</th></tr><tr><td>TT 424</td><td colspan="2">6.70</td><td>TT 426</td><td colspan="2">4.78</td></tr><tr><td>TT 425</td><td colspan="2">5.19</td><td>TT 427</td><td colspan="2">3.40</td></tr><tr><td>TT 444</td><td colspan="2">6.79</td><td>TT 447</td><td colspan="2">3.34</td></tr><tr><td>TT 445</td><td colspan="2">4.92</td><td></td><td colspan="2"></td></tr><tr><td>TT 464</td><td colspan="2">6.72</td><td></td><td colspan="2"></td></tr><tr><td>TT 465</td><td colspan="2">4.67</td><td></td><td colspan="2"></td></tr></table>						Standard			Optional			0.826 T ₂ ratio			1.21 T ₂ ratio			Series	Ratio		Series	Ratio		TT 424	6.70		TT 426	4.78		TT 425	5.19		TT 427	3.40		TT 444	6.79		TT 447	3.34		TT 445	4.92					TT 464	6.72					TT 465	4.67				
Standard			Optional																																																										
0.826 T ₂ ratio			1.21 T ₂ ratio																																																										
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TT 425	5.19		TT 427	3.40																																																									
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TT 464	6.72																																																												
TT 465	4.67																																																												
gearing	Type Range gearing Transfer gearing	Spur Constant mesh, planetary Constant mesh, in-line overall transmission ratios—.846 drop box <table><tr><th colspan="3">Standard</th><th colspan="3">Optional</th></tr><tr><th colspan="3">0.826 T₂ ratio</th><th colspan="3">1.21 T₂ ratio</th></tr><tr><th colspan="2">Forward</th><th>Reverse</th><th colspan="2">Forward</th><th>Reverse</th></tr><tr><th>Low</th><th>High</th><th></th><th>Low</th><th>High</th><th></th></tr><tr><td>2.516</td><td>.699</td><td>2.321</td><td>3.687</td><td>1.024</td><td>3.401</td></tr></table>						Standard			Optional			0.826 T ₂ ratio			1.21 T ₂ ratio			Forward		Reverse	Forward		Reverse	Low	High		Low	High		2.516	.699	2.321	3.687	1.024	3.401																								
Standard			Optional																																																										
0.826 T ₂ ratio			1.21 T ₂ ratio																																																										
Forward		Reverse	Forward		Reverse																																																								
Low	High		Low	High																																																									
2.516	.699	2.321	3.687	1.024	3.401																																																								
clutches	Multidisk, hydraulically-actuated, spring released, oil-cooled (automatically compensates for wear)																																																												
flanges	Input Output	Mechanics 7C Torqmatic® Coupling, M6C Mechanics 7C																																																											
parking brake	Type Size	Expanding shoe, mechanically applied DCM 10 x 3 in DCM (254 x 76.2 mm)																																																											
power takeoff	Implement pump drive: Size Rating (At 2000 to 2800 RPM) Steer pump drive (remote-mounted—1 model only): Size Rating* (At 2000 to 2800 RPM) Ratio (both drives)	SAE C, 2-bolt or 4-bolt Intermittent—160 hp (119 kW) Continuous—120 hp (90 kW) SAE 2 Bolt "B" pad 70 hp Intermittent (52 kW) (200 max. hp combined) (149 kW)* 1.00 x engine speed																																																											
speedometer drive	Size Ratio	SAE 5/32, heavy duty 0.846 x transmission output speed																																																											
control valve body	Clutch cutoff control either hydraulically or pneumatically-actuated																																																												
oil system†	Oil type Capacity (excluding external circuit) Sump Filter (customer furnished) Cooler (customer furnished)	Hydraulic transmission fluid type C-3 Models 8½ US gal (32 litres) Single, integral Remote-mounted Provision for remote-mounted or transmission-mounted (optional)																																																											
size	Length Width Height Weight	30 in (762 mm) 20 in (508 mm) 35 in (881 mm) 1000 lbs (454 kg) direct-mounted 1040 lbs (472 kg) remote-mounted																																																											

*Simultaneous power takeoff operation is not to exceed published ratings.

†Totally enclosed system. No external lines except to oil cooler and oil filters.

Note: All data and specifications subject to change without notice.

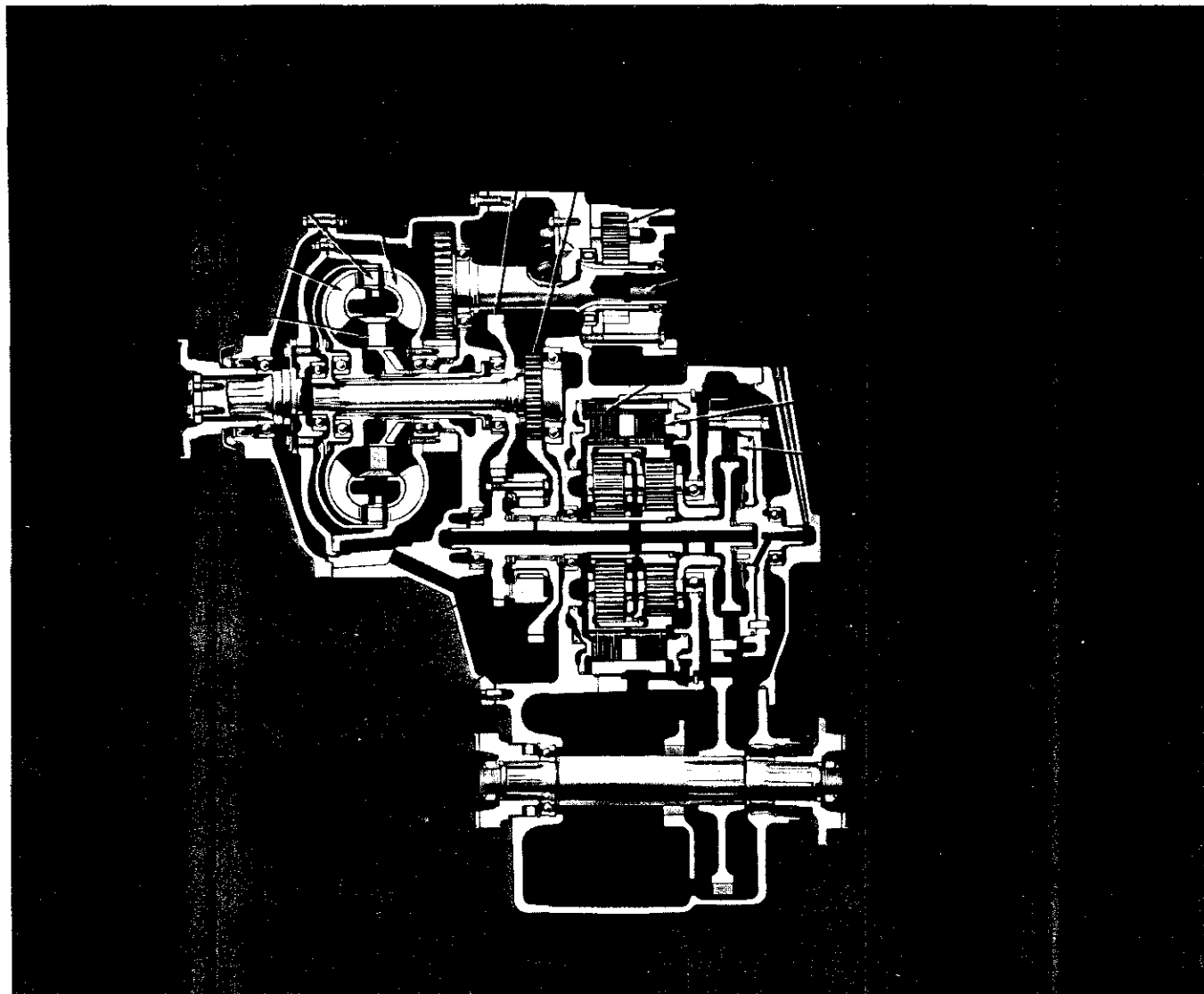
TT 3000 mounting dimensions



options

- Transmission remote-mounted
- Torqmatic Coupling
- Engine-driven steer pump PTO drive, SAE 2 bolt, B pad
- Speedometer drive
- Front output disconnect
- Choice of Mechanics drive flanges
- Drum-type parking brake

TT 3000 powershift transmission



converter reversing transmission

The TT Series powershift transmissions are basically a torque converter and a planetary gear transmission combined in a single, compact package. This package consists of a twin turbine torque converter, a forward and reverse planetary gear combination, two range planetary gear sets, and a high-range clutch. The twin turbine torque converter provides smooth and automatic transition from the first to the second stage for maximum productivity in each selector range. The hydraulically-actuated clutches provide fast, smooth, full-power shifting in forward speed ranges and smooth transition between

forward and reverse range operation. The smooth shifting at full power while changing direction of travel is the direct benefit of the new "softshift" system. Forward, reverse, and speed range selection is accomplished by a single selector valve control.

This transmission series pioneered powershift cycling designs and have set the standard for fast, smooth operation and a long, reliable life in hundreds of diverse applications.



Detroit Diesel Allison
Division of General Motors Corporation

Indianapolis, Indiana 46206



Date JUNE 1977 No. 77A

TT 3420 CYCLING TRANSMISSIONS

I. Introduction

The TT 3420 is a Powershift Transmission incorporating a twin turbine torque converter, an engine driven PTO drive, planetary gearing, hydraulic clutches, front and rear output, a reverse warning pressure tap, provision for clutch cutoff, and a provision for a neutral start switch.

Soft Shift

The Soft Shift System gives smooth shifting at full power while changing directions of travel. Soft Shift is a standard feature on the TT 3420. Soft Shift offers faster hydraulic action, increased torque capacity, longer brake life and reduced cycle time.

The ratings for the TT 3420 Transmission are as follows:

Applicable Engine HP

Input Power	112-186 kW (150-250 HP)
	Depending on application
Input Speed	2800 RPM (max.)
Input Torque	542 Nm (400 lb. ft.)

II. Product Description

The following sections explain the standard features available.

Mounting

Side	Four 5/8-11 tapped holes in side pads. Each side,
Front	Modified SAE-3 flange on converter
Direct Mount	Housing bolts to engine flywheel housing, flex plate

Torque Converter (2-Stage, 4-Element, Twin Turbine)

Torque Multiplication Ratio:	TT 424 - 6.70	TT 444 - 6.79
	TT 425 - 5.19	TT 445 - 4.92
	TT 426 - 4.78	TT 447 - 3.34
	TT 427 - 3.40	TT 464 - 6.72
		TT 465 - 4.67

Rotation, Viewed from Transmission Input

Input	Clockwise
Output (Forward)	Clockwise
(Reverse)	Counterclockwise

<u>Gear Ratio</u>	<u>Standard (.826T₂ Ratio)</u>	<u>Optional (1.21T₂ Ratio)</u>
	<u>Overall Ratio with .846 Dropbox</u>	
Low Range - F1	2.516	3.687
High Range - F2	.699	1.024
Reverse - R	2.321	3.401

Gear Ranges

Selector Positions	4 Speed Forward, 2 Speed Reverse Reverse (R ₁), Neutral, Low Range (F ₁), High Range (F ₂)
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Gear Data

Range Gearing	Constant Mesh Planetary
Transfer Gearing	Constant Mesh In-Line
Gear Type	Spur

Power Take-Off

	<u>Rating</u>	<u>Ratio</u>
SAE 2- or 4-Bolt "C" Pad	Continuous	90 kW (120 HP)
	Intermittent	119 kW (160 HP)
	(149 kW 200 HP Max. HP combined @ 2000 to 2800 RPM)	

Oil System

Sump - Integral
Input pressure and scavenge pump - Positive Disp.
Gear Type

Transmission oil capacity initial fill - 32 litres (8-1/2 U.S. Gal.)
Oil type hydraulic transmission fluid type - C-3
Converter oil outlet pressure max. - 448 kPa (65 PSI)

Dry Weight (approx.)

Direct Mount	454 Kg (1,000 lbs.)
Remote Mount (add)	18 Kg (40 lbs.)
Parking Brake (add)	9 Kg (20 lbs.)

Dimensions

Length	762 mm (30 in.)
Width	508 mm (20 in.)
Height	889 mm (35 in.)

3. Quick Match Charts

<u>SA Number</u>	<u>Converter Model</u>
SA 1351	TT 445
SA 1195	TT 465

4. Installation Drawings

<u>Number</u>	<u>Subject</u>
AS 00-016	Flex Plate Input Drive Data
AS 00-026	Shift Tower Gating Patterns
AS 00-027	Air Actuated Clutch Cut-Off Option
AS 00-045	Off-Highway Transmission Gages
AS 00-051	Cooler Oil Flow Data
AS 00-052	Neutral Start Switch Provision
AS 22-004	External Hydraulic Circuit Requirements
AS 22-008	Drive Flange Option
AS 22-015	Speedometer Drive Option
AS 32-001	Basic Installation Drawing
AS 32-003	Implement & Steer Pump Clearance Information
AS 32-004	Implement Pump Mounting Flange & Spline Information
AS 32-005	Steer Pump Mounting Flange & Spline Information

For further information, please contact the Transmission Sales Department,
#7341, P. O. Box 894, Detroit Diesel Allison Division, G.M.C., Indianapolis,
Indiana, 46206.

Sales Development

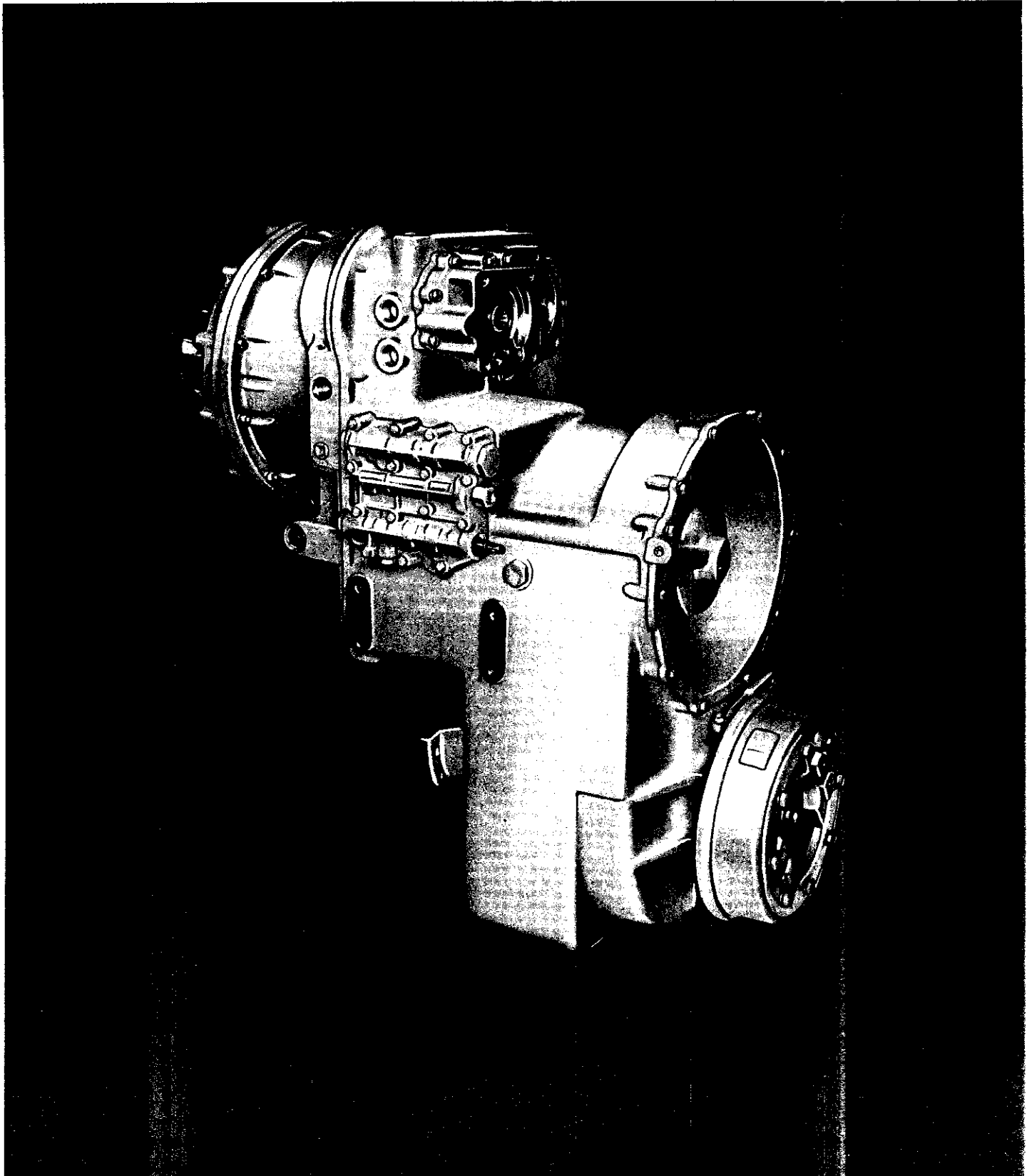


Allison Transmissions

cycling models

TT and TRT 4000

150 to 355 hp



specifications

		TT 4720	TRT 4820
rotation	Input—right hand Output—right hand (forward ranges)		
rating	Input power (gross) Input speed, max Input torque, max (net)	300 hp 2800 rpm 440* lb ft	355 hp 2800 rpm 630 lb ft
speeds	Forward Reverse	4 2	4 4
mounting	Direct mounted Remote mounted	SAE 2 flywheel housing with flex disk drive; two mounting pads, each side Input flange or Torqmatic® coupling; two mounting pads, each side	
torque converter	Type Stall torque ratio	2-stage, 2-phase, 4-element, twin turbine TT 425—5.1 TT 465—4.7 TT 430—6.1 TT 470—5.8 TT 445—4.6 TT 625—5.0 TT 450—6.0 TT 645—4.7	
gearing	Type: Range gearing Transfer gearing	Constant mesh, spur type, planetary Constant mesh, spur type, in-line	
	Gear ratios: Forward low Forward high Reverse low Reverse high	2.71 (2.18*) 0.73 1.98	2.58 0.69 2.35 0.63
clutches	Hydraulic-actuated, spring-released, oil-cooled, multidisk, self-adjusting (automatic compensation for wear)		
flanges	Input (remote mounted) Output	Mechanics 6C with Torqmatic® coupling Mechanics 7C, 8C, 9C; Rockwell 7N; Spicer 1700, 1800	
parking brake	Type Size	Drum, internal-expanding shoe 12 x 3 in.	
power takeoff	Implement Pump Drive Steer Pump Drive Rating (each drive)** Ratio (both drives)	SAE C, 2-bolt or 4-bolt; SAE C spline (B, optional) SAE C, 2-bolt or 4-bolt; SAE C spline (B, optional) Intermittent—200 hp at 2100-2800 rpm Continuous—120 hp at 2100-2800 rpm 1.00 x engine speed	
control valve body	Either clutch cutoff control or inching control valve, optional		
oil system †	Oil type Capacity (excluding external circuit) Sump Filter and cooler (customer furnished)	Hydraulic transmission fluid, Type C-2 10 US gal Integral Remote mounted	
size	Length, max Width Height	47.40 in. (1204 mm) 22.16 in. (563 mm) 42.72 in. (1085 mm)	
	Weight	Approx 1495 lb (678 KG)	Approx 1640 lb (744 KG)

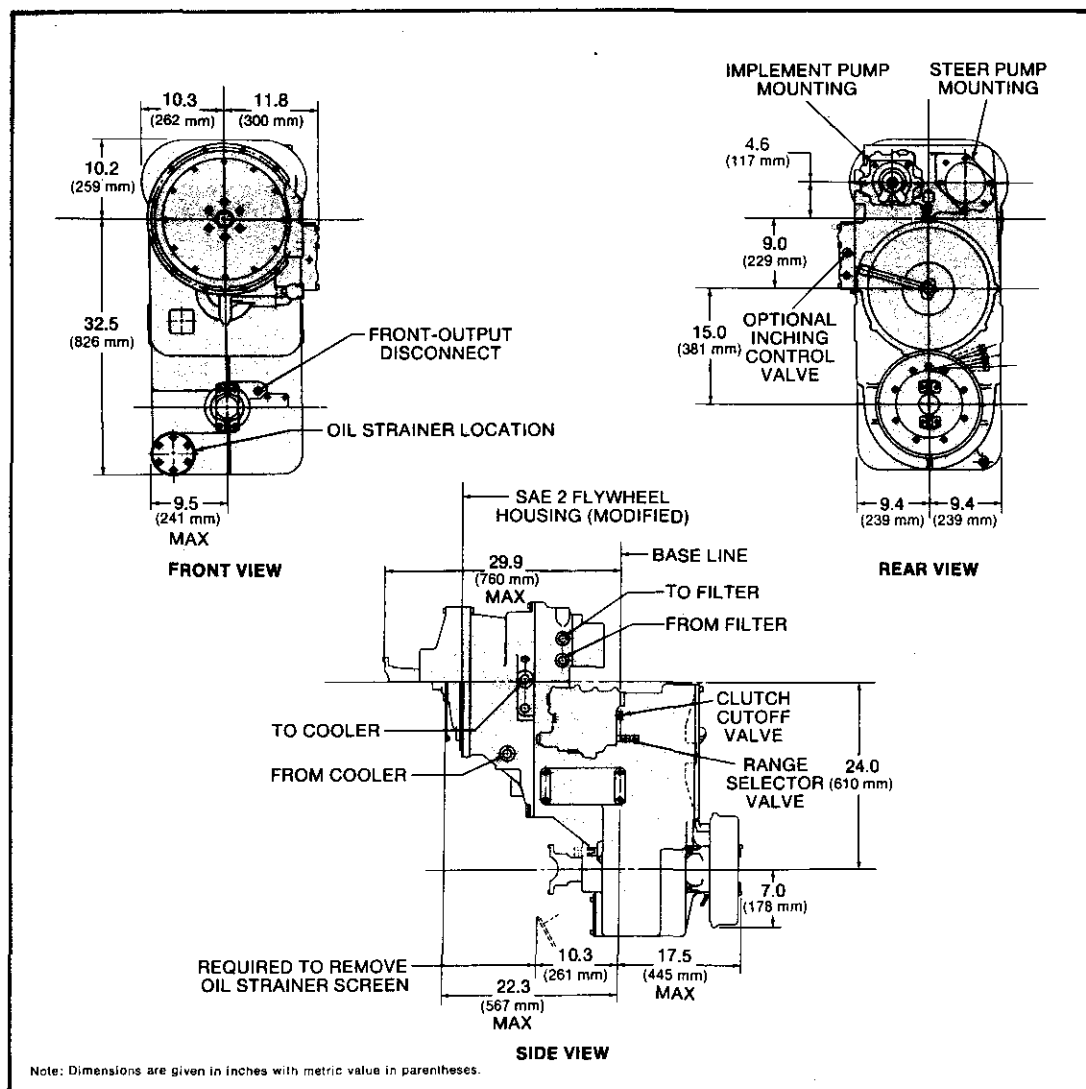
*Rating is 530 lb ft with optional 2.18:1 Forward Low Ratio.

**Simultaneous power takeoff operation is not to exceed published ratings.

†Totally enclosed system. No external lines except to remote oil filter and cooler.

Note: All data and specifications subject to change without notice.

mounting dimensions

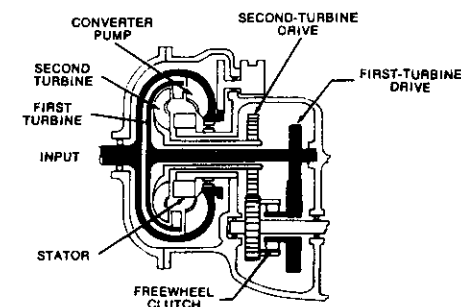


twin turbine principle

The TT and TRT Series Powershifts contain a twin-turbine torque converter. Essentially, this is a unit which has two turbines, one inside the other. Each turbine drives a different combining gear which drives the forward-reverse range gears.

When the load is started, oil flow within the converter causes the first turbine to turn, driving a low speed combining gear which in turn drives the range gears. As the load is reduced, due to increased vehicle movement, the higher velocity oil flow reaches the second turbine and causes it to turn. This drives the range gears through a higher speed combining gear. (The first turbine and its combining gear freewheel when the second turbine is operating at higher speeds.)

The result is automatic two-speed performance from the torque converter. When this is combined with two speeds in the range gearing, you get four-speed performance. Yet the operator only has two forward (and one or two reverse) shift lever positions to select.



options

- Transmission remote mounted, or direct mounted on engine
- Clutch cutoff control valve (air or hydraulic)
- Inching control valve
- Parking brake
- Choice of popular flanges
- Torqmatic® coupling
- Front-output disconnect
- Choice of 2-bolt or 4-bolt power takeoff mountings

TT and TRT4000 powershift transmissions

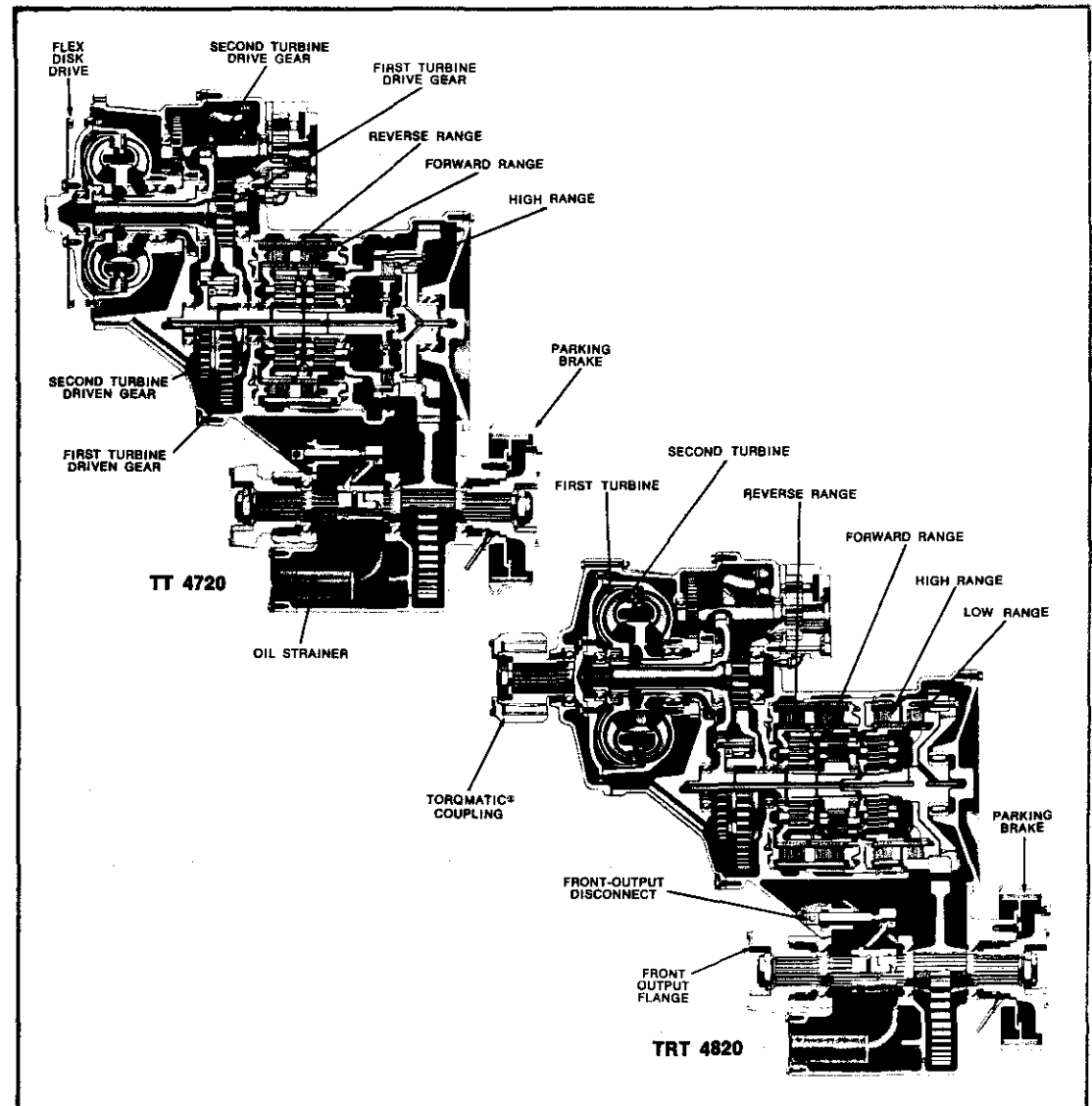
'soft shift' system

Smooth shifting at full power while changing direction of travel is the direct benefit of the new Soft Shift system—now a standard feature with all TT and TRT 4000 series transmissions.

Soft Shift is a system of orifices and a trimmer in the main control valve body which modulates pressure to a new dual-area piston providing a progressive apply force on the clutch. The metered flow of oil controls the torque peak automatically during clutch engagement. With Soft Shift, there is no more slowing down to shift, no more dangerous stalls. Shift shock is reduced, because

SOFT SHIFT CONTROLS THE POWER

This twin-turbine transmission, together with Soft Shift, offers an impressive array of advantages, including: faster hydraulic action, increased torque capacity; longer brake life; reduced cycle time.



Detroit Diesel Allison

Division of General Motors Corporation

Indianapolis, Indiana 46206



Date April 1977 No. 71E

TT-4700 & TRT-4800 Series Transmissions

I. Introduction

The Allison TT-4700 and TRT-4800 Series Transmissions are designed for use in shovel loaders, compactors, hydraulic cranes, log loaders, lift trucks and material handling, motor graders, rubber tire tractors, specialized mining equipment, and similar cycling applications in the 150-355 HP (112-265 kW) gross power range. This transmission is a single compact unit utilizing a twin turbine converter, planetary gearing, oil sump, hydraulic controls, engine driven hydraulic pump PTO, and hydraulically actuated clutches as standard equipment. A modulated shift control is now used on all models. Additional features, such as steer pump PTO drive, parking brake, flanges and control valves are also available.

The TT-4700 and TRT-4800 Series have a general input rating as follows when in wheel loader applications. More severe applications, such as compactors, should be evaluated on an individual basis.

<u>Models</u>	<u>TT-4720</u>	<u>TT-4720*</u>	<u>TRT-4820</u>
Max. Input Torque	440 lb. ft. (597 Nm)	530 lb. ft. (719 Nm)	630 lb. ft. (854 Nm)
Max. GVW	60,000 lb. (27,216 kg)	60,000 lb. (27,216 kg)	90,000 lb. (40,823 kg)
Max. Input Speed	2800 RPM	2800 RPM	2800 RPM
Max. Engine Power	300 HP (224 kW)	300 HP (224 kW)	355 HP (265 kW)

*Equal forward and reverse ratios only.

II. Product Description

The TT-4700 and TRT-4800 Series offer a variety of features for the many applications of today's cycling type vehicles. These features are generally grouped into two basic models: TT-4700 and TRT-4800.

The standard features of these models are as follows:

A. TT-4700

1. Two speed forward and one speed reverse
2. Direct engine mounting - flex plate drive, wet housing
3. Twin turbine converter
4. Transfer case - front and rear output
5. Hydraulic clutch cut-off
6. Engine driven hydraulic power take-off SAE "C" pad
7. Provisions for remote mounted oil filter

- 8. Output flanges
- 9. 1.0:1 pump drive ratio

B. TRT-4800

Same as TT-4700 except it incorporates two-speed forward and two-speed reverse and is available with TT-400 Series or TT-600 Series torque converters depending on the vehicle and engine.

The following sections further explain the standard features available.

1. Mounting

- a. Engine mounted, wet housing configuration is standard with flex plate drive.
- b. Remote mounted configuration is optional. The torqmatic coupling (input torsional dampener) is also optionally available on remote mounted configurations.
- c. Four bolt mounting pads are located on each side of the transmission.

2. Torque Converter:

The following twin turbine converter models are available with the TT-4700-1 or TRT-4800-1 Series.

<u>Model</u>	<u>Torque Ratio</u>
TT-425	5.19
TT-430	6.61
TT-445	4.92
TT-450	6.34
TT-465	4.67
TT-470	6.01
TT-625	5.21
TT-645	4.91

3. Engine Driven Power-Take-Offs:

Two SAE C-4 bolt PTO drive pads are standard on all TT-4700 and TRT-4800 Series transmissions. Optional SAE C-2 bolt openings are also available as pump mounting pads.

Mounting

Standard - SAE C-4 bolt, internal spline, P.D. - 1.168 inches, (29.67 mm), 30° pressure angle, 14 teeth.

Optional - SAE C-2 bolt, internal spline, P.D. - 1.168 inches, (29.67 mm), 30° pressure angle, 14 teeth.

NOTE: C to B spline coupling adapter (Part No. 6771957) is available for the C size splines, SAE-B opening is not available.

Ratings at Engine Speed

Single Pad Rating:

- Intermittent - 160 HP (119 kW) at 2000 to 2800 RPM
 - 420 lb. ft. (570 Nm) up to 2000 RPM
- Continuous - 120 HP (90 kW) at 2000 to 2800 RPM
 - 315 lb. ft. (427 Nm) up to 2000 RPM

Combined Ratings:

- Torque Limit - 630 lb. ft. (870 Nm) up to 2000 RPM
- *HP Limit - 240 HP (179 kW) 2000 RPM and above

*Regardless of which Pad is being utilized the combined, total instantaneous usage should not exceed 240 (179 kW) Hp.

4. Clutch Cut-Off

The hydraulic clutch cut-off is standard on all models. The clutch cut-off valve is actuated by hydraulic pressure tapped from the vehicle hydraulic brake lines. This action cuts off the oil supply to the range selector valve and disengages the power to the transmission output, this in effect, shifting the transmission to neutral. The clutch cut-off is completely controlled by the brake pedal which actuates the valve when the pedal is depressed and returns the transmission to the selected range gear when the pedal is released.

An improved Clutch Cut-Off Valve Body has been released on all TRT-4820 transmissions. This Valve-Body has an improved Clutch Cut-Off response time. There is a Clutch Cut-Off in forward low, forward high and reverse high. No Cut-Off in reverse low.

The air actuated clutch cut-off is an optional system that operates similar to the hydraulic clutch cut-off. The brake pedal travel actuates an air cylinder, which in turn, exhausts clutch apply pressure.

5. The Range Shift Control:

The range shift control is manually operated with 25 to 40 lb. (111-178 N) force required.

III. Optional Equipment

1. Flanges

The available flanges for the TT-4700 and TRT-4800 Series Models are:

INPUT

- Mechanics 7C
- Mechanics 7C Torqmatic  Coupling

OUTPUT

Mechanics 7c
Mechanics 8C
Mechanics 9C
Spicer 1700
Spicer 1800
Rockwell 7N

2. Parking Brake

A. The parking brake is optional on all TT-4700 and TRT-4800 models.

Type - Drum, 12 x 3 (305 x 76 mm)

Rating - 58,000 lb. in. (79,088 Nm) at 1000 lbs. (4448 N) apply force (manufacturer's rating for run in condition - burnished)

B. Parking brake apply lever position change.

The parking brake lever position has been relocated on all assemblies. The new brake assembly has the apply lever at 102 degrees from the vertical (4 o'clock position). The clevis pin hole in the lever will be approximately 1.6 inches lower with the new assembly.

3. Torqmatic[®] Coupling

The Allison Torqmatic[®] Coupling is located on the converter input shaft to dampen engine vibration. This coupling is only available for remote mounted models and with a Mechanics 7C flange. The maximum driveline angularity is 4 degrees.

4. Inching Control Valve

The inching control is a special feature for lift trucks or hydraulic cranes where close vehicle speed control is necessary.

Type - Two spool valve

80 lbs. (356 N) Apply Force

5. Front Output Disconnect

A manually operated front output disconnect with a two piece shaft is available as an option.

IV. Specifications and Ratings1. Dry Weight

<u>Model</u>	<u>Pounds</u>
TT-4700	1495 (678 kg)
TT-4800	1640 (744 kg)

With remote mounting, add 40 lbs. (18 kg)

With parking brake, add 35 lbs. (16 kg)

With TT-600 converter, add 15 lbs. (6.8 kg)

2. Oil System

Input Pressure Pump - Positive Displacement, dual section,
3 Gear Type

Sump - Integral

Oil Capacity, (excluding external circuit) Gallons - 10 U.S. (37.9 liters)

Oil Type - Hydraulic Transmission Fluid, Type C-3

Oil Filter - Remote Mounted (supplied by Customer)

Instrumentation - Temperature Gage required

Clutch Pressure Gage optional

3. Overall Transmission Gear Ratios

<u>Range</u>					<u>TRT-4820</u>
Forward Low	2.71	3.21*	2.18*(**)	2.58*(**)	2.58
Forward High	.73	.86	.73	.86	.69
Reverse Low	1.98	2.35	1.98**	2.35**	2.35
Reverse High	-	-	-	-	.63

*These ratios could be made available at a premium charge.

**Equal directional ratios.

4. Transmission Rotation (Viewed from Input)

All Models - Input - Right Hand

Output - Same as Input

5. Output Shaft Torque LimitsTT-4700 and TRT-4800

Front Output - 7100 lb. ft. (9626 Nm)

Rear Output - 7100 lb. ft. (9626 Nm)

NOTE: Figures apply to solid output shaft and two-piece shaft with disconnect. All converter and gear ratio combinations within the input torque result in less than 7100 lb. ft. (9626 Nm) output shaft torque at low range stall.

V. Product Features

A. Full Power Shifting

Included as a standard feature in the TT and TRT-4000 transmission is a new "soft shift" system that enables full power shifting between ranges, as well as smooth full power and/or full speed directional changes.

The modulated shift capability is achieved by utilizing a two-area piston and a hydraulic trimmer. This system accomplishes a large reduction in the transient shift shocks while utilizing a high capacity clutch.

B. Dual Section Charging Pump

A two section charging pump allows one section to provide continuous lube directly to the forward and reverse clutches.

C. Clutch Capacity

The TT-4720 transmission will incorporate the same number of forward and reverse clutch plates as the prior TRT-4621. Our TRT-4820 will have a seven plate reverse clutch and eight plate forward clutch configuration.

D. Tilt Angles

Maximum tilt angles for intermittent operations including chassis mounting angle and terrain slopes have been analytically determined. The transmission should not be operated at continuous high speeds at the large tilt angles. These angles should serve as a general guide only and each installation involving a large tilt angle should be evaluated in reference to that application. The tilt direction is defined when viewing the transmission from the rear and is off the vertical.

<u>TT, TRT-4001-1, 3</u>	
<u>Intermittent</u>	<u>Direction of Tilt</u>
35°	Left
65°	Right
30°	Forward
20°	Rearward

VI. References

1. Sales Briefs:

<u>Number</u>	<u>Subject</u>
9	Temperature and Pressure Gauges
40	Implement Pumps
42	Oil Recommendations

VI. References (Cont.)1. Sales Briefs: Cont.

<u>Number</u>	<u>Subject</u>
56	Paint Specifications
65	Drivelines Angularity

2. Manuals and Catalogs:

<u>SA Number</u>	<u>Publications</u>
SA 1158	TT & TRT-4000 Parts Catalog
SA 1362	TT-4700 Service Manual
SA 1363	TRT-4800 Service Manual
SA 1336	TT-TRT-4000 Operators Manual

3. Quick Match Charts

<u>SA Number</u>	<u>Converter Model</u>
SA 1191	TT-425
SA 1192	TT-430
SA 1351	TT-445
SA 1258	TT-450
SA 1195	TT-465
SA 1259	TT-470
SA 1196	TT-625
SA 1260	TT-645

4. Installation Drawings:

<u>AS Number</u>	<u>Subject</u>
00-011	Drive Flange Chart
00-026	Shift Tower Gating
00-027	Air Clutch Cut-Off Option
00-028	Inching Control Option
00-045	Temperature and Pressure Gauges
00-051	Cooler Oil Flow
00-052	Neutral Start Switch Provision
42-003	External Hydraulic Circuit Requirement
42-009	Flex Plate Input Drive Data
42-012	Speedo Drive Option
42-015	Basic Installation
42-016	PTO Drive & Clearance Data

For further information, please contact the Transmission Sales Department, J5.
 Detroit Diesel Allison Division, P. O. Box 894, Indianapolis, Indiana 46206.

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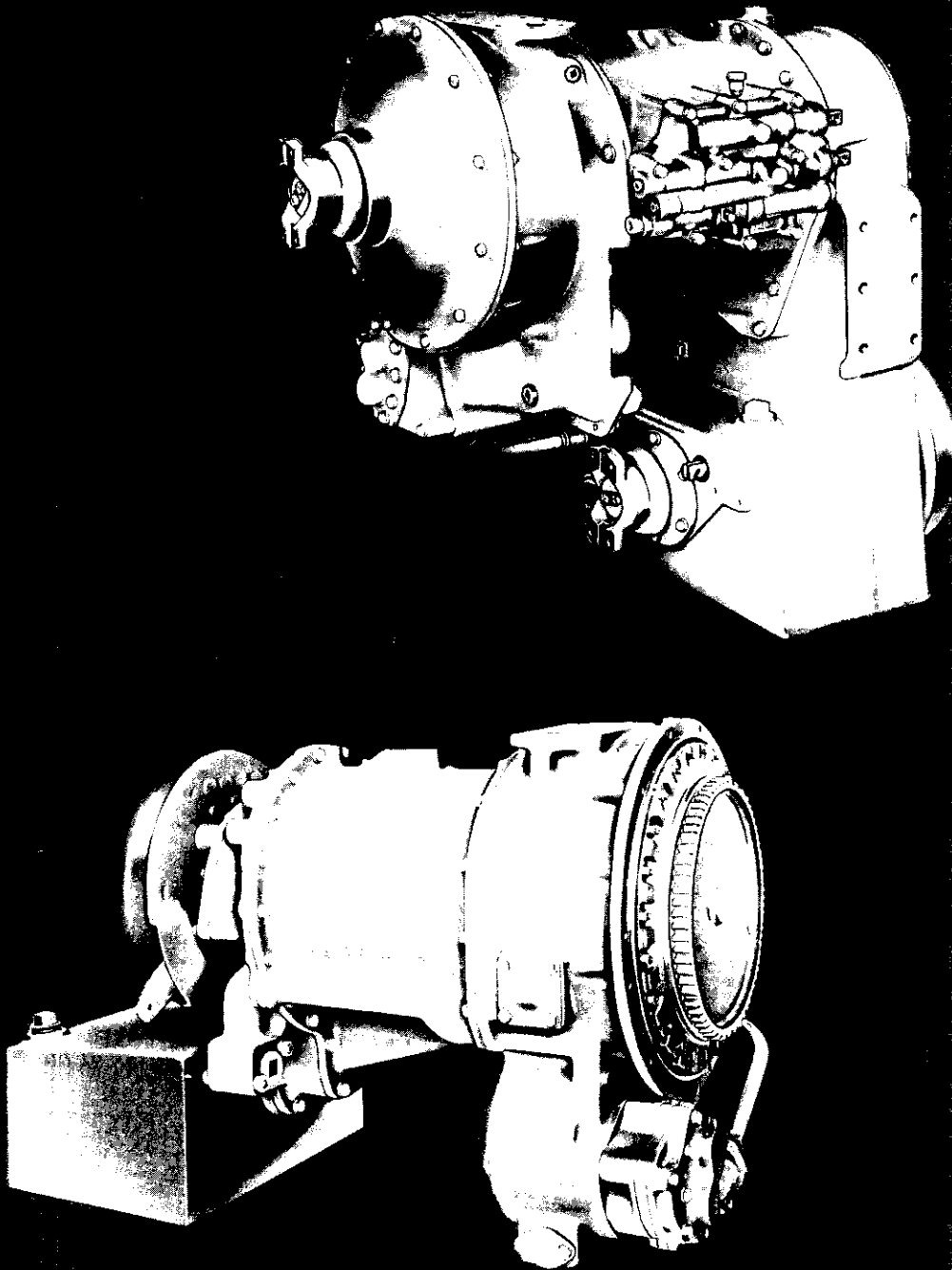
Allison Transmissions

cycling models

CRT 3000

70 to 185 hp

(52 to 138 kW)



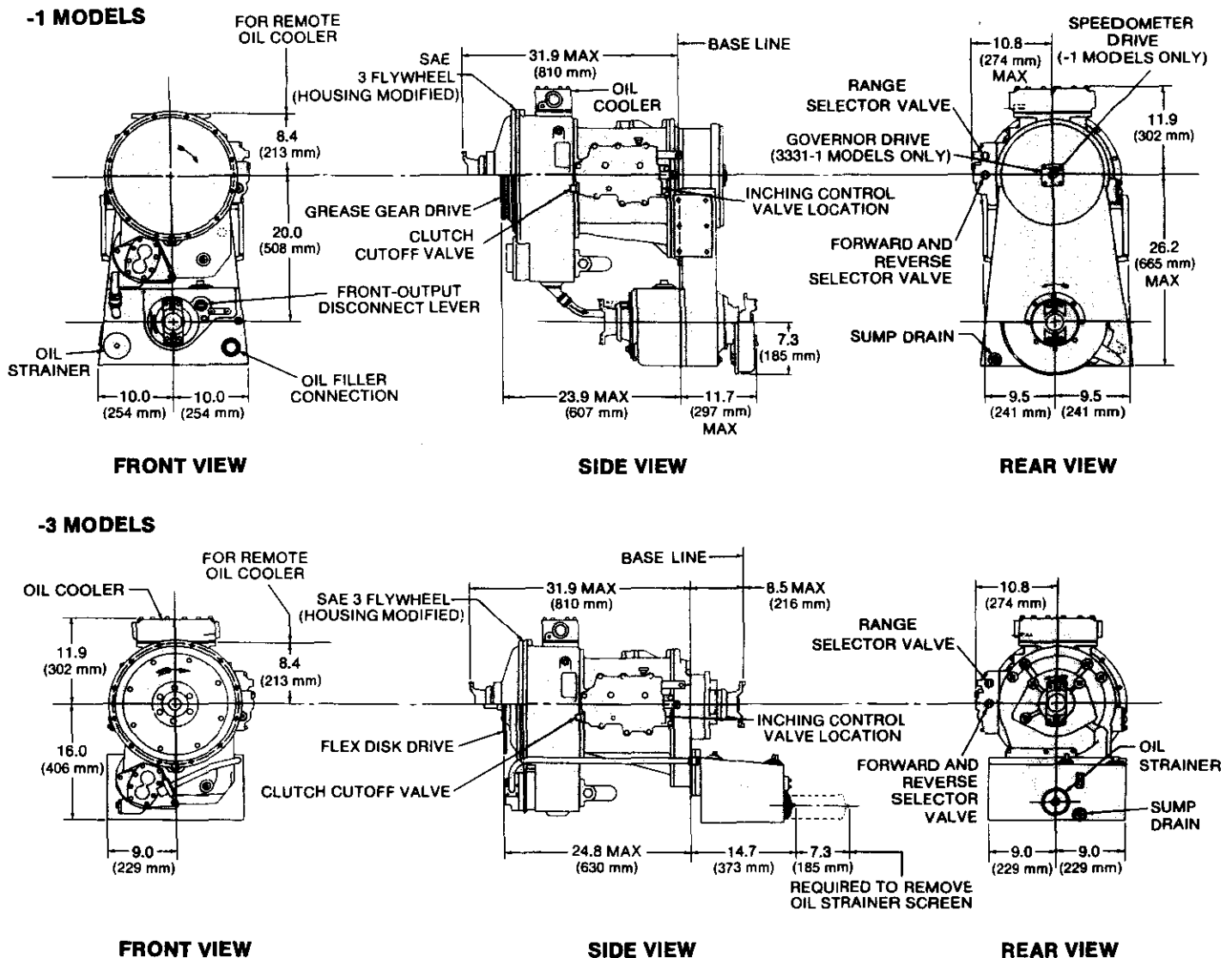
specifications

applicable power	Input	70 to 185 hp (52 to 138 kW)
rating	Input speed, max Input torque, max (net)—CRT 3331 —CRT 3531, 3630	3000 rpm 325 lb ft (441 N•m) 375 lb ft (508 N•m)
rotation	Input—right hand Output—right hand (forward ranges)	
speeds	Forward Reverse	3 3
mounting	Direct mounted (front) Remote mounted (front) Direct and remote mounted (rear)	SAE 3 flywheel housing with grease gear or flex disk drive Input flange or Torqmatic® coupling 6-hole mounting pad on each side (-1 models); 4 tapped holes in adapter housing (-3 models)
torque converter	Type Stall torque ratio	Single-stage, 3-element, polyphase TC 350 TC 360 TC 370 3.09 2.86 2.47
gearing	Type: Range gearing Transfer gearing Gear ratios: Low Intermediate High Transfer gearing	Constant mesh, spur, planetary Constant mesh, spur, in-line 3331, 3531 models 3630 models Forward Reverse Forward Reverse 8.00 7.75 8.70 8.43 2.90 2.81 2.90 2.81 1.00 0.97 1.00 0.97 0.66 (standard) 0.79 0.79 (optional) 1.62 (3331-1 only)
clutches	Hydraulic-actuated, spring-released, oil-cooled, multidisk, self-adjusting (automatic compensation for wear)	
flanges	Input Output	Mechanics 6C, 7C; Spicer 1500, 1600; Rockwell 5N; Mechanics 6C with Torqmatic® coupling Mechanics, 6C, 7C, 8C, 9C; Spicer 1500, 1600, 1700, 1800; Rockwell 5N, 6N
parking brake	Type Size	Drum, internal-expanding shoe 13½ x 2 in. (340 x 51 mm)
power takeoff	Implement pump drive: Size Rating * Steer pump drive (remote mounted, -1 models only): Size Rating * Ratio (both drives)	SAE C, 4-bolt Intermittent—80 hp (60 kW) at 2100-3000 rpm Continuous—50 hp (37 kW) at 2100-3000 rpm SAE A modified, 6-bolt 20 hp (15 kW) at 2100-3000 rpm 1.00 x engine speed
speedometer drive	Size Ratio	SAE 5/32 (3.96 mm) heavy duty Same as transmission range speed
control valve body	Either clutch cutoff control or inching control valve optional	
oil system	Oil type Capacity (excluding external circuit) Sump Filter (customer furnished) Cooler	Hydraulic transmission fluid, type C-2 -1 models -3 models 7½ US gal (28 litres) 9 US gal (34 litres) Integral Integral or remote Remote mounted Provision for remote mounting; transmission mounted, optional
size	Length, max Width Height (w/direct mounted oil cooler) Weight	-1 models -3 models 43.61 in. (1108 mm) 46.59 in. (1183 mm) (w/integral sump) 20.77 in. (528 mm) 19.77 in. (502 mm) 39.17 in. (995 mm) 27.89 in. (708 mm) 1170 to 1260 lb 830 to 955 lb (531 to 372 kg) (3.77 to 434 kg)

* Simultaneous power takeoff operation is not to exceed published ratings.

Note: All data and specifications subject to change without notice.

mounting dimensions



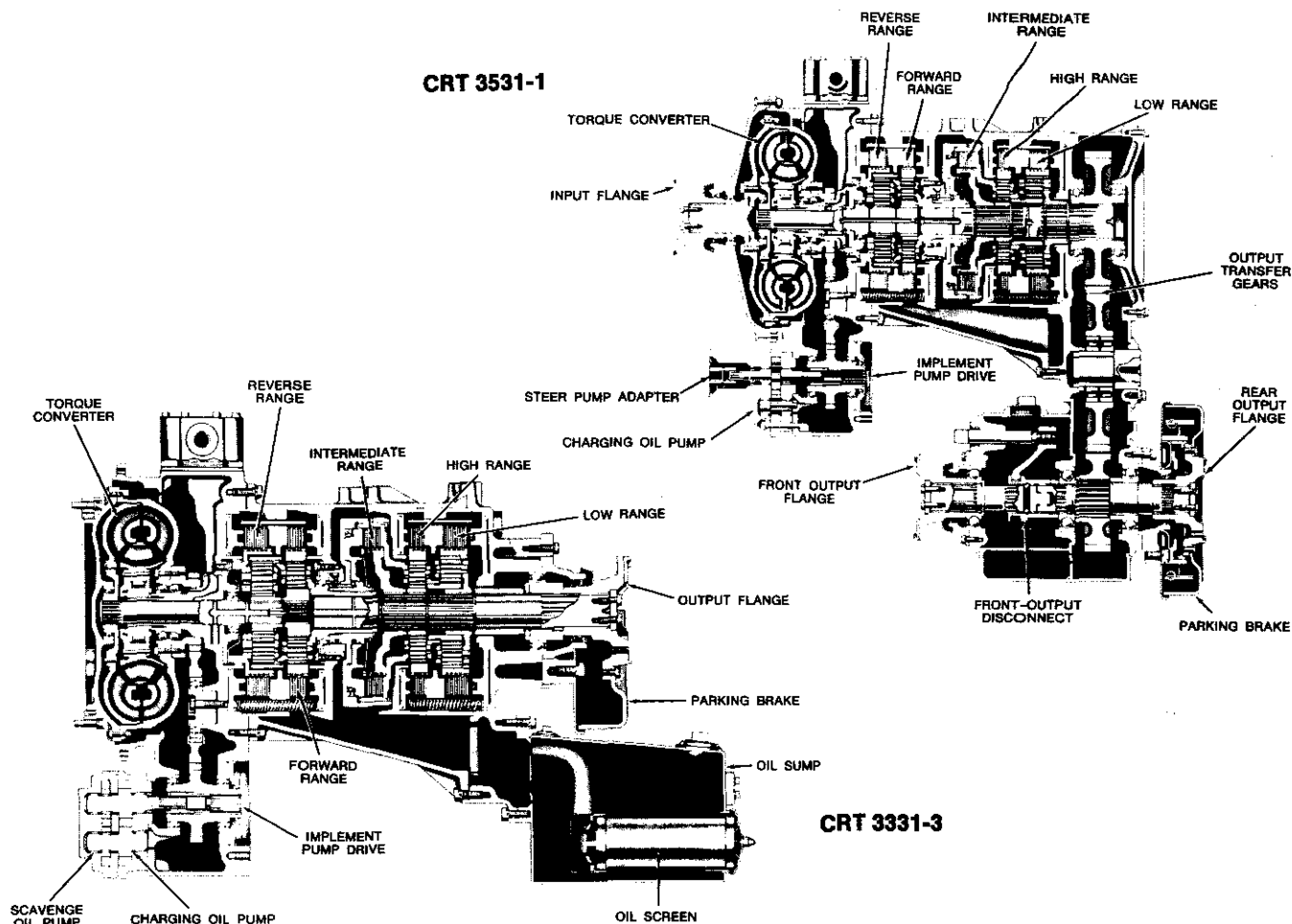
Note: Dimensions are given in inches with metric value in parentheses.

options

- Transmission remote mounted or direct mounted on engine
- Flex disk or grease ring drive
- Clutch cutoff control valve (air or hydraulic)
- Inching control valve
- Steer pump drive (remote mounted -1 models only)
- Speedometer drive (-1 models only)
- Governor drive (3331-1 model only)
- Remote or transmission mounted oil cooler
- Parking brake
- Front-output disconnect (-1 models)
- Heavy duty front output shaft (3331-1 model only)
- Choice of popular flanges
- Torqmatic® coupling
- Remote mounted sump (-3 models)

CRT 3000 powershift transmission

CRT 3531-1



converter reversing transmission

The CRT series powershift transmissions are basically a torque converter-planetary gear transmission combined in a single, compact package. This package consists of a torque converter, a forward and reverse planetary gear combination, and three range planetary gear sets. The hydraulic-actuated clutches provide fast, smooth, full-power shifting in all of the three forward and three reverse speed ranges and smooth transition between forward and reverse range operation. An added fea-

ture of this series is the hydraulic inching control which permits continuous feel of the load pickup and precise "inching" of the load. Forward or reverse operation is selected by a single directional lever while the range selector lever is moved only to change the speed range.

This series transmission pioneered Powershift cycling operations. They set the standard for fast production and long life reliability in hundreds of applications.



Detroit Diesel Allison

Division of General Motors Corporation

Indianapolis, Indiana 46206



CRT-3331 TORQMATIC TRANSMISSION

I Introduction

The Allison CRT-3331 Transmission is a cycling type full powershift transmission with three speeds forward and reverse. The basic CRT-3331 is an integral package consisting of a three element, multiphase, torque converter; planetary gearing; hydraulically actuated, multiple disc clutches; a hydraulic control system; and a hydraulic clutch cut-off valve. Both transfer case (-1) and straight through (-3) models are available.

The CRT-3331 is presently being used in shovel loaders, material handling equipment, lift trucks, hydraulic cranes, specialized oil field and mining equipment, pneumatic rollers, rail switchers and maintenance equipment, and other applications requiring cycling type operation.

The input ratings of the CRT-3331 are as follows:

Maximum Input Torque, Net - General-325 lb.ft., Compactors-245 lb.ft.
Maximum Input Speed - 3000 R.P.M.
Gross Engine Horsepower Range - 70-150 HP

II Product Description

The following sections explain the standard features available.

1. Mounting:

- a. Engine mounted with SAE 3 converter housing is standard with flex disc drive.
- b. Engine mounted, "grease ring" drive.
- c. Drop box models have six tapped holes on each side of the rear of the transmission in addition to the front engine mounting providing a three point mounting configuration.
- d. Straight thru models are rear mounted with four tapped holes in the rear of the adaptor housing in addition to the front engine mounting, thus providing a three point mounting configuration.

- e. Remote mounted configuration is optional. The Torqmatic Coupling (input torsional isolator) is also optionally available on remote mounted configurations.

NOTE: "Grease ring" drive reduces noise and gear wear by having the torque converter driven by a closed and sealed concentric gear arrangement in which grease is permanently retained.

2. Torque Converter:

The following torque converter models are available:

<u>Model</u>	<u>Torque Ratio</u>
TC-350	3.09
TC-360	2.86
TC-370	2.47

3. Engine Driven Power Take-Off

The SAE C-4 bolt PTO aperture is standard on both the CRT-3331-1 and -3 Models.

Mounting - (Standard) SAE C, internal spline, P.D. = 1.1667 inches
30° pressure angle, 14 teeth

(Optional) SAE B internal spline, P.D. = 0.813 inches,
30° pressure angle, 13 teeth

NOTE: C to B spline coupling adaptor (P/N 6771957) is available for the C size splines.

Ratio - PTO drive gear to engine speed - 1.0:1

Rating - Intermittent: 200 lb.ft. up to 2100 RPM
80 HP @ 2100 RPM and above
Continuous: 125 lb.ft. up to 2100 RPM
50 HP @ 2100 RPM and above

NOTE: Sealed bearings are incorporated in the PTO Drive to inhibit transmission oil seepage into auxiliary gear drive. If a special gear box is mounted at the PTO opening where a hydraulic implement pump is normally located, a maximum of one (1) GPM transmission oil flow may be taken from the cooler return line (remote mounted cooler) to lubricate the special gear box. The oil level in the gear box must not exceed the centerline of the PTO. It is recommended that any special PTO gear box be drained from the bottom directly into the sump or into the drain line from the converter housing. Allison review and approval is required on all special PTO drives as described above to insure satisfactory performance.

4. Clutch Cut-Off

The hydraulic clutch cut-off is standard on the CRT-3331. The clutch cut-off valve is actuated by hydraulic pressure tapped from the vehicle hydraulic brake lines. This action cuts off the oil supply to the range selector valve and disengages the power to the transmission output thus in effect shifting the transmission to neutral. The clutch cut-off is completely controlled by the brake pedal which actuates the valve when the pedal is depressed and returns the transmission to the selected range gear when the pedal is released.

The air actuated clutch cut-off is an optional system that operates similar to the hydraulic clutch cut-off. The brake pedal travel actuates an air cylinder which in turn exhausts clutch apply pressure.

5. Output Configuration:

Straight through or drop box outputs are standard. The transfer case models are available with outputs at the "C" and "D" positions. The drop box models are standard with a "C" position (front output) disconnect. A solid shaft with no disconnect is also available.

III Optional Equipment

1. Flanges:

"A" Position (Input Flange, -1 and -3 Models)

Spicer 1500, 1600, Mechanics 6C, 6C w/ Torqmatic coupling, 7C and Rockwell 5-N Plain.

"B" Position (Inline Output, -3 Models only)

Spicer 1700, Mechanics 7C, 7C w/ parking brake, 8C w/ parking brake and Rockwell 6-N Special.

"C" Position (Front Output, -1 Models only)

Spicer 1500, 1600, Mechanics 6C, 7C, 9C, Rockwell 5-N Plain, and 6-N Plain.

"D" Position (Rear Output, -1 Models only)

Spicer 1500 w/ parking brake, 1700 w/ parking brake, Mechanics 6C, 7C, 7C w/ parking brake, Rockwell 5-N Special w/ parking brake and 6-N Special w/ parking brake.

2. Parking Brake:

The optional parking brake is available at the "B" and "D" positions as shown in the preceding Flange Section.

Type - Timken 13-3/8 x 2

Rating - 45,000 inch lbs. @ 2100 lbs. apply force (manufacturer's rating for run in condition - burnished)

3. Torqmatic Coupling (Remote Mount only):

The Allison Torqmatic coupling is located on the converter input shaft to dampen vibration. The coupling requires a Mechanics 6C flange, Part No. 6775960, at the "A" position. The maximum drive-line angularity is five degrees.

4. Inching Control Valve:

The inching control is a special feature for lift trucks where close vehicle speed control is necessary.

Type - Three Spool Valve
Rating - 80# Apply Force

5. Speedometer Drive (-1 Models only):

Type - SAE 5/32 Heavy Duty
Ratio - Speedometer drive shaft speed is equal to transmission range speed.

6. Governor Drive (-1 Models only):

Type - 1.14 NS - 2A thread
Gear Data - P.D. = .9463 - .9519
 O.D. = .9880 - .9983
Ratio - Governor drive shaft speed is equal to turbine shaft speed.

7. Steer Pump Drive (Remote Mounted Models only):

Mounting - Modified SAE "A" Pad, 6 Bolt
Rating - 50 lb.ft. up to 2100 RPM
 *15 HP maximum @ 2100 and above
Ratio - Same as engine speed
Gear Data - SAE "A" Spline, 30° pressure angle, P.D. = 0.5625 inches,
 9 teeth.

*Total HP available for steer pump and PTO Drives is 50 or 80 HP as shown in the PTO Drive Section, Item 4. If the steer pump and the PTO Drive are used simultaneously, 15 HP should be deducted from the PTO rating.

8. Remote Mounted Sump (-3 Models only):

An optional remote mounted sump is available when space limitation causes interference with an integral sump. The location and installation data for the optional sump is shown on AS 33-011. All such installations are subject to the requirements specified on AS 33-011 and to review and approval by Allison.

9. Optional Two Speed Model:

The CRT-3321-1 and CRT-3321-3 Models are options of the basic CRT-3331, the only change being the deletion of the low range planetary gear set.

The CRT-3321 has no provision to lock the low range clutch apply oil or to eliminate the low range detent in the selector valve body. Therefore, the shift tower (AS 33-024) or shift controls must be designed to eliminate the shift to low range. Inadvertent shifting of the selector valve into low range would exhaust main pressure into the transmission housing causing loss of clutch pressure, excessive aeration and spewing of oil from the breather.

10. Greased Gear Drive Kit:

A greased gear drive kit, P/N 6775458, is available to convert the earlier CRT-3321 and 3331 Models to the greased gear drive from previous systems. This kit includes a drive ring, P/N 6775414; a seal, P/N 6769818; bolts, P/N 9412270; and a container of grease, P/N 6769877. The installation procedure to convert to the greased gear drive is covered by AS 00-006 and 007.

IV Specifications and Ratings

1. Dry Weight in Lbs. (Approximate):

<u>Model</u>	<u>Weight</u>
CRT-3321-1	1140 to 1230 lbs.*
CRT-3321-3	800 to 925 lbs.*
CRT-3331-1	1170 to 1260 lbs.*
CRT-3331-3	830 to 955 lbs.*

*Dependent on Options

2. Oil System

Sump - Integral

Input pressure and scavenge pump - Positive Disp.

Gear Type

Transmission Oil Capacity - (-1 Models) - 7.5 gal. Refill - 5.5 gals.
 (-3 Models) - 9 gal. Refill - 7 gals.

Oil Type - Hydraulic Transmission Fluid Type C-3

Converter Oil Outlet Pressure - Maximum - 65 PSI

3. Transmission Gear Ratios:

	<u>CRT-3331</u>	<u>CRT-3321</u>
<u>Forward</u>		
Low	8.0:1	2.9:1
Intermediate	2.9:1	
High	1.0:1	1.0:1
<u>Reverse</u>		
Low	7.8:1	2.8:1
Intermediate	2.8:1	
High	1.0:1	1.0:1

Transfer Gear Ratios (-1 Models only)

Reduction - 1.62:1

Overdrive - .66:1

4. Transmission Rotation (Viewed from Input)

Input - Right Hand

Output - Right Hand (in forward ranges)

5. Output Shaft Torque Limits

Front Output - 4500 lb.ft.

Rear Output - 4500 lb.ft.

Special Heavy Duty Front Output - 9000 lb.ft.

Figures apply to solid and two-piece output shaft with disconnects. Due to wide variations in possible output torques as related to models, input torque levels, and ratios, all single output usage must be reviewed on an individual basis.

6. Internal Relief Valve:

An internal relief valve is incorporated in the main regulator valve body of the CRT-3321 and 3331 transmissions to prevent excessive pressures during cold starts.

The relief valve requires that the customer furnished external cooler lines be capable of handling cooler oil flow without exceeding the maximum converter outlet pressure of 65 PSI at normal operating temperatures. A combined cooler and line drop of 40 PSI should meet the 65 PSI requirement since the lube valve maintains approximately 25 PSI maximum pressure in the cooler circuit.

During cold starts, the internal relief valve will by-pass oil and possibly cause converter out pressure to rise to approximately 100 PSI prior to warm-up. It is essential that all installations be carefully checked to insure that the external cooling system does not exceed 65 PSI under normal operating conditions. If the pressure exceeds 65 PSI, the unit should be checked for restrictions in the cooler lines or improper cooler line size. The minimum cooler line size recommended is 5/8" I.D.

7. Input Inertia (lbs.ft. sec²):

Remote Mounted - .2020

Engine Mounted - .2236

NOTE: The above figures represent the inertia of the parts mechanically attached to the engine during converter operation and do not include a correction for the effects of the torus oil.

V. References1. Sales Briefs:

<u>Number</u>	<u>Subject</u>
9	Temperature and Pressure Gauges
40	Implement Pumps
42	Oil Recommendations
56	Paint Specifications
65	General Recommendations for Driveline Angularity

2. Manuals & Catalogs:

<u>SA Number</u>	<u>Publication</u>
SA-1073	CRT 3331 Service Manual
SA-1244	CRT 3321 and 3331 P.C.
SA-1355	Operators Manual

3. Quick Match Charts:

<u>SA Number</u>	<u>Converter Model</u>
SA-1173	TC 350
SA-1174	TC 360
SA-1175	TC 370

4. Installation Drawings:

<u>AS Number</u>	<u>Subject</u>
AS 00-003	Front Trunnion Support
AS 00-006	Grease Specifications
AS 00-007	Transmission Drive Adaptation
AS 00-009	Heat Exchange Performance
AS 00-016	Flex Plate Input Drive Data
AS 00-036	Flex Drive Characteristics
AS 33-001	External Hydraulic Circuit Requirements
AS 33-002	Installation Diagram (Straight Thru Models)
AS 33-003	Installation Diagram (Transfer Case Models)

4. Installation Drawings (continued):

<u>AS Number</u>	<u>Subject</u>
AS 33-005	Cooler Oil Flow Specifications
AS 33-008	Steer Pump Drive Option
AS 33-009	Implement Pump Drive
AS 33-010	Drive Flange Options
AS 33-011	Remote Mounted Sump Option
AS 33-012	Inching Control Valve Option
AS 33-013	Governor Drive Option
AS 33-014	Air Actuated Clutch Cut-off Option
AS 33-020	Speedometer Drive Option
AS 33-024	Shift Tower Gating Patterns

For further information, please contact the Transmission Sales Department,
#7341, P. O. Box 894, Detroit Diesel Allison Division, GMC, Indianapolis,
Indiana 46206.



Allison Transmissions

Sales Brief

Date March, 1977 No. 52 Rev.

CRT-3531 and 3630-1

TORQMATIC TRANSMISSIONS

I. Introduction

The CRT-3531 and 3630-1 Series Torqmatic transmissions are used in lift trucks, shovel loaders, earth augers, log loaders, rubber tire tractors, hydraulic cranes and similar cycling applications in the 130 to 175 gross horsepower range. The CRT-3531 Series is available as a drop box (-1) or a straight through (-3) model. The CRT-3630 is available only as a drop box (-1) Model.

The CRT-3531 and 3630-1 Models are full reversing three speed powershifts with a Torqmatic converter, planetary gearing and hydraulically actuated clutches in a compact integral unit.

Standard features include hydraulic clutch cut-off, engine driven PTO, remote filter provision, integral oil cooler provision and a hydraulic valve body.

The input power ratings for the CRT-3531 and CRT-3630-1 are as follows:

Maximum Input Torque, net - General - 375 lb.ft. - Compactors - 275 lb.ft.
Maximum Input Speed - 3000 RPM
Gross Engine Horsepower Range - 130 to 185 HP

II. Product Description

1. Mounting:

Direct Engine - SAE 3 (dry) converter housing with flex disc drive. Ring gear and flex disc types are dependent on engine model.

Remote - Trunnion mounting with flange input drive. Optional Mechanics 6C flange with Torqmatic coupling is also available.

All Allison transmissions require three point mountings. The engine mounted CRT-3531 and 3630-1 Models are supported at the engine bell housing and on either side of the drop box or adapter housing. Remote mounted models have provisions for front trunnion mounting as well as provisions on either side of the drop box or adapter housing.

2. Torque Converter:

The CRT-3531 and 3630-1 transmissions offer a choice of three converter models with the following stall torque ratios.

	<u>TC-350</u>	<u>TC-360</u>	<u>TC-370</u>
Number of Phases	1	1	1
Number of Elements	3	3	3
Stall Torque Ratio	3.09	2.86	2.47

3. Output Configuration:

Transfer case (-1) Models are available with a three gear drop box and outputs at the "C" and "D" positions. The standard transfer gear ratio is 0.66:1 on the CRT-3531-1. The standard CRT-3630-1 and optional 3531-1 transfer gear ratio is 0.79:1.

The front output disconnect ("C" position) is standard on all drop box models. A solid shaft, no disconnect, option is also available.

The straight through (-3) models are available on the CRT-3531 only. The CRT-3531-3 offers an inline output ("B" position).

4. Hydraulic Clutch Cut-Off:

To provide engine power for accessory driven equipment such as an implement pump, a clutch cut-off is provided. This device may be operated hydraulically by the vehicle hydraulic brake line pressure or by air if the vehicle is air brake equipped. The hydraulic clutch cut-off is standard.

Hydraulic pressure is tapped from the brake apply line to actuate a hydraulic valve which exhausts the clutch apply pressure and effectively puts the transmission in neutral range. Depression of the brake pedal actuates the system and the release of the brake pedal returns the transmission into the selected range.

The optional air clutch cut-off operates identical to the hydraulic system except the brake pedal actuates an air cylinder in place of the hydraulic valve.

5. Oil Filter:

Provisions have been made for a remote mounted oil filter. The filter must be furnished by the customer.

6. Engine Driven Power-Take-Off:

The engine driven PTO is located behind the charging pump in the torque converter housing.

Type - SAE C, 4 bolt pad

Rating - Intermittent - 200 lb.ft. up to 2100 RPM pump speed
80 HP above 2100 RPM pump speed

Continuous - 125 lb.ft. up to 2100 RPM
50 HP above 2100 RPM

Ratio - Standard - 1.00 x engine speed

Optional - 0.86 x engine speed

An optional engine driven PTO is also available.

Type - SAE modified A, 6 bolt pad, optional SAE 2 bolt pad

Rating - (Maximum) 50 lb.ft. up to 2100 RPM pump speed
20 HP above 2100 RPM pump speed

7. Transmission Breather:

An integral mounted transmission breather is standard on all models. If the transmission application is such that the integral breather is exposed to unusually severe dirt conditions or is inaccessible for servicing, a plug assembly with a 1/4 NPSC female straight pipe thread, which will fit the present opening on the transmission case, can be ordered. A hose assembly to remote mount the breather in an accessible and clean location can be added to this adapter!

NOTE: Only one breather is required! Do not install a second breather on the oil fill tube. Oil fill tube covers or openings should fit tightly to prevent dirt infiltration.

III. Optional Equipment

1. Torqmatic Coupling (Remote Mount Only):

The optional Allison Torqmatic coupling is an engine torsional damper located on the converter input shaft. The Torqmatic coupling requires a Mechanics 6C flange, P/N 6775960, at the "A" position. The maximum drive-line angularity is 5 degrees.

2. Flanges:

Input ("A" Position):

Spicer 1600, Mechanics 6C, 6C w/Torqmatic coupling, Rockwell 5-N plain.

Inline Output ("B" Position - 3 Models Only):

Mechanics 7C w/parking brake, 8C w/parking brake.

Front Output ("C" Position, -1 Models Only):
Spicer 1500, Mechanics 6C, 7C, Rockwell 6-N plain

Rear Output ("D" Position, -1 Models Only):
Spicer 1500 w/parking brake, Mechanics 7C, 7C w/parking brake, Rockwell 6-N Special w/parking brake.

3. Parking Brake:

The optional Timken parking brake is available only at the "B" and "D" positions as shown on the preceding flange section.

Type - Timken 13-3/8 x 2
Rating - 45,000 inch lbs. @ 2100 lbs. apply force (vendor rating for run in condition-burnished).

4. Remote Mounted Sump (-3 Models only):

An optional remote mounted sump is available when space limitations cause interference with an integral sump. The location and installation data for the optional sump is shown on AS 33-011. All such installations are subject to the requirements specified on AS 33-011 and to review and approval by Allison Sales Department.

5. Inching Control:

The inching control is a special feature for lift truck and similar applications where close vehicle speed control is necessary.

Type - Three spool valve
Ratings - 80# apply force

6. Speedometer Drive (-1 Models Only):

Type - SAE 5/32 Heavy Duty
Ratio - Speedometer drive shaft speed is equal to transmission range speed.

IV. Specifications

1. Weight (Dry lbs. - approximate):

Transfer case model - 1170 to 1260#
Straight through model - 830 to 955 #

NOTE: Weight is dependent on the options selected.

2. Rotation (Viewed from input end):

Input - clockwise

Output - Same as input (forward ranges)

3. Transmission Gear Ratios:

<u>Range</u>	<u>Forward</u>	<u>Reverse</u>
Low	8.00:1 (3531)	7.75:1
	8.70:1 (3630)	
Intermediate	2.90:1	2.81:1
High	1.00:1	0.97:1

Transfer Gear Ratios (CRT-3531-1) - 0.66:1 (Standard)
0.79:1 (Optional)
(CRT-3630-1) - 0.79:1

4. Oil System:

Charging pump - input driven, gear type, positive displacement.

Scavenge pump (-3 Models) - gear type, common housing with charging pump.

Oil Type - Hydraulic Transmission Fluid, Type C-3.

Oil Capacity (-1 Models) - Initial Fill - 7.5 gallons.

Refill - 5.5 gallons.

(-3 Models) - Initial Fill - 9 gallons

Refill - 7 gallons

Oil Filter - Remote mounted, customer furnished

Oil Cooler - Integral or remote mounted

Converter-out Oil Temperature - 250°F.

Converter Outlet Pressure - Full throttle, stall - 25 PSI min.

Full throttle, no load - 65 PSI max.

Main Pressure - Full throttle, stall - 145-155 PSI

Lubrication Pressure - Full throttle - 15-30 PSI

5. Input Inertia - Lb.ft. Sec 2

Remote Mounted Models - .2020

Engine Mounted Models - .2236

NOTE: The above figures represent the inertia of the parts mechanically attached to the engine during converter operation. These figures do not include a correction for the effect of the torus oil.

6. Internal Relief Valve:

An internal relief valve is incorporated in the main regulator valve body of the CRT-3531 and CRT-3630-1 transmissions to prevent excessive pressures

during cold starts.

NOTE: The relief valve requires that the customer furnished external cooler lines be capable of handling cooler oil flow without exceeding the maximum converter outlet pressure of 65 PSI at normal operating temperatures. A combined cooler and line drop of 40 PSI should meet the 65 PSI requirement since the lube valve maintains approximately 25 PSI maximum pressure in the cooler circuit.

During cold starts, the internal relief valve will by-pass oil and possibly cause converter out pressure to rise to approximately 100 PSI prior to warmup. It is essential that all installations be carefully checked to insure that the external cooling system does not exceed 65 PSI under normal operating conditions. If the pressure exceeds 65 PSI, the installation should be checked for restrictions in the cooler lines or improper cooler line size. The minimum cooler line size recommended is 5/8" I.D.

V. References

1. Sales Briefs:

<u>Number</u>	<u>Subject</u>
9	Temperature and Pressure Gauges
40	Implement Pumps
42	Oil Recommendations
56	Paint Specifications
65	Driveline Angularity

2. Manuals and Catalogs:

<u>SA Number</u>	<u>Publication</u>
SA-1104	CRT-3531 and 3630 Service Manual
SA-1244	CRT-3531 and 3630 Parts Catalog
SA-1355	Operators Manual

3. Quick Match Charts:

<u>SA Number</u>	<u>Converter Models</u>
SA-1173	TC-350
SA-1174	TC-360
SA-1175	TC-370

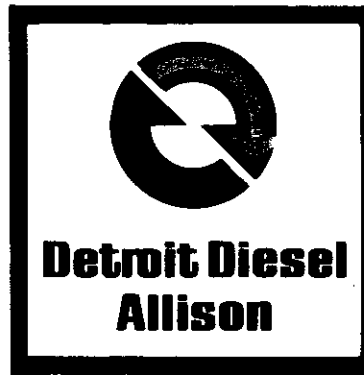
4. Installation Drawings:

<u>AS Number</u>	<u>Subject</u>
AS 00-003	Front Trunnion Support
AS 00-006	Grease Specifications
AS 00-007	Transmission Drive Adaptation
AS 00-009	Heat Exchanger Performance
AS 00-016	Flex Plate Input Drive Data
AS 00-036	Flex Drive Characteristics
AS 33-001	External Hydraulic Circuit
AS 33-002	Installation Diagram (Straight Through Models)
AS 33-003	Installation Diagram (Transfer Case Models)
AS 33-005	Cooler Oil Flow
AS 33-008	Steer Pump Drive Option
AS 33-009	Implement Pump Drive
AS 33-010	Drive Flange Options
AS 33-011	Remote Mounted Sump Option
AS 33-012	Inching Control Valve Option
AS 33-014	Air Actuated Clutch Cut-Off Option
AS 33-020	Speedometer Drive Option
AS 33-024	Shift Tower Gating Patterns

If there are any questions, please contact the Transmission Sales Department,
P. O. Box 894, Detroit Diesel Allison Division, GMC, Indianapolis, Indiana 46206.

**Allison
Cycling
Transmissions**

**Operators
Manual**



**CRT 3321
CRT 3331
CRT 3531
CRT 3630
CRT 5530
CRT 5630
CRT 5631**

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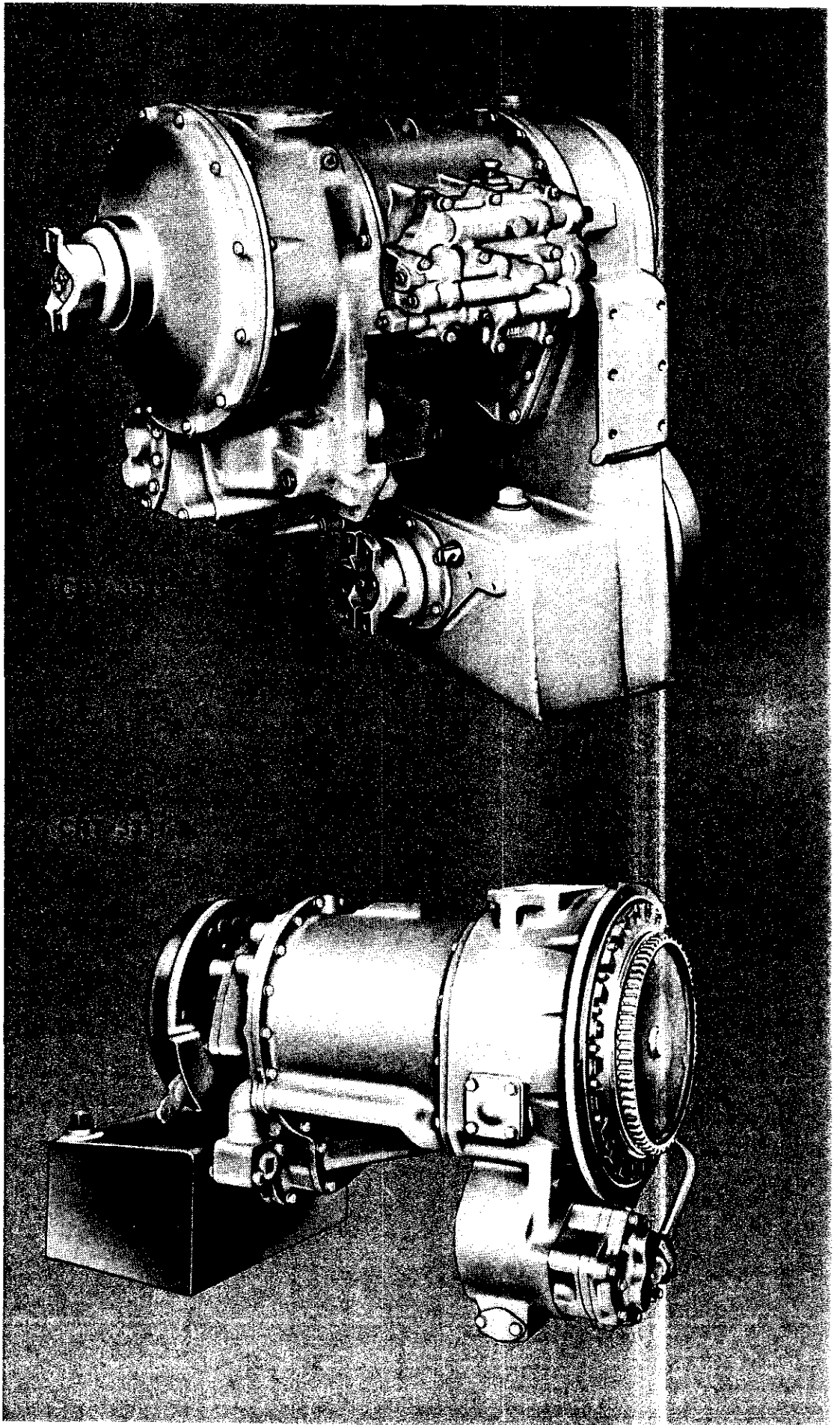
OPERATING INSTRUCTION

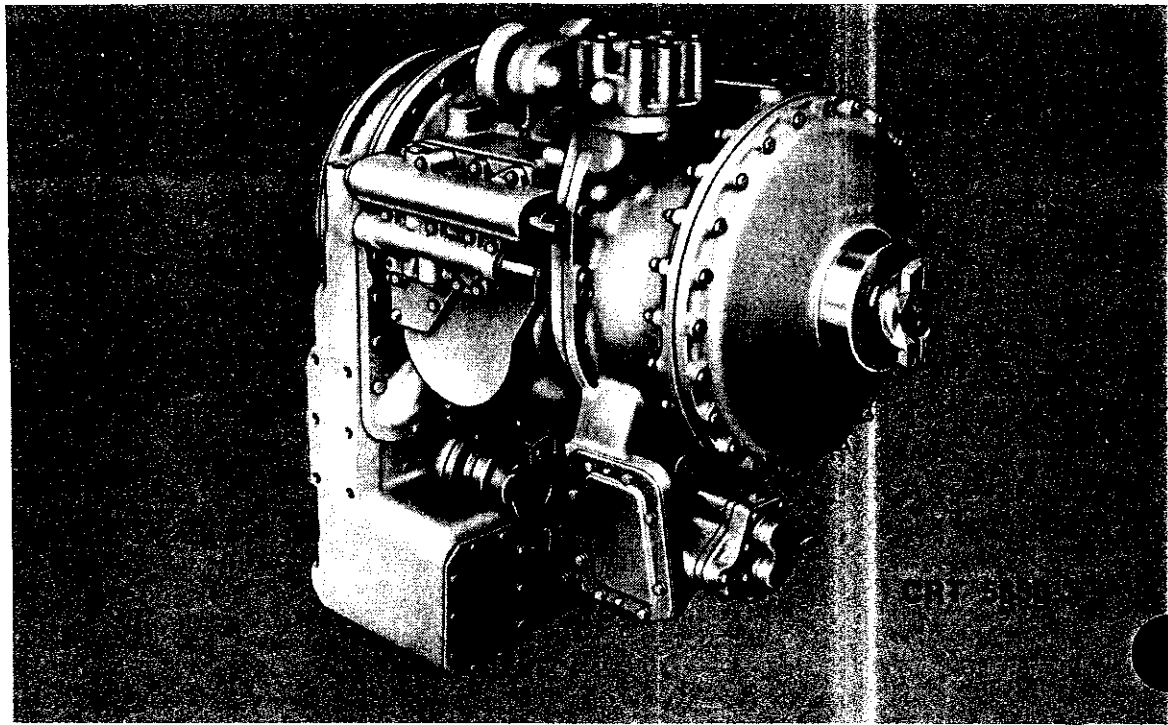
A LOOK AT THE CRT 3000 SERIES

Matched to engines in the 70 to 185 horsepower class, these reversing transmissions provide every desirable feature for cycling operations.

Rugged and compact, these units contain all the transmission elements in a single package. This package contains a torque converter, a forward and a reverse planetary gear set—and either one or two range planetary gear sets, depending on the model. The hydraulic actuated clutches provide smooth, fast full-power shifting in each range and a smooth transition between forward and reverse operation.

Optional features: remote mount or direct engine mount—flex disk or grease ring drive—clutch cutoff control valve (air or hydraulic)—inching control valve—steer pump drive—speedometer drive—governor drive—remote or transmission mount oil filter—remote or direct mount oil cooler—parking brake—front output disconnect—heavy duty front output shaft—choice of popular flanges—remote mount sump—power takeoff—three converter ratios—straight-through or drop-box models—remote torsional dampener coupling.





A LOOK AT THE CRT 5000 SERIES

These transmissions set the standard for reliability and high work output. ALLISON CRT[®] are reversing transmissions that provide: full power crowd and bucket loading ability—continuous, sensitive feel of the load—hydraulic clutch cutoff—smooth handling of off-balance loads—positive positioning for load spotting—faster reversing.

Matched with engines in the 175 to 35 horsepower class these rugged and complete units contain all transmission components in one compact package. This package consists of a torque converter for powerful starting torque, a forward and reverse planetary gear set and two range planetary gear sets. Hydraulic actuated clutches provide smooth, fast, full-power shifting in each of the three forward and three reverse ranges and smooth transition between forward and reverse operation.

Optional features include: remote mount or direct engine mounted—parking brake—filter remote mount or on transmission—speedometer drive—choice of popular flanges—power takeoff—implement pump drive—clutch cutoff valve (air or hydraulic)—choice of 7 torque converter ratios.

TRANSMISSION CONTROL LEVERS

The following shift patterns show the sequence of the shift levers for the directional control and the range control for all models.

Directional Lever	Range Lever
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- | | |
|---------------|--------------------|
| ● F (FORWARD) | ● N (NEUTRAL) |
| ● N (NEUTRAL) | ● L (LOW) |
| ● R (REVERSE) | ● I (INTERMEDIATE) |
| | ● H (HIGH) |

OPERATING TIPS

Starting engine

Place the selector lever in neutral position before starting the engine. If the transmission is equipped with a neutral start switch, the switch will prevent the engine from starting unless the selector lever is in neutral. If the starter will not operate in neutral, or will operate in any range other than neutral, call this to the attention of your maintenance personnel.

Pressures, temperatures

When gages are provided for indicating transmission pressures and temperature, check them frequently to determine if readings are within normal range. Normal operating range is 180° to 200°F. The oil temperature should not exceed 250°F. Should the temperature reach this limit, the vehicle should be stopped, shifted to neutral, and the engine operated at 1200 to 1500 rpm. The temperature should fall to normal before operating the vehicle any further. If the high temperature persists, stop the engine and have the overheating condition investigated by your maintenance personnel.

CAUTION: *The engine should never be operated for more than 30 seconds at full throttle with the transmission in gear and the vehicle not moving. Prolonged operation of this type will cause excessively high transmission oil temperature which will damage the transmission.*

The transmission oil pressure gage indicates clutch application pressure. The needle will vary with transmission shifting and speeds but should return to normal at normal engine operating speeds. Shut the engine off if the pressure remains abnormal and have the condition investigated by your maintenance personnel.

Speed Limitations When Shifting

The transmission can be upshifted or downshifted even at full throttle. There is no speed limitation on upshifting. However, a downshift must not be made if the vehicle speed exceeds maximum speed normally attainable in the next lower gear. Downshifting at excessive speed will overspeed the engine.

Changing Direction of Travel

When shifting from forward to reverse, or reverse to forward, the throttle should be closed and the vehicle braked to a slow (creeping) speed. Then the shift to the opposite direction may be made, and the throttle reopened when the vehicle begins to move in the opposite direction.

Sense-Feel Operation

Some transmissions are equipped with a "sense-feel" valve which provides a definite hydraulic retarding force against shifting the directional lever from neutral to forward or from neutral to reverse. The retarding force persists until full clutch engagement occurs, then is automatically cancelled. The operator has the sensation of "picking up" the load, and can more accurately gage the application of the clutch.

ching ontrol

Some transmissions are equipped with an inching control feature. This is a valve which is controlled by the operator separately from the range selector and the directional selector.

This valve is manipulated by the operator to accurately control the application of main pressure to the forward or reverse clutch. Thus, the operator has a feel of the load pick up and precise "inching" of the load.

utch tutoff ontrol

Some transmissions are equipped with a clutch cutoff, or "declutch" device. This control eliminates the need to shift to neutral when full engine power is needed to drive accessory equipment, such as a bucket. The device is activated when the operator fully applies the service brakes. After the brake pedal passes through the first portion of the stroke (some linkages have a detent), the clutches are completely released. When the brake pedal is released the clutches are re-applied. Some installations are equipped with an on-off switch which allows the operator to lock out the clutch cutoff when it is not wanted. For example, when "roading" the vehicle over long distances, or when inching the vehicle forward or backward in tight quarters and the clutch cutoff, with each brake application, is not wanted.

ower Takeoff eration

All transmissions have provisions for a power takeoff (PTO) at the front of the transmission. It is engine driven and rotates whenever the engine is running.

In most applications, the power takeoff is continuous and is used to drive a hydraulic pump which supplies hydraulic pressure for the operation of various accessories.

In addition to the engine driven power takeoff, mentioned above, the CRT 5600 series may also have a power takeoff driven by the transmission output. This allows the operator to operate the power takeoff in either low-, intermediate- or high-range as well as forward or reverse. A mechanical disconnect allows the operator to engage or disengage the power takeoff. The power takeoff will not operate when: