

- The rear disconnect is in the OFF position
- The range selector lever is in NEUTRAL
- The directional lever is in NEUTRAL
- The clutch cutoff is in the ON position and the service brakes are applied.

## **Towing or Pushing**

Before towing the vehicle, be sure to lift the drive wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing. Because of the design of the hydraulic system, the engine cannot be started by towing or pushing the vehicle.

## **Parking Brake**

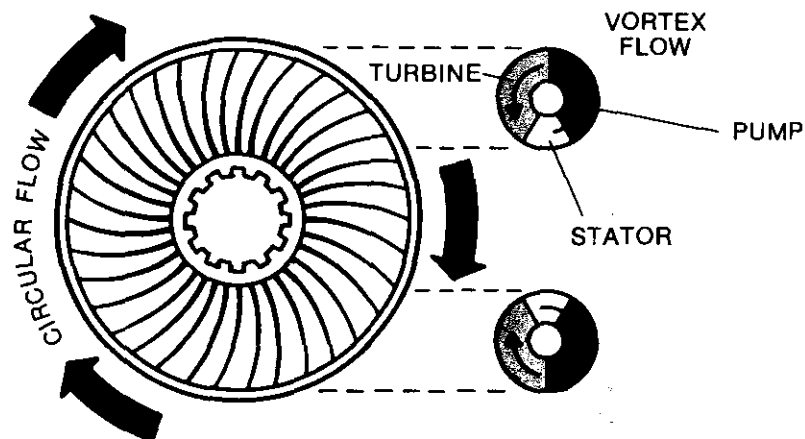
Since there is no “park” position in the shift pattern, the parking brake must be applied to hold the vehicle when it is unattended.

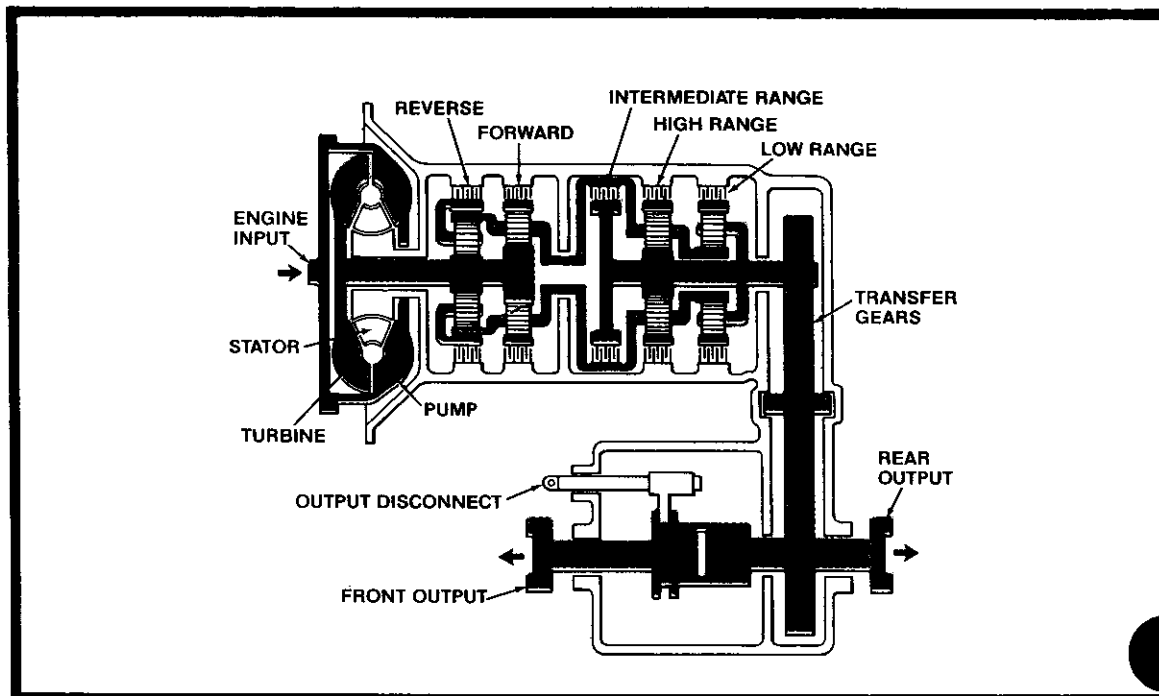
# MAINTENANCE INSTRUCTIONS

## OPERATION AND FUNCTION OF THE TORQUE CONVERTER

The torque converter, driven by the engine, is the input member of the transmission. It multiplies engine torque and provides a hydraulic cushion between the engine and the load. No disconnect clutch is needed.

The torque converter includes the pump, stator and turbine. The engine drives the pump, which throws oil against the turbine vanes. The turbine transmits torque to the transmission gearing. The stator redirects the oil to the pump in a direction which will assist pump rotation. This redirection of oil is the key to torque multiplication.





## INSIDE THE CRT 3000 SERIES

### Torque Converter

The torque converter includes the pump, stator and turbine. It functions as a torque multiplier, or as a fluid coupling, depending upon load and operating conditions.

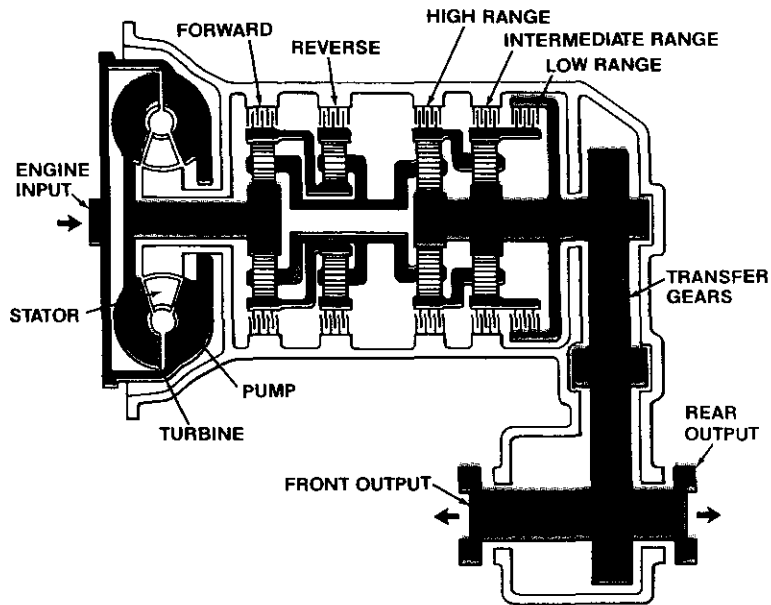
### Planetary Gearing

In all models (except CRT 3321) the planetary gear train consists of a forward planetary gear set, a reverse planetary gear set and two range planetary gear sets. These are combined with five clutches to provide three forward ranges and three reverse. The CRT 3321 has a forward planetary gear set, a reverse planetary gear set and one range planetary set. These are combined with four clutches to provide two forward ranges and two reverse.

Some models of the CRT 3000 series are equipped with a transfer gear (drop-box) configuration which places the transmission output on a lower level than the input. This will permit a forward output as well as a rear output. A front output disconnect is available on the CRT 3000.

### Hydraulic System

A single integral hydraulic system serves the torque converter and the range gearing. Oil for all hydraulic operations is supplied by the same integral sump and is returned to it.



## INSIDE THE CRT 5000 SERIES

### Torque converter

The torque converter includes the pump, stator and turbine. It functions as a torque multiplier, or as a fluid coupling, depending upon load and operating conditions.

### Planetary gearing

The planetary gear train consists of four constant mesh planetary gear sets. The front set is the forward set, followed by the reverse, the high-range and the intermediate-range set. These planetaries are combined with five clutches to provide three forward ranges and three reverse. The operator controls the application of the various clutches by moving the directional control lever and the range control lever. The transmission output is a transfer gear case (drop-box) which permits both a forward and a rear output. A parking brake mounted on the rear output is available as an option.

### Hydraulic system

A single integral hydraulic system serves the converter and the range gearing. Oil for all hydraulic operations is supplied by the same integral sump and is returned to it.

# CARE AND MAINTENANCE

## Periodic Inspections

A minimum of maintenance is necessary on your ALLISON POWERSHIFT transmission. However, careful attention should be given to all control linkages and to the oil level. For easier inspection, the transmission should be kept clean. Make periodic inspections for loose bolts, leaking oil lines or wet split lines.

## Importance of Proper Oil Level

Maintaining the proper oil level is very important. Transmission oil cools, lubricates, and transmits power. If the oil level is too low the converter and clutches will not get a proper oil supply, resulting in poor performance. If the oil level is too high the oil will become aerated, causing overheating.

# Daily Pre-start Checks

Control  
Linkage

1

Check the transmission shift control linkage and the directional linkage to ensure that the linkages are free and that the selector levers are properly positioned. The shift levers should engage in all shift tower positions freely. Inspect the linkages for binding, wear, cracks, breaks or defective cotter pins.

Oil  
Level Check

2

The cold check (engine not running) is made to determine if there is sufficient oil to safely start the engine—especially if the vehicle has been idle. The oil level should be at or near the full-level check plug. Some transmissions have one plug, others have two plugs—an ADD and a FULL plug.

Oil Level  
Check

3

Oil level must be checked with the engine running at 1000 rpm, transmission in neutral and with the transmission at normal operating temperature (180° to 200°F). The upper check plug (if there are two plugs) indicates the full oil level while the lower plug is the add level. The oil must be maintained at the FULL level. If there is only one check plug, the oil level must be maintained at this level. Add oil if necessary to bring the level to the FULL mark.

*NOTE: Observe the type of flow from the plug opening. If it is aerated or flows freely in a full stream, allow the oil to drain down to the full level before replacing the plug.*

## **Oil, Filter Change**

The oil should be changed every 1000 hours of operation or sooner, depending upon operating conditions. Also, the oil must be changed whenever there are traces of dirt or evidence of high temperature indicated by discoloration or strong odor. The filter screen in the sump should be removed and cleaned with mineral spirits at each oil change.

The filter elements should be replaced at each oil change and at 200 hour intervals between oil changes. The filter shells should be cleaned. New gaskets and seal rings must be used when replacing filter elements. After installation, check the filter for oil leakage while the vehicle engine is running.

## **Keeping Oil Clean**

It is absolutely necessary that the oil put in the transmission be clean. Oil must be handled in clean containers, filler etc., to prevent foreign material from entering the system.

## **Filling Transmission**

At temperatures above  $-10^{\circ}\text{F}$ , pour hydraulic transmission fluid type C-2 into filler opening. At temperature below  $-10^{\circ}\text{F}$ , an auxiliary pre heat is required to raise the temperature in the sump. Use only C-2 fluids from approved manufacturers. See your dealer for this approved list.

For the CRT 3000 series, the refill capacity is  $5\frac{1}{2}$  US gallons for the straight-through models and 7 gallons for the drop-box models. For the CRT 5000 series, the refill capacity is  $11\frac{1}{4}$  US gallons.

Make the Cold Oil Level Check and the Hot Level Check as described above.

## **Care of Breather**

The breather should be kept clean at all times. It should be checked and cleaned regularly and as frequently as necessary, depending upon the operating conditions. A badly corroded or plugged breather restricts proper breathing, causing oil leaks.

## **Control Linkage Adjustment**

Manual shift linkage must be adjusted so that the operator's control is positioned to exactly match the detent position of the selector valve on the transmission. Adjust the linkage so that it can be freely connected without moving either the valve or the operator's control. Then operate the range selector lever, the directional selector lever and the output disconnect (if applicable) through each position. Make minor adjustments, if necessary, to insure that each of the selector levers seats in each position of the operator's control. Then inspect the control linkage for binding wear or breaks.

## **Parking Brake Adjustment**

The internal, expanding shoe-type of parking brake is mounted on the rear of the transmission housing at the output. Following is the procedure for adjusting the parking brake.

- Adjust the brake shoes for proper drum clearance by inserting a screwdriver or brake adjusting tool into a hole at the rear of the brake drum, and rotating the star wheel between the lower ends of the brake shoes. The star wheel should be rotated until 0.010-inch thick feeler gages are held snugly between the adjusting ends of the shoes and the brake drum. Use two thickness gages simultaneously—one on each shoe.
- Adjust the vehicle brake linkage by releasing the hand lever fully, and adjusting the connecting linkage so that it can be freely connected to the apply lever on the brake. All slack should be taken out of the brake, without actually moving the brake shoes, when the linkage adjustment is made.



# TROUBLESHOOTING

A transmission malfunction should be investigated immediately to prevent further damage to the transmission. Some evidences of malfunctioning are overheating, poor performance or unusual sounds.

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 trouble.

## **(A) LOW CLUTCH APPLY PRESSURE (transmission oil pressure gage)**

<b>Cause</b>	<b>Remedy</b>
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

## **(B) OVERHEATING**

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 (A)
5. Engine water overheated	5. Correct engine overheating
6. Cooler oil or water line kinked or clogged	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**

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

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

### **Ⓔ VEHICLE TRAVELS IN NEUTRAL WHEN ENGINE IS ACCELERATED**

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

1. Adjust linkage
2. Overhaul transmission

### **Ⓕ VEHICLE LACKS POWER AND ACCELERATION AT LOW SPEED**

1. Low clutch apply pressure
2. Low converter-out pressure
3. Engine malfunction
4. Aerated oil

1. Refer to Ⓐ
2. Refer to Ⓐ
3. Check engine; refer to engine service manual
4. Refer to Ⓒ

### **Ⓖ CLUTCH CUTOFF VALVE INEFFECTIVE**

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)

1. Rebuild control valve body assembly
2. Check pressure at control valve (min-max limit—130-2000 psi)
3. Check at 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 Method Selection

When transmissions are 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 below.

- (1) The following procedures will prepare a transmission for a month to 6 weeks storage, depending on the environment.
- (2) Drain the oil. Remove the transmission oil filter element(s).
- (3) Install the drain plugs and new filter element(s).
- (4) Fill the unit to operating level with any commercial preservative oil which meets the US Military Specification MIL-L-21260, Grade 1.
- (5) 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 shift to forward (high) range and stall the transmission output to raise the oil temperature to 225°F.

*CAUTION: Do not allow temperature to exceed 225°F. If the unit does not have a temperature gage, do not stall for more than 30 seconds.*

- (6) As soon as the unit is cool enough to touch, seal oil openings and breathe with moisture-proof tape.
- (7) Coat all exposed, unpainted surfaces with a good grade of preservative grease such as a petrolatum that meets US Military Specification (MIL-C-11796), Class 2

### **Storage, 1 Year Without Oil**

- (8) Repeat the above procedures ((5) through (7)) at monthly intervals for indefinite storage.

- (1) Drain the oil.
- (2) Seal all openings and breathers with moisture-proof tape.
- (3) Coat all exposed, unpainted surfaces with a good grade of preservative grease.
- (4) Atomize or spray 2 ounces of Motorstor\*, or equivalent, into the transmission through the oil pan drain plug.
- (5) If additional storage time is required, (3) and (4), above, should be repeated at yearly intervals.

### **Storage, 1 Year With Oil**

- (1) Drain the oil. Remove the transmission oil filter element(s).
- (2) Install the drain plugs and new filter element(s).
- (3) Fill the transmission to operating level with a mixture of 30 parts type C-2 transmission fluid to 1 part Motorstor, or equivalent.
- (4) 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.

*Caution: Do not allow temperature to exceed 225°F. If the unit does not have a temperature gage, do not stall for more than 30 seconds.*

- (5) As soon as the unit is cool enough to touch, seal all openings and breathers with moisture-proof tape.

**\* 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).**

## Restoring Units to Service

- (6) Coat all exposed, unpainted surfaces with a good grade of preservative grease.
- (7) If additional storage time is required, (through (6), above, should be repeated yearly intervals, except it is not necessary to drain the transmission—just add the Motorstor, or equivalent.

- (1) If Motorstor, or equivalent, was used in preparing the transmission for storage use the following procedures to restore the unit to service.
- (2) Remove the tape from openings and breather.
- (3) Wash off all the external grease with solvent.
- (4) 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.*

- (5) If Motorstor, or equivalent, was not used in preparing the transmission for storage, use the following procedures to restore the unit to service.
- (6) Remove the tape from openings and breathers.
- (7) Wash off all the external grease with solvent.
- (8) Drain the oil.
- (9) Install a new oil filter element(s).
- (10) Refill transmission with hydraulic transmission fluid, type C-2 to proper level.

## SERVICE LITERATURE

The following Allison publications covering the operation, servicing and overhaul of your Allison transmission can be ordered from your dealer or distributor.

<b>Service Manual</b> CRT 3321, 3331 CRT 3531, 3630 CRT 5630, 3631	<b>Publication No.</b> SA 1073 SA 1104 SA 1083
<b>Parts Catalog</b> CRT 3321, 3331, 3531, 3630 CRT 5530, 5630, 5631	SA 1244 SA 1076

# Allison Cycling Transmissions





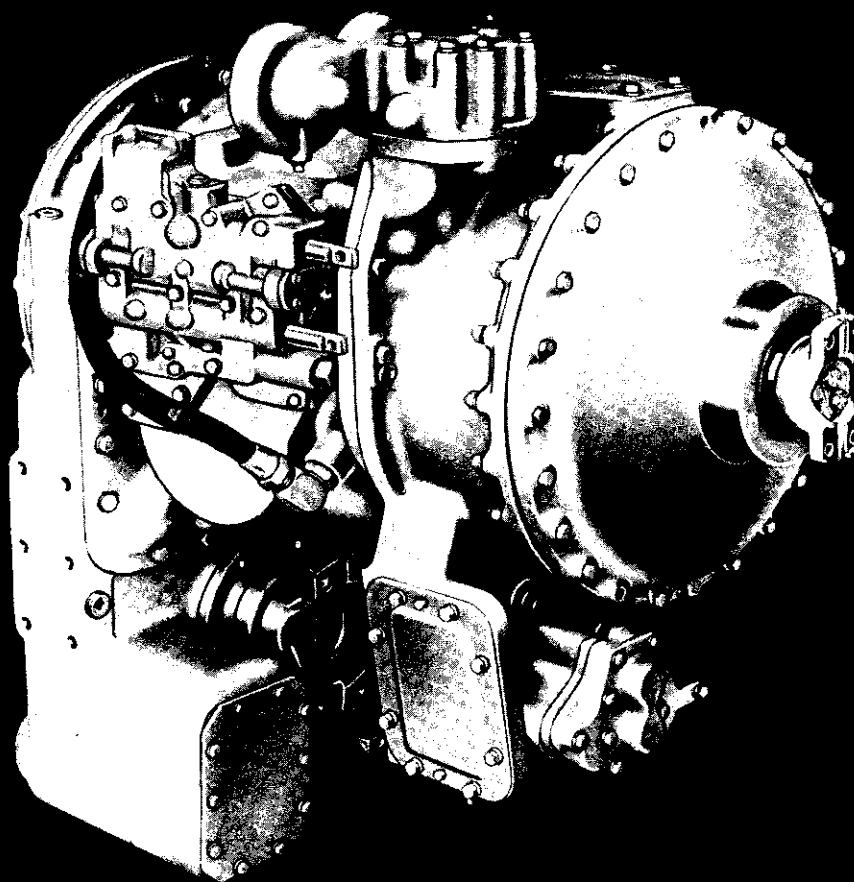


# Allison Transmissions

cycling models

CRT 5000

175 to 465 hp\*  
(131 to 347 kW)\*



\*For engines up to 465 hp (347 kW) gross

# CRT 5633

## specifications

rotation	Input—right hand Output—right hand (forward ranges)	
rating	Input power, max (net) Input speed, max Input torque, max (net)	430 hp (320 kW) 2500 rpm 900 lb ft (1220 N•m)
mounting	Direct mounted  Remote mounted	SAE 1 flywheel housing with flex disk drive; 6-hole mounting pad, each side at rear Trunnion on front cover; 6-hole mounting pad, each side at rear
torque converter	Type Stall torque ratio	Single-stage, 3-element, polyphase TC 530—3.6      TC 570—3.3 TC 540—3.0      TC 580—2.7 TC 550—3.4      TC 590—2.5 TC 560—2.7
gearing	Type: Range gearing Transfer gearing  Gear ratios: Low Intermediate High Transfer gearing	Constant mesh, straight tooth, planetary Constant mesh, straight spur, in-line  Forward      Reverse 3.04      3.17 1.51      1.57 0.76      0.79 1.00 (standard); 1.30 (optional)
clutches	Hydraulic-actuated, spring-released, oil-cooled, multidisk, self-adjusting (automatic compensation for wear)	
flanges	Input Output	Mechanics 7C; Spicer 1700 Mechanics 8C, 9C; Spicer 1800
parking brake	Type Size	Drum, internal-expanding shoe 12 x 5 in. (305 x 127 mm)
power takeoff	Side mounted Implement pump drive (non-loader version) Rating (both power takeoffs)* Ratio	SAE, 8-bolt, heavy duty, modified SAE C Intermittent—200 hp (150 kW) above 2100 rpm Continuous—125 hp (95 kW) above 2100 rpm 1.00 x engine speed
speedometer drive	Size Ratio	SAE 5/32 (4 mm) heavy duty 1.00 x output speed
control valve body	Manual controlled, hydraulic operated valve system	
oil system	Type Capacity (excluding external circuit) Sump Filter (remote or direct mounted) Cooler (customer furnished)	Hydraulic transmission fluid, Type C-2 13 US gal (49.2 litres) Integral Full-flow, replacement elements Remote mounted
size	Length, max Width (w/direct mounted oil filter) Height (w/direct mounted oil filter) Weight (dry)	50.42 in. (1 281 mm) 30.59 in. (777 mm) 41.72 in. (1 060 mm) 2450 lb (1110 kg)

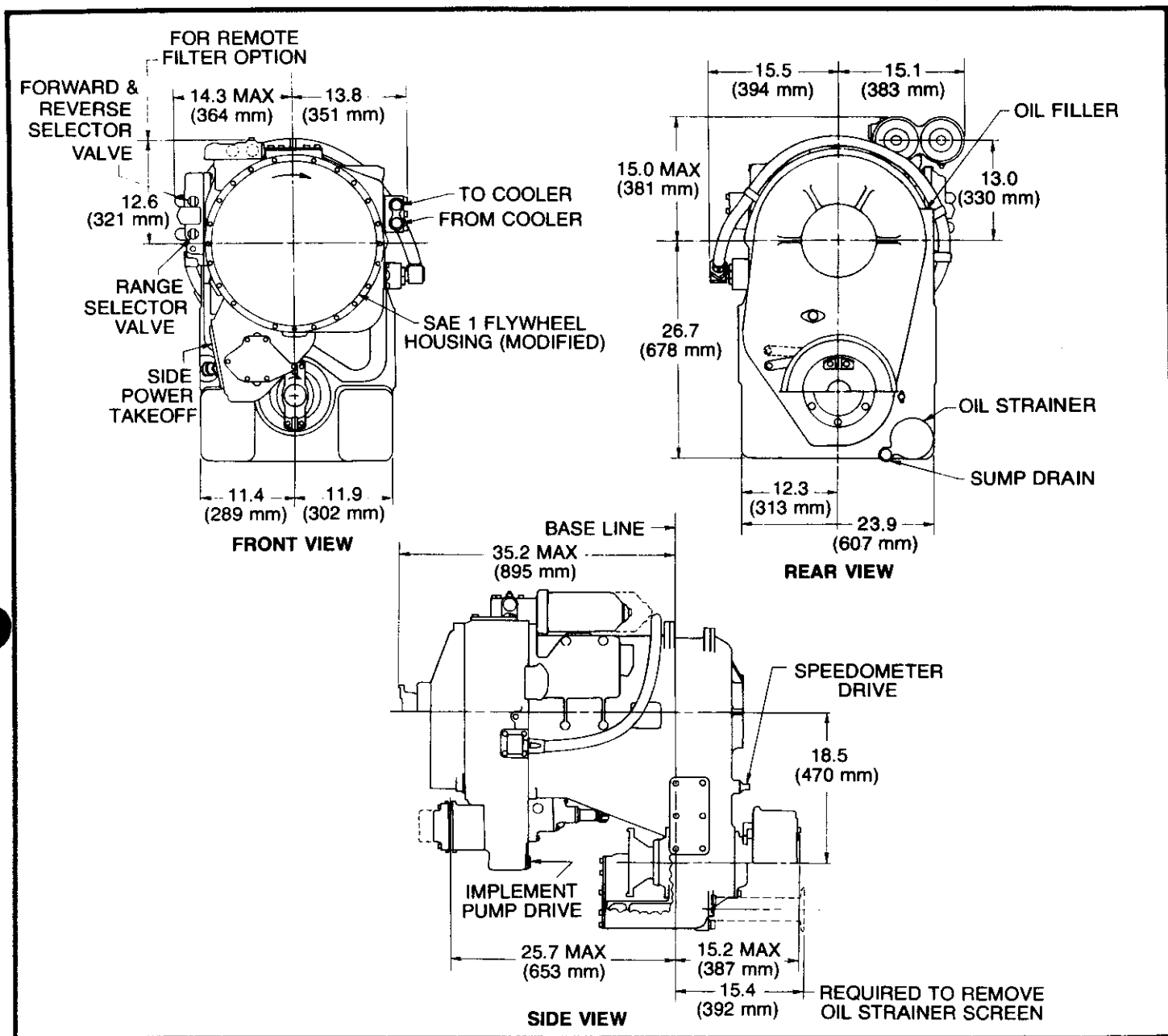
\*Simultaneous power takeoff operation is not to exceed published rating of 500 lb ft (680 N•m) or 200 hp (150 kW) intermittent 315 lb ft (430 N•m) or 125 hp (95 kW) continuous.

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

# CRT 5633

## mounting

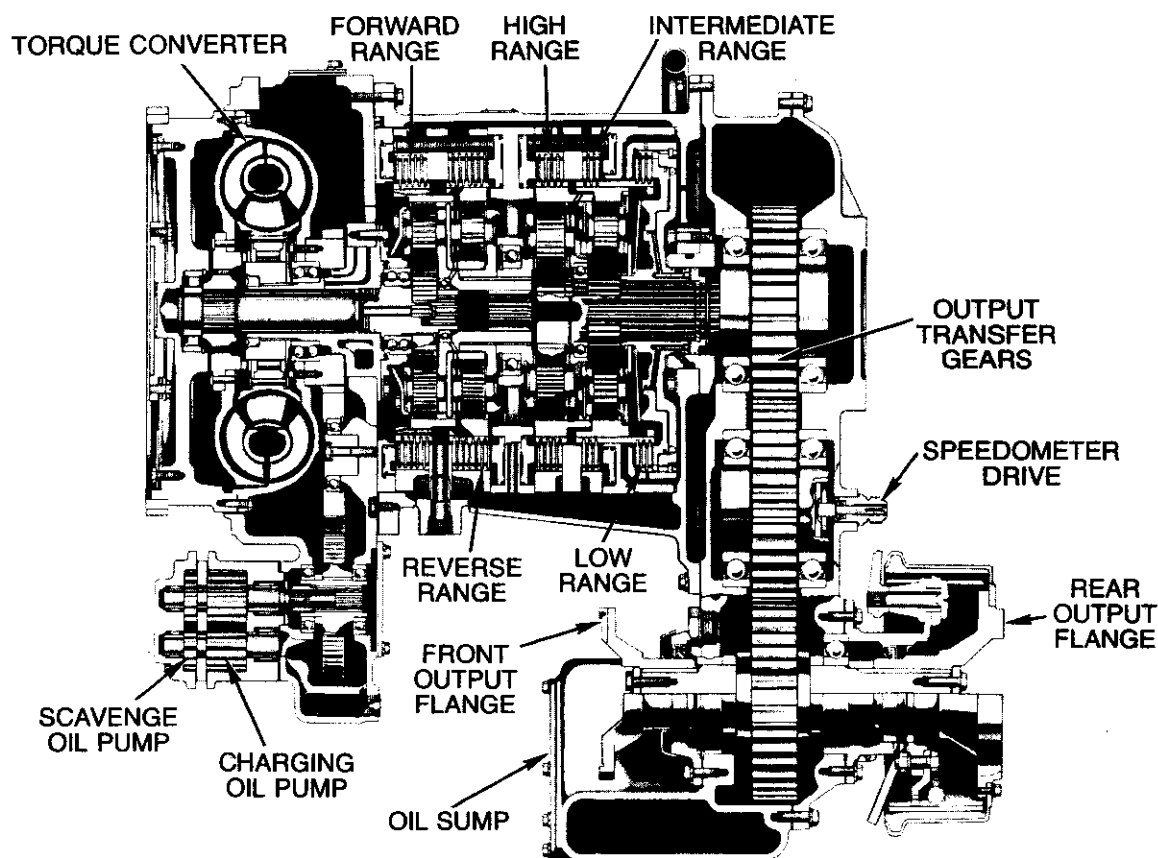
## dimenisons



## options

- Transmission remote mounted, or direct mounted on engine
- Parking Brake
- Oil filter remote mounted or on transmission
- Speedometer drive
- Choice of popular flanges
- Power takeoff on side or rear of converter housing (non loader version)
- Clutch cutoff control valve (air or hydraulic)

# CRT 5000 powershift transmission



## converter reversing transmission

The CRT 5633 transmission was designed for use in shovel loaders, fork lift trucks, compactors, rubber tire tractors, log loaders and for similar type applications.

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 two 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.

Smooth shifting at full power while changing direction of travel is a direct benefit of the new Soft Shift system—now a standard feature with all CRT 5633 transmissions.

Soft Shift is a system in which the valve body incorporates a modulated clutch apply pressure to forward and reverse 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.

Full directional changes can be made with maximum operator comfort. Shift shock is reduced because—SOFT SHIFT CONTROLS THE POWER.



**Detroit Diesel Allison**

Division of General Motors Corporation

Indianapolis, Indiana 46206



## CRT-5633 TORQMATIC TRANSMISSIONS

### I. Introduction

The CRT-5633 Transmission is a three speed forward, three speed reverse Powershift transmission designed for shovel loaders, fork lift trucks, compactors, motor graders, specialized mining equipment, rubber tire tractors, log loaders and similar cycling applications.

The CRT-5633 Transmissions consists of a torqmatic converter, constant mesh planetary gears, hydraulically actuated clutches, drop box and a self-contained hydraulic system consisting of a sump, control valve body and filters.

The CRT-5633-7 model is a special design that offers the same features as the standard CRT-5633 except for the deletion of the transfer case and oil sump.

The power input ratings for the CRT-5633 are as follows:

Maximum Net Input Torque (lb. ft.) - 900 (1220 Nm)

Maximum Input Speed (RPM) - 2500

Maximum Net Input Horsepower - 430 (320 Kw)

The above ratings are maximum and are intended primarily as guidelines. The rating for a given transmission application must be further modified by considering weight and duty. It is recommended that potential CRT-5633 applications be submitted to the Allison Sales Department for approval.

### II. Product Description

#### 1. Mounting:

- a. Direct Engine - SAE #1, wet type converter housing, ring gear and flywheel types dependent on the engine model, two side mounting pads.

- b. Remote - SAE #1, wet type converter housing, two side mounting pads, front trunnion mounting.

## 2. Torque Converter:

The following torque converter models and stall torque ratios are available:

	<u>Stall Torque Ratio</u>
TC-530	3.58
TC-540	2.95
TC-550	3.43
TC-560	2.74
TC-570	3.26
TC-580	2.67
TC-590	2.54

## 3. Output Configuration:

The CRT-5633-5 Transmission is standard with a drop box; however, it may be purchased without the drop box and a stub shaft output as a CRT-5633-7 Model.

The CRT-5633-5 Models offer dual outputs at the "C" and "D" positions. The standard drop box ratio for the CRT-5633-5 is 1.00:1 A 1.30:1 optional ratio is available.

## 4. Soft Shift:

The CRT-5633 provides the ability to shift at full throttle from forward to reverse and reverse to forward. This capability is achieved by improved clutch plates, adding plates in forward and reverse clutches and with a redesigned forward and reverse planetary ring gear. The valve body assembly now incorporates a modified clutch apply pressure to forward and reverse clutch, thus reducing shift shock.

## 5. Forward and Reverse Clutch Lubrication:

The CRT-5633 utilizes one of two methods of providing continuous positive lubrication to the forward and reverse dependent upon the application for which the transmission is used.

### a. Loader Version

Lubrication on the loader version is supplied from a positive displacement pump mounted on the rear power takeoff pad. The hose between the drop box suction port and the pump is supplied with the transmission. The hoses and filter between the pump and main housing lube pressure port are customer supplied.

NOTE: This auxiliary lube is required on all CRT-5633 used in loader applications.

### b. Non-Loader Version

Forward and reverse clutch lubrication is supplied from the regular transmission hydraulic circuit.

6. Control Valve Body

The CRT-5633 control valve body spools face the transmission input.

III. Optional Features

1. Flanges:

Input - 'A' Position (Remote mounted models only)

Spicer, 1700 Mechanics 7-C

Front Output - 'C' Position (Single or Dual Output Models)

Spicer 1800, Mechanics 8-C, 9-C

Rear Output - 'D' Position (Single Output Models)

Spicer 1800, Mechanics 8-C, 9-C

Dual Output - 'C', 'D' Position

Spicer 1800 w/PB, Mechanics 8-C w/PB, 9-C w/PB

2. Parking Brake (Dual Output Models only)

The parking brake is available at the Rear Output 'D' position only.

Type - Bendix 12 x 5" with or without drum.

Rating - 90,000 (10,170 Nm) inch lbs. (manufacturer's rating for run-in condition burnished).

3. Power Take-Offs

There are two engine driven PTO positions available on the CRT 5633 non-loader version and one PTO position on the loader version.

Side Mounted

Type - SAE Heavy Duty (Modified aperture), 8 bolt mounting.

Speed - Same as engine speed

Rating - Intermittent - 500 lb. ft. (680 Nm) up to 2100 RPM  
200 HP (150 Kw) above 2100 RPM

Continuous - 315 lb. ft. (430 Nm) up to 2100 RPM  
125 HP (95 Kw) above 2100 RPM

Rear Mounted (Non-loader version only)

Type - SAE 'C' Mounting flange

Speed - Same as engine speed

Rating - Intermittent - 500 lb. ft. (680 Nm) up to 2100 RPM  
200 HP (150 Kw) above 2100 RPM

Continuous - 315 lb. ft. (430 Nm) up to 2100 RPM  
125 HP (95 Kw) above 2100 RPM

NOTE: When both the side and rear PTO's are operated simultaneously, a combined maximum rating of 500 lb. ft. (680 Nm) or 200 HP (150 Kw) on an intermittent basis or 315 lb. ft. (430 Nm) or 125 HP (95 Kw) on a continuous basis must not be exceeded.

5. Speedometer Drive: (Not available on 1.3:1 Drop Box Ratio)

Type - SAE Heavy Duty  
 Shaft Speed - Equal to output speed  
 Rotation - Left hand, opposite output rotation

6. Clutch Cut-Off:

The hydraulic clutch cut-off option is actuated by hydraulic pressure tapped from the vehicle by hydraulic brake lines. The clutch cut-off control gives the same effect as the transmission being shifted to neutral when the brake pedal is depressed. When the brake pedal is released, the transmission continues operation in the selected range gear.

The air clutch cut-off option is similar to the hydraulic clutch cut-off except the brake pedal actuates an air cylinder instead of a hydraulic cylinder.

Oil Filter:

Integral mounted dual full flow oil filters are optional.

7. Transmission Breather:

A breather is not furnished as a part of the CRT-5633 Transmission Assembly. A combination breather-filler tube cap similar to A-C P/N 1528732 must be supplied by the customer. Under extremely dirty or severe operating conditions, a heavy duty breather is recommended. The A-C Division, GMC, manufactures a satisfactory breather, P/N 1553201, which is used by several customers.

The above referenced breathers are designed to fit a pipe or tube end with a 1.510-1.500 O.D. (38.4-38.1 mm) and .065 in (1.65 mm) wall thickness. The O.D. and I.D. of the pipe or tube should be finished back 1.25in (31.8 mm) from the end to provide for assembly.

IV. Specifications

1. Weight (dry lbs. - approximate):  
 2400 - 2500 # (1090-1130 kg) (dependent on model and options)
2. Rotation (Viewed from Input)  
 Input - Right Hand  
 Output - Same as Input
3. Input Inertia  
 Remote mounted - .9752 (lb.ft. sec<sup>2</sup>) (1.3222 Nm sec<sup>2</sup>)  
 Engine mounted - 2.3792 (lb.ft. sec<sup>2</sup>) (3.2257 Nm sec<sup>2</sup>)



**NOTE:** The input inertia values for engine mounted transmissions will vary with different flywheels and starter ring gear configurations. The above figures represent typical applications. These values are the inertia of the parts mechanically attached to the engine during converter operation.

#### 4. Transmission Gear Ratios:

<u>Gear Range</u>	<u>Forward</u>	<u>Reverse</u>
Low	3.04:1	3.17:1
Intermediate	1.51:1	1.57:1
High	0.76:1	0.79:1
Transfer Gear Ratio - (Standard) 1.00:1		
(Optional) 1.30:1		

#### 5. Oil System

Sump - Integral  
 Charging Pump - Positive Displacement, gear type  
 Oil Capacity - Initial Fill - 13.45 gal (49.2 litres) (approx.)  
                                   Refill - 11.2545 gal (42.6 litres) (approx.)  
 Oil Cooler Manifold - Inlet and outlet provided for remote oil cooler - Customer furnished.  
 Oil Type - Hydraulic Transmission Fluid Type C-3  
 Lubrication Pump - Positive Displacement, Gear Type (loader version only)  
 Main Oil Pressure - 130 to 140 PSI (896 to 965 kPa)

#### 6. Output Torque Limitations

Front Output - 11,000 lb. ft.  
 Rear Output - 11,000 lb. ft.

### V. References

#### 1. Sales Briefs

<u>Number</u>	<u>Subject</u>
9	Temperature and Pressure Gauges
37	Housing Gasket
42	Oil Recommendations
56	Paint Specification
65	Driveline Angularity

#### 2. Manuals

SA 1559	Parts Catalog
SA 1547	Service Manual
SA 1355	Operators Manual

3. Installation Drawings

<u>Numbers</u>	<u>Subject</u>
AS 00-001	Transmission Drive Adaptation
AS 00-002	Engine-Transmission/Converter Adaptation Requirements
AS 56-005	Side Power Take-Off-Option
AS 56-007	Implement Pump Drive Option
AS 56-015	Basic Installation Drawing-Loader Version
AS 56-016	Basic Installation Drawing-Non-Loader Option
AS 56-017	Output Option Without Transfer Housing-Non-Loader Option
AS 56-018	Auxiliary Lube Circuit
AS 56-019	Air Actuated Clutch Cut-Off Option
AS 56-020	Hydraulic Clutch Cut-Off Option
AS 56-021	External Hydraulic Circuit
AS 56-022	Cooler Oil Flow
AS 58-004	Remote Filter Installation
AS 58-035	Drive Flange Chart

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



Date March, 1977 No. 37E

5633, 5860, 5960, 6061

TORQMATIC TRANSMISSION HOUSING GASKET

This Sales Brief is being revised to present updated information.

For installations where any of the above referenced Torqmatic Transmissions are engine mounted, a gasket, Part No. 5181902 or equivalent is required between the engine flywheel housing and the converter housing of the transmission. All of these transmissions are for installation with a wet type flywheel housing. The installation diagrams illustrating the position of this gasket are AS 56-015 and 016 for the CRT-5633 model, and AS58-029 for the CLBT-5860, 5960, and 6061 models.

The housing gasket is a separate item and is not included as part of the transmission assembly. Therefore, the gasket must be specified on the original purchase order for the transmission or purchased as a service item from the Transmission Parts Department under Part No. 5181902.

In addition to the gasket, certain other conditions must be met to insure a satisfactory installation with a wet type flywheel housing configuration. They are:

1. Flywheel housing drain hole must be plugged.
2. The engine bellhousing must have a drain hole that lines up with the gasket bolt hole and the transmission housing drain hole as shown on AS 56-015 and 016 and AS 58-029.
3. Starter motor and crank end seal must be compatible to a wet housing configuration.

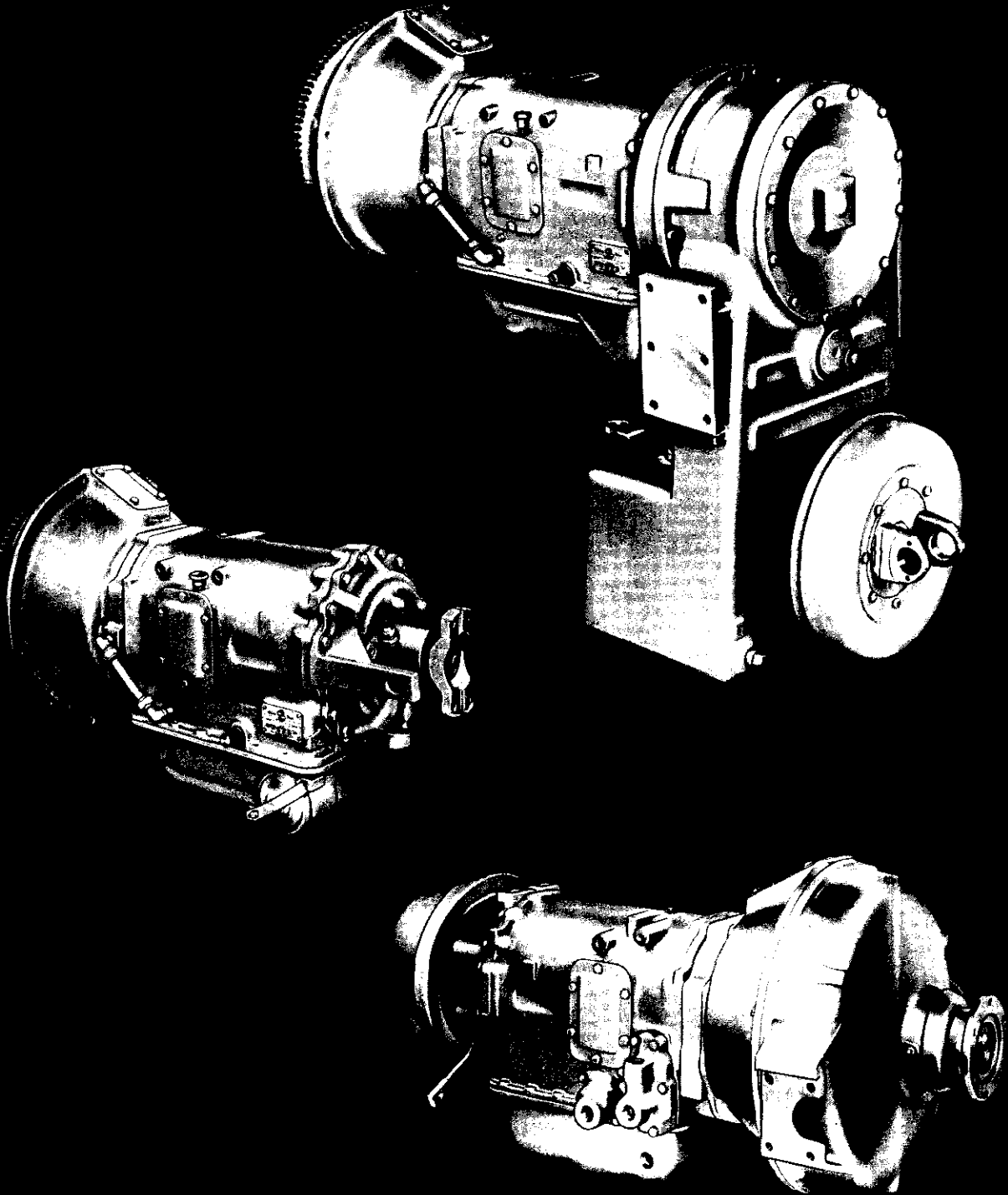




# Allison Transmissions

hauling model

C(L)T 3000  
100 to 200 hp  
(75 to 149 kW)



# specifications

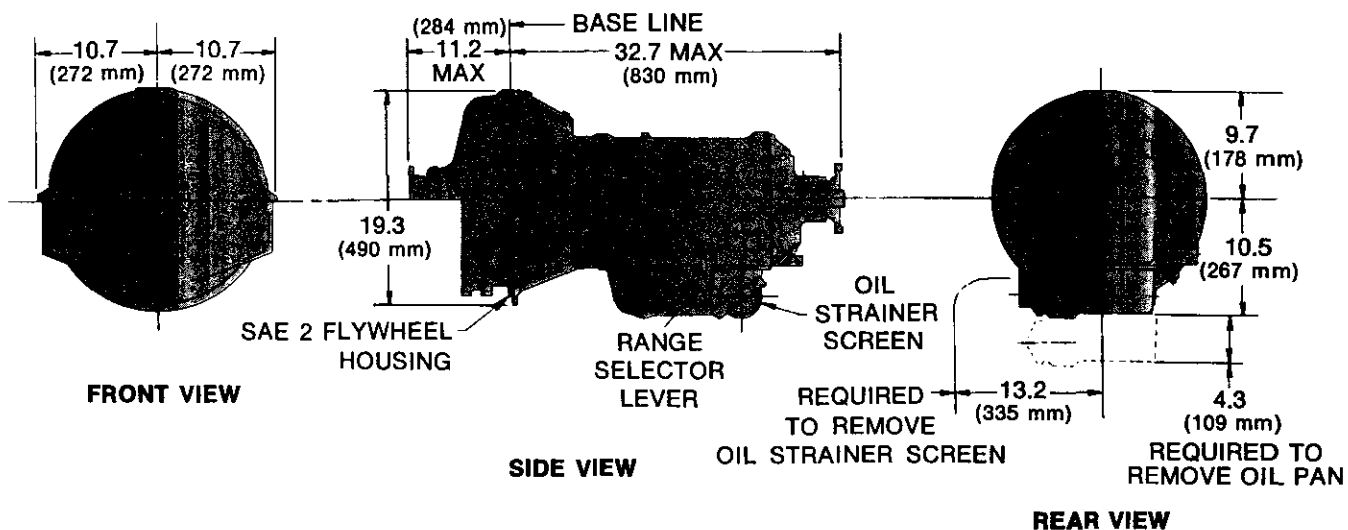
applicable power	Input	100 to 200 hp (75 to 149 kW)	
rating	Input speed, max	3000 rpm	
	Input torque, max (net): 3341, 3361 models 3441, 3461 models	350 lb ft (475 N·m) 400 lb ft (542 N·m)	
rotation	Input—right hand	Output—right hand (forward ranges)	
mounting	Direct mounted (dry converter housing)	SAE 2 flywheel housing with one mounting pad (straight through) or two mounting pads (transfer gear) at rear	
	Remote mounted	Input flange with two SAE 2 mounting pads at front and one mounting pad (straight through) or two mounting pads (transfer gear) at rear	
torque converter	Models	TC 420 3341, 3361 3441, 3461	TC 430 3341, 3361 VTC 430 VCLT 3341
	Type	Single-stage, 4-element, polyphase	Single-stage, 3-element, polyphase
	Stall torque ratio	2.94	3.58
	Lockup clutch, automatic (optional): 3341, 3441, 3361, 3461 models	3.57 (open); 2.55 (closed)	
gearing	Type:	Effective in all forward ranges, or all except first	
	Range gearing	Constant mesh, involute spur, planetary	
	Transfer gearing	Constant mesh, involute, in-line	
	Gear ratios:	3341, 3441 models	3361, 3461 models
	First	3.81	3.81
	Second	1.94	2.74
	Third	1.00	1.94
	Fourth	0.72	1.39
	Fifth		1.00
	Sixth		0.72
	Reverse (low)	4.35	4.35
	Reverse (high)	3.12	
	Transfer gear (-7 model only)	1.62	1.62
clutches	Hydraulic-actuated, spring-released, oil-cooled, multidisk, self-adjusting (automatic compensation for wear)		
flanges	Input (remote mounted)	Almetal R5; Spicer 1500, 1550, 1650, 1700; Mechanics 7C	
	Output	Mechanics 6C, 7C, 8C; Spicer 1500, 1600, 1700; Rockwell 5N, 6N	
parking brake	Size and type:	10½ x 3 in. (266 x 76 mm) contracting band; 12 x 4 in. (305 x 102 mm) internal-expanding shoe	
	Straight through models	13¾ x 2 in. (339 x 51 mm) internal-expanding shoe	
power takeoff	Transfer gear models		
	Side mounted:	Regular-duty SAE, 6-bolt (both sides)	
	Size	N, 1, 2, 3, and rev (low) at turbine speed; 4 and rev (high) at 1.39 x turbine speed	
	Speeds:	N, 1, 3, 5 and rev at turbine speed; 2, 4, and 6 at 1.39 x turbine speed	
	3341, 3441 models	80 hp (60 kW) at 3000 rpm	
	3361, 3461 models		
	Rating (either side or total of both)		
speedometer drive	Size	SAE 5/32 (3.96 mm) regular drive	
	Ratio	0.286 x Output speed	
control valve body	Either 4-speed or 6-speed and with or without lockup circuit		
oil system	Oil type	Hydraulic transmission fluid, type C-2	
	Capacity (excluding external circuit):	6 US gal (22.8 litres)	
	Straight through models	7½ US gal (28.4 litres)	
	Transfer case models	Integral	
	Sump	Remote mounted	
	Filter and cooler (customer furnished)		
size	Length, max	Straight through	Transfer case
	Width, max	43.85 in. (1113 mm)	50.47 in. (1280 mm)
	Height	21.42 in. (544 mm)	20.00 in. (508 mm)
	Weight	20.18 in. (512 mm)	36.94 in. (937 mm)
		600 to 700 lb (272 to 318 kg)	1086 lb (492 kg)

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

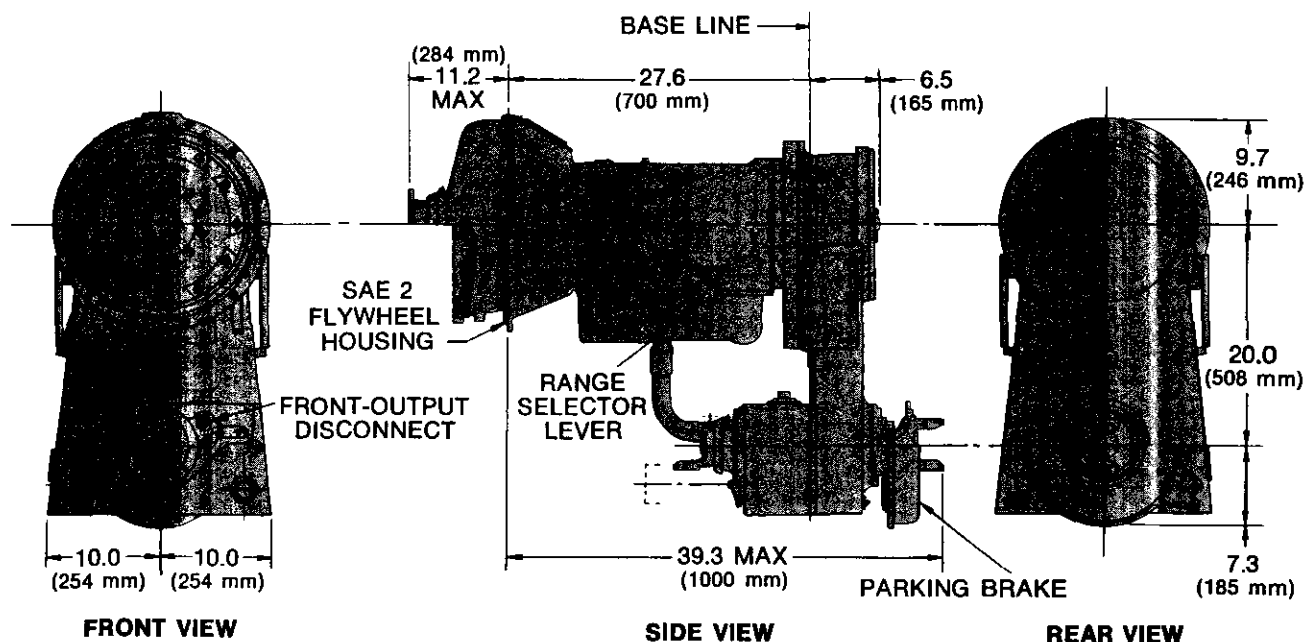
Note: All data and specifications subject to change without notice.

# mounting dimensions

## STRAIGHT THROUGH MODELS



## TRANSFER GEAR (-7) MODELS



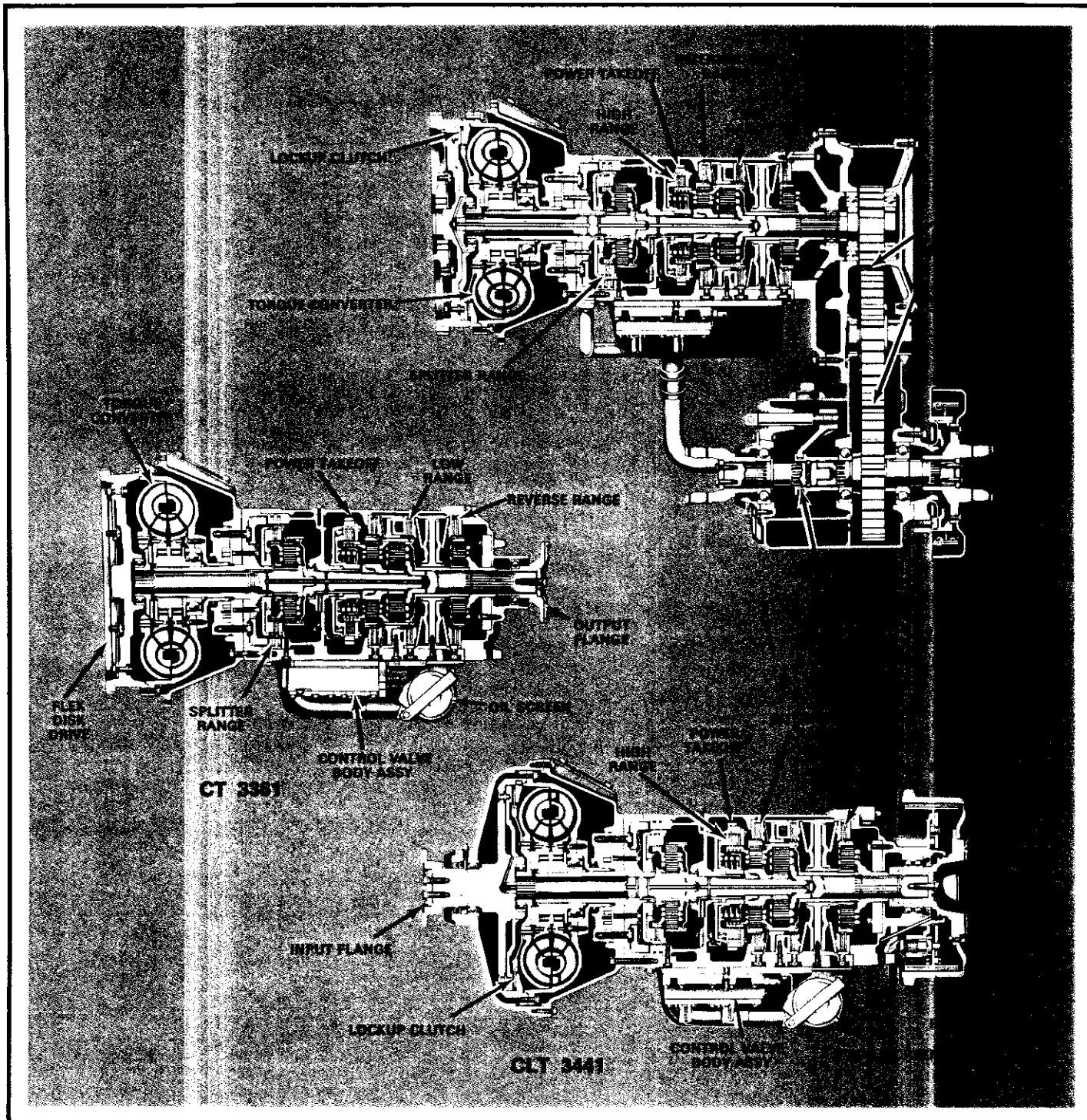
Note: Dimensions are given in inches with metric value in parenthesis.

## options

- Transmission remote mounted, or direct mounted on engine
- Automatic lockup clutch
- Variable input capacity converter
- Choice of 4 or 6 speeds forward
- Choice of popular drive flanges
- Parking brake
- Heavy-duty rear output
- Transfer gearing (-7 model)
- Front or rear output disconnects with transfer gearing



# C(L)T 3000 powershift transmission



**Detroit Diesel Allison**  
Division of General Motors Corporation

Indianapolis, Indiana 46206



## CT-CLT 3000 SERIES TORQMATIC TRANSMISSIONS

### I. INTRODUCTION

The CT-CLT 3000 Series Torqmatic Transmissions are designed and available for use with gasoline or diesel engines in the 125-200 HP range. The transmission is available as either a four (4) speed forward, two (2) speed reverse transmission or as a six (6) speed forward single speed reverse transmission. Both configurations are full power shifting transmissions equipped with hydraulic torque converter, constant mesh planetary gears and hydraulic controls.

Typical applications for the CT-CLT 3000 Series Torqmatic Transmissions are scrapers, graders, straddle carriers, rear dump trucks, tow tractors, material handling trucks, mobile cranes, oil well servicing rigs and snow plows.

A chart provided below, identifies the various CT-CLT 3000 Series models and lists the rating established for each model.

<u>Model</u>	<u>Maximum Net Input Torque Rating</u>	<u>Maximum Full Load Input Speed RPM</u>	<u>HP Range</u>
CT-CLT 3341	350 lb.ft.*	3000	100-175
CT-CLT 3361	350 lb.ft.*	3000	100-175
CT-CLT 3441	400 lb.ft.**	3000	150-200
CT-CLT 3461	400 lb.ft.**	3000	150-200

\*For agricultural applications, maximum input torque is limited to 275 lb.ft. net at engine governed speed.

\*\*For agricultural applications, maximum input torque is limited to 315 lb.ft. net at engine governed speed, but must be approved by the Allison Division Sales Department.

### II. PRODUCT DESCRIPTION

#### 1. Torque Converter

A single stage four element torque converter is provided in the CT-CLT 3000 Series Transmissions. The converter enables the engine to reach peak power quickly and to deliver full power without lugging or stalling the engine.

Listed below are the torque converter models available and their torque multiplication ratio.

<u>Transmission Model</u>	<u>TC Model</u>	<u>Ratio</u>
CT-CLT 3341 & 3361	TC-420*	2.94:1
CT-CLT 3341 & 3361	TC-430	3.58:1
CT-CLT 3441 & 3461	TC-420*	2.94:1
CT-CLT 3300 & 3400	VTC-430	3.57 - 2.55:1

\*For agricultural applications, the TC-420 converter elements only are available.

## 2. Gear Train & Ratios

Behind the torque converter is a constant mesh planetary gear train and hydraulically controlled clutches. The gear train will provide either four (4) speeds forward and two (2) speeds in reverse or six (6) speeds forward and single speed reverse depending upon which hydraulic control system is used on the transmission. Listed below are the transmission gear ratios.

<u>CT-CLT 3341 &amp; 3441</u>		<u>CT-CLT 3361 &amp; 3461</u>	
<u>Gear</u>	<u>Ratio</u>	<u>Gear</u>	<u>Ratio</u>
1st	3.81:1	1st	3.81:1
2nd	1.94:1	2nd	2.74:1
3rd	1.00:1	3rd	1.94:1
4th	.72:1	4th	1.39:1
R <sub>1</sub>	4.35:1	5th	1.00:1
R <sub>2</sub>	3.12:1	6th	.72:1
		R	4.35:1

## 3. Hydraulic Controls

The hydraulic control valve body is located in the transmission oil pan. The valve body is connected to the transmission shift tower in the cab of the vehicle. The valve body manual selector lever is on the left hand side of the transmission. This lever may be mechanically connected - cable or rod linkage - to the shift tower. Satisfactory applications have also been made using air controls between the transmission shift tower and valve body manual selector lever. Both the shift tower - which must be adequately gated for each range - and the control system between the valve body manual selector lever must be customer furnished.

A universal selector lever is supplied on each transmission which can be installed in a variety of positions on the selector shaft. If the installation requires the lever to be reindexed, it should be permanently stamped to facilitate field service. Refer to AS Drawings 34-004 and as 00-029 if the universal lever requires rework or relocation.

## 4. Mounting

Direct Engine - SAE #2 (Dry) Flywheel housing plus rear mount.  
 Remote - Two SAE #2 pads on either side of transmission front cover plus rear mount.

NOTE: Output configuration will dictate the type of rear mount necessary.

## 5. Output Configuration

Standard - Straight thru configuration with one of the following output housings:

10-1/2" bearing retainer - 3341 & 3361 engine mounted units only. (refer to AS 34-004)

Heavy duty bearing retainer - remote mounted 3341 & 3361's and all 3341 & 3461's. (refer to AS 34-009)

Optional - Transfer case - designated as a -7 model

2 output model - 1.62:1 ratio with manual sliding collar type disconnect on front output.

## 6. Speedometer Drive

10-1/2" bearing retainer - SAE 5/32 regular - speedo drive. Shaft speed = .286 x output speed.

Heavy Duty bearing retainer - speedo drive provision crossed axis spiral drive gear, 22 normal pitch 4 tooth.  
86° 17' 56" LH Helix angle  
22° 30' Normal pressure angle

NOTE: Driven gears, shafts and cables for the HD rear bearing retainer speedometer gear drive are available from Stewart-Warner. Direct inquiries to: Stewart Warner Corporation, 1826 Diversey Parkway, Chicago, Illinois.

## 7. Power Take Off (PTO)

Type - Converter driven  
Mounting flange - 2 SAE 6 bolt - main housing  
Rating - 80HP (60 kw) @ 3000 RPM-either side or total of both  
Ratio (PTO gear speed to turbine shaft speed)  
4 speed models  
    N (no load) 1st, 2nd, 3rd & R<sub>1</sub> - 1.00:1  
    4th & R<sub>2</sub> - 1.39:1  
6 speed models  
    N (no load) 1st, 3rd, 5th & R - 1.00:1  
    2nd, 4th & 6th - 1.39:1

## III. OPTIONAL FEATURES

The following options are offered with the CT-CLT-3000 Series Transmissions.

### 1. Lockup Clutch

All CLT models incorporate an automatic lockup clutch which, when engaged, locks the converter pump and turbine together and transmits full engine power mechanically to the transmission. In many applications this results in faster vehicle speeds and improved fuel economy.

On the four speed transmissions, the lockup clutch will engage automatically in 2nd thru 4th. It will not engage in 1st or either reverse range. On six speed transmissions the customer may elect to have lockup engage only in 2nd thru 6th gear rather than all forward gears. The lockup clutch will not engage in reverse.

## 2. VIP (Variable Input Power) Converter

The VIP converter is available as a VCLT 3000 Series transmission. The VIP converter provides two converter capacities in one; full or normal capacity to match full rated power of the engine and partial capacity to match available engine power when accessory loads are being utilized. The capacity is controlled by stator vane position (normal-open or partial capacity - towards closed) which is selected by an external control valve. The external valve can be actuated by mechanical, electrical, hydraulic or pneumatic means - as furnished by the vehicle manufacturer.

The VTC 430 model 3 element converter with a 3.57:1 torque ratio is available for the CLT-3000 Series. This feature is further explained in VIP Brochure SA1160.

## 3. Flex Disc Drive

All engine mounted CT-CLT 3000 Series are designed to accommodate flex disc drive. Several different flex disc assemblies with and without crankshaft adaptors are available from the Allison Division. Contact the Transmission Sales Department for further information.

## 4. Push Start Pump

A push start pump is available for straight thru applications where required.

## 5. Parking Brakes

10-1/2" bearing retainer	10-1/2 x 3 Clark brake
HD bearing retainer	12 x 4 Timken
-7 transfer case	13-3/8 x 2 on rear output flange only

## 6. Flanges

<u>Input Flanges</u>	<u>Straight Thru* Output Flanges</u>	<u>Transfer Case*</u>	
		<u>Front Output</u>	<u>Rear Output</u>
Almetal R-5	Spicer 1600	Mech 6-C	Mech 6-C
Spicer 1550	Spicer 1500	Mech 7-C	Mech 7-C
Spicer 1500	Mech 7-C	Mech 8-C	Mech 8-C
Spicer 1650		Spicer 1500	Spicer 1500
Spicer 1700		Spicer 1600	Spicer 1700
Mech 7-C		Rock 5N Plain	Rock 5N Spec
		Rock 6N Plain	Rock 6N Spec

\*NOTE: The use of parking brakes and/or disconnect clutches will dictate flange availability.

Ref. AS 33-010 & AS 34-017

#### IV. SPECIFICATIONS AND DATA

##### 1. Inertia Rating (engine mounted models only)

CT Models .925 lb.ft.sec<sup>2</sup> (est)  
 CLT Models 1.032 lb.ft.sec<sup>2</sup>

NOTE: The input inertia values for engine mounted transmissions will vary somewhat with different flywheel and starter ring gear configurations.

The above referenced figures are representative of typical applications.

These values represent the inertia of the parts mechanically attached to the engine during converter operation and do not include a correction for the effect of the torus oil mass.

##### 2. Oil System

Oil Type - Hydraulic transmission fluid type C-3

Capacity - 7 gallon exclusively of external hydraulic circuit

Oil Check - Customer provided fill tube and dipstick for oil pan on straight thru models. -7 Models are equipped with oil level check plug in transfer case and can be customer equipped with fill tube and dipstick. The recommended oil level check procedure is as follows:

- Transmission range - neutral
- Transmission oil - Operating temperature (150°-200°F. sump temp.)
- Engine speed - Idle (approx. 600 RPM)

Before checking, the transmission should be shifted into all ranges to assure full charging to the transmission, and the engine speed should be increased in speed sufficiently to assure full charge to all external circuits. (1200 + RPM). Checking of the oil should be no more than one (1) minute after engine has been reduced to idle speed.

The safe operating range for the transmission oil level is from the add mark to the full mark.

Temperature - 250°F. maximum converter out

Filters - 1 AC PF132 or equivalent in converter out line required

Cooler Lines - 5/8" minimum I.D. lines

##### 3. Instrumentation

Pressure Gage - Optional-maximum 250 PSI operating pressure - Ref. Sales Brief No. 9.

Temperature Gage - Required - Ref. Sales Brief No. 9.

4. Dry Weight (Lbs. - Approximate)

Straight thru models	600-700 lbs. (272 to 318 kg)
-7 transfer case models	1086 lb. (492 kg)

5. Driveline Angularity

Maximum 5° - compound angle

V. ADDITIONAL REFERENCE MATERIAL1. Sales Briefs

<u>Number</u>	<u>Subject</u>
9	Temperature and Pressure Gages
42	Oil Recommendations
56	Paint Specifications
65	Driveline Angularity

2. Manuals and Catalogs

<u>SA Number</u>	<u>Publication</u>
SA 1096	Service Manual
SA 1079	Parts Catalog
SA 1354	Operators Manual

3. Match Charts

<u>SA Number</u>	<u>Converter Model</u>
SA 1193	TC-420 - 4 element
SA 1194	TC-430 - 4 element
SA 1205	VTC-430 - 3 element

4. Installation Drawings

<u>Drawing No.</u>	<u>Subject</u>
AS 00-001	Master Physical Adaption Chart
AS 00-029	Selector Lever Chart
AS 33-010	Drive Flange Option Chart
AS 34-001	Cooler Oil Flow
AS 34-002	Installation Diagram - Transfer Gear Output
AS 34-004	Installation Diagram
AS 34-005	Remote Input Option
AS 34-006	External Hydraulic Circuit
AS 34-007	Side PTO
AS 34-008	Output Parking Brake Option
AS 34-009	Heavy Duty Output
AS 34-010	Recommended Remote Mount Configuration
AS 34-014	Six-Speed Manual Control Valve Option
AS 34-015	Air Control Shift Requirements
AS 34-017	Drive Flange Option Chart
AS 34-018	Variable Capacity Converter, Air Control Option
AS 34-021	Optional Deep Sump Pan

5. Installation Manual - Off-Highway Transmission Sales Department,  
Detroit Diesel Allison Division of General Motors Corporation,  
P. O. Box 894, Indianapolis, Indiana, 46206.



**Allison  
Powershift  
Transmissions**

**Operators  
Manual**

**3000 Series**



**CT, CLT, VCLT—3341, 3441**

**CT, CLT, VCLT—3361, 3461**

# OPERATING INSTRUCTIONS

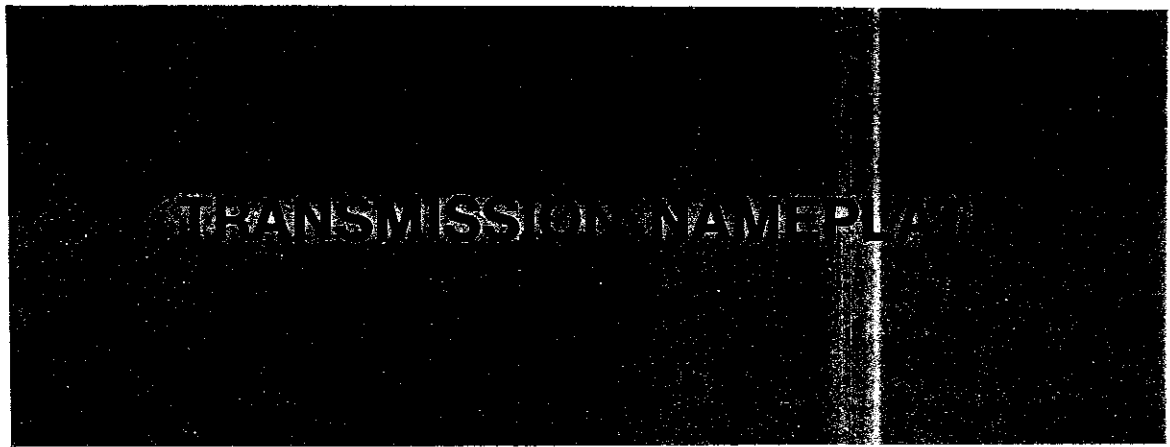
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Your vehicle is designed to work efficiently, at low cost, and with the greatest possible ease. Each component was carefully selected for its ability to meet the design criteria. As a result, your vehicle is equipped with an Allison Powershift 3000 Series transmission.

# **OPERATING INSTRUCTIONS**



The nameplate is located on the lower left rear corner of the transmission housing (see illustration). This plate displays the model number, part number, and serial number of the transmission. Use *all three* numbers when seeking information or ordering replacement parts for this transmission.

For a handy reference, why not record the information on 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 this series of transmissions represents the following features.

## Prefix Designation

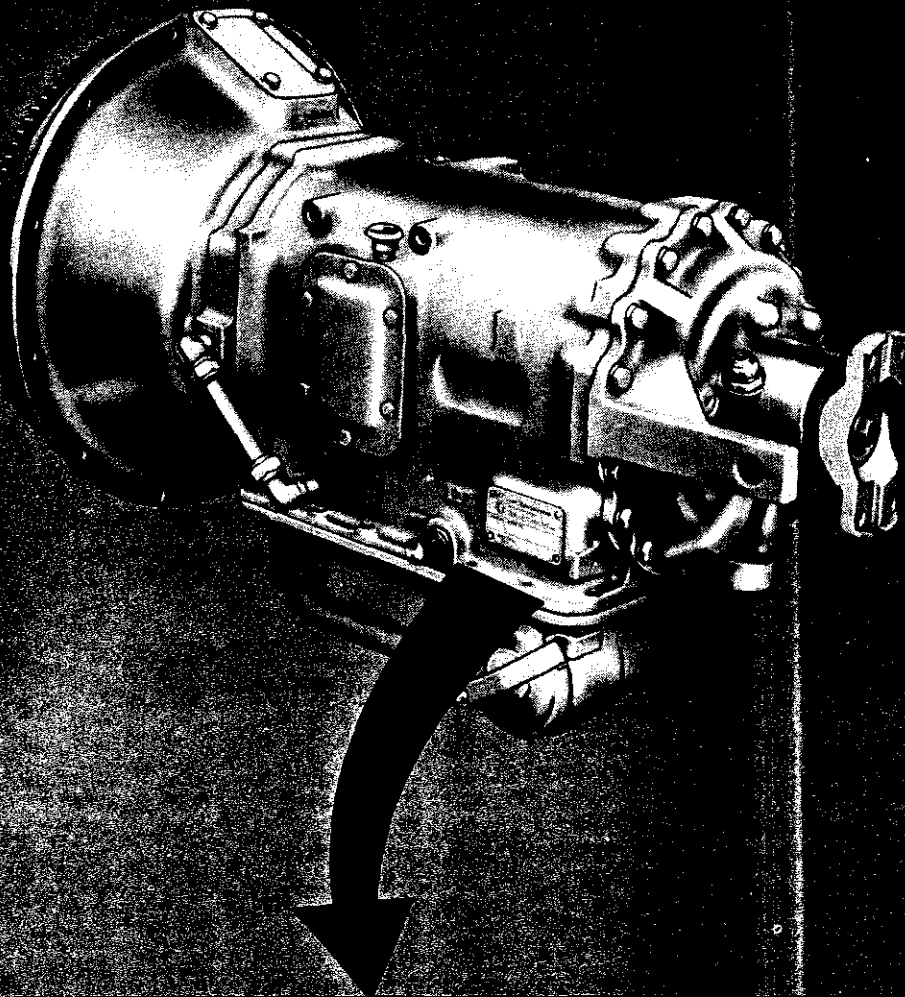
VC—Variable-capacity converter  
C—Converter (fixed capacity)  
L—Lockup clutch  
T—Transmission







## Model Designation

3—Transmission series (3000 Series)  
3 or 4—Standard duty (3) or Heavy duty (4)  
4 or 6—Forward speed ranges (4) 4-speed or (6) 6-speed  
1—First significant model change

## Suffix Designation

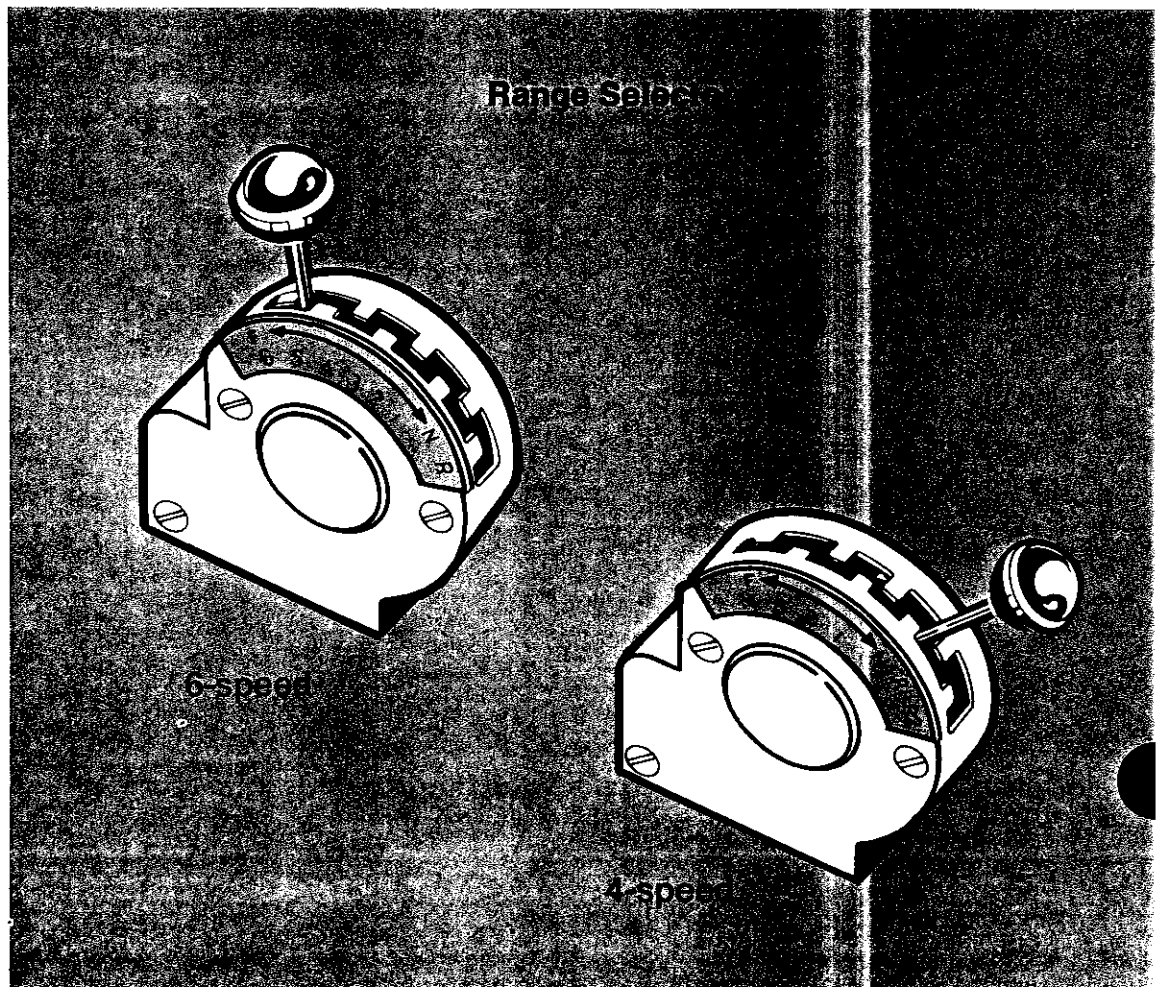
1, 4, 5, or 6—Type of rear mounting  
7—Drop-box (transfer gear housing)



		<b>Allison Transmission</b>	
		Manufactured By	
		<b>Detroit Diesel Allison</b>	
		Division of General Motors Corporation	
		Indianapolis, Indiana	
SERIAL NO.	PART NO. 		
	MODEL NO.		

# THE RANGE SELECTOR

The transmission is controlled by a single range selector lever. The Allison Powershift eliminates the need for a mechanical disconnect clutch during gear changes. The selector lever and its quadrant are shown here. The quadrants shown here are typical for the 4-speed and 6-speed Powershift transmissions. Although your vehicle may have some other designation on the quadrant, the sequence will remain the same.





# OPERATION

## OIL LEVEL CHECK

Before starting the engine, check to ensure that there is sufficient oil in the sump. (Refer to the Oil Level Check Procedures within this manual.)

## STARTING

To start the engine, place the range selector lever in neutral position, and actuate the starter. A neutral start switch (if used) will prevent the engine from starting if the selector lever is in any other range position. (When ambient temperature is below  $-10^{\circ}\text{F}$ , an auxiliary preheat is required to raise the oil temperature in the sump and external circuits.)

## RANGE SELECTION

Generally, satisfactory operation of the vehicle depends largely on the operator's judgement in selecting the proper range for the various operating conditions. To develop that judgement, the following guide lines are presented—applying these guide lines will permit the power package to produce at peak performance.

- When shifting from neutral to low (1st) range, always idle the engine.
- When moving the vehicle from a full stop, always start in low (1st) range.
- Select an operating range that permits the engine to operate at full throttle and at near governed speed during greatest load conditions.

## **Full-Power Range Shifts**

- If the engine consistently reaches governed speed during full throttle operation, shift to the next higher range.
- If the engine fails to reach governed speed during full throttle operation, shift to the next lower range.

- Any upshift to a higher speed ratio, in the same direction, can be made at full throttle and load. For most vehicles, the best performance can be obtained by making the shifts at near engine governed speed. For some vehicles, however, it may be desirable to momentarily release the throttle until shift is made.

- Any downshift to a lower speed ratio, in the same direction, can also be made at full throttle and load, but not at a speed higher than the speed limit for the desired lower ratio. Failure to observe the downshift speed limitations will result in excessive over-speeds and damage to the engine and transmission.

## **Directional Shifts**

- When shifting from forward to reverse or reverse to forward, the throttle should be closed and the vehicle braked to a full stop.
- After the shift to the opposite direction has been made, the throttle may be opened again to the desired setting.

## **Temporary Stops**

- During normal operation, it is not necessary to shift to neutral during temporary stops. While the vehicle is stopped, the operator should select low range and hold the unit with the service brake until he is ready to resume operations.

# CONVERTER-DRIVEN POWER TAKEOFFS

A pad for a converter-driven power takeoff is located at each side of the transmission housing. (Models with a variable-capacity converter have a PTO pad on left side only.) An accessory, such as a pump, may be attached to either or both of the PTO mounting pads. The driven accessory may be in constant mesh with the PTO gear or it may have a disconnect mechanism. If a disconnect mechanism is used, use the following procedures to engage or disengage the accessory.

## Engagement

- Idle the engine, apply the service brakes, and shift to any selector position other than neutral. This will stop rotation of the PTO drive gear within the transmission. Then engage the accessory gear with the PTO drive gear. If these gears do not mesh and engagement is prevented, allow the vehicle to creep slightly while maintaining engagement pressure. Engagement will occur with correct tooth alignment.

*CAUTION: Do not attempt to force engagement by clashing the gear teeth. This practice can cause damage not only to the accessory but also to the transmission.*

## Neutral Operation

- Shift to neutral, and increase engine speed until the desired PTO speed is attained.

## Drive-Range Operation

- Shift to the desired range and drive the vehicle. During this type of operation, the speed of the PTO will remain approximately constant in relation to engine speed, regardless of the selected operating range.

## Disengagement

- If the vehicle is in neutral operation, release the throttle and allow the engine to idle. After the PTO-driven equipment comes to a stop, disengage the PTO.

## OUTPUT DISCONNECTS

- If the vehicle is moving in a driving range, the PTO-driven equipment may be disengaged when it is no longer required, *and* there is no load on the PTO gear. When these conditions are met the PTO gear can be pulled out of engagement.

On some drop-box models, an output disconnect may be located at the upper rear and/or lower positions of the transfer gear housing. An output disconnect may also be provided for the front output. The drive at these locations is provided by the transmission output shaft, and therefore, equipment driven by these output locations will operate only when the vehicle is moving.

Controls for these output disconnects vary with vehicle design requirements. They may be simple, direct mechanisms, or may be linked indirectly with another control. In either case, the following procedure remains the same.

- Apply the service brakes and bring the vehicle to a full stop. Then, actuate the engagement mechanism. During engagement, it may be necessary to allow the vehicle to creep slightly to align the driveline splines for positive engagement.
- Select the desired operating range and drive the vehicle.

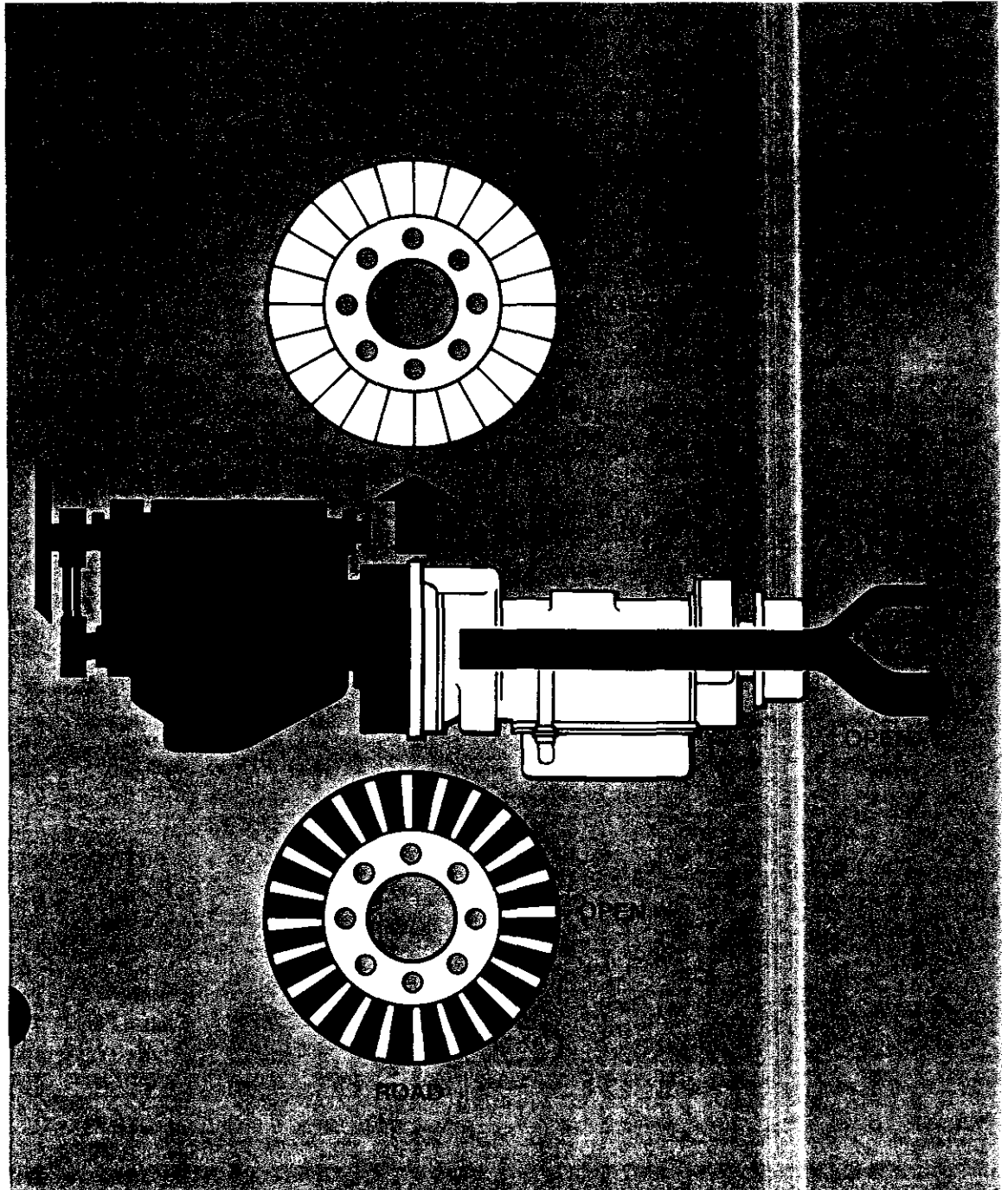
*NOTE: The output speed at these power take-offs will increase as the speed of the vehicle increases.*

- When PTO operation is no longer required, apply the service brakes, and bring the vehicle to a full stop. Then, actuate the control to disengage the PTO.

## VARIABLE-CAPACITY CONVERTER

Some transmissions are equipped with a variable-capacity converter. This type converter has stator vanes that can be "opened" and "closed" (change of blade angle) to meet different power requirements. The stator vanes may be actuated, regardless of engine speed,

any time from either position. When the vanes are "open," full engine power is directed into the vehicle driveline. When the vanes are "closed" (partially), a predetermined percentage of power is diverted from the driveline and directed into an engine-driven PTO. Thus, during operation of the PTO-driven equipment, the operator will notice a decrease in vehicle drive performance.



## CONVERTER LOCKUP CLUTCH

Some transmissions are equipped with a lockup clutch. This clutch is automatically controlled to engage or disengage at predetermined vehicle speeds within specified operating ranges (see chart). During low-speed, high-torque operation the lockup clutch is disengaged to allow the converter to multiply torque. During high-speed, low-torque operation the lockup clutch is engaged to provide a direct drive to the transmission range gearing. If the lockup clutch is engaged when upshifts or downshifts are made, the clutch automatically disengages to allow the converter to act as a fluid coupling and absorb the shock of the gear change.

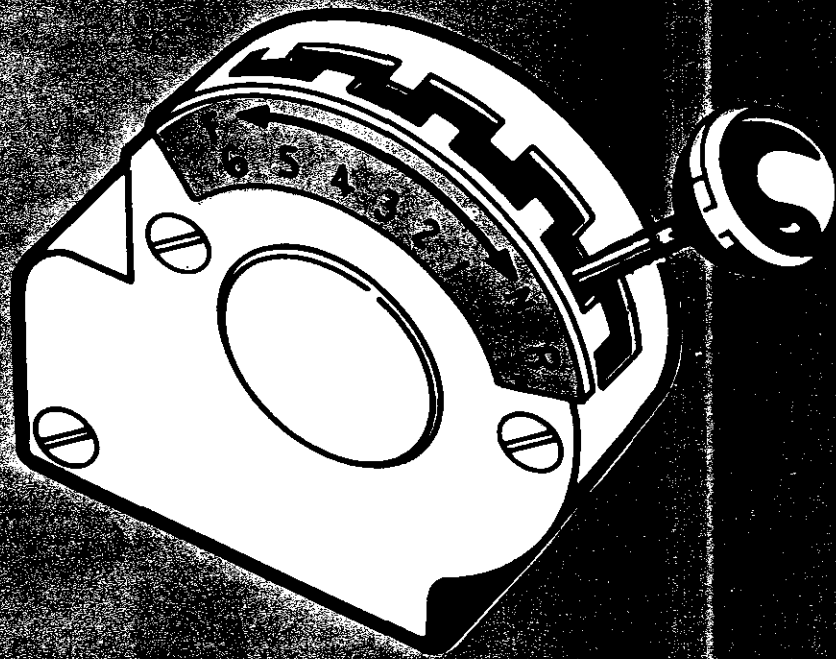
Operating range	Effective lockup ranges	
	4-speed	6-speed
Neutral	No	No
First	No	Yes*
Second	Yes	Yes
Third	Yes	Yes
Fourth	Yes	Yes
Fifth	—	Yes
Sixth	—	Yes
Reverse 1	No	No
Reverse 2	No	—

\*Some models do not have lockup in first gear

## TOWING OR PUSHING

Before towing or pushing a disabled vehicle ALL transmission output drivelines should be disconnected or the drive wheels lifted from the road. The engine cannot be started by pushing or towing.

If, however, the transmission is equipped with an output-driven oil pump assembly, the vehicle may be pushed or towed safely. First determine that the trouble is not in the transmission, then shift to neutral, and SLOWLY move the vehicle to the repair area. (If the transmission is suspect, prepare the vehicle as described in the preceding paragraph.)



## 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.

# TEMPERATURES

The normal operating temperature range for these transmissions is 180-220°F. This temperature is indicated by either a transmission oil temperature gage or the engine coolant temperature gage. When an over temperature condition is indicated, stop the vehicle and determine the cause. Refer to the Troubleshooting portion in this manual for the possible causes of and remedies for overheating.

The most common, and easily remedied, causes of overheating are due to extended operation under over-loaded conditions, or neglecting to downshift, when necessary, to match the load. When these conditions have caused overheating, shift to neutral and run the engine at 1200-1500 rpm until the temperature returns to normal.

# PRESSURES

The normal pressure range for 4-speed transmissions is 100-190 psi. The normal pressure range for 6-speed transmissions is 90-200 psi. During normal operation, the pressure will fluctuate during range shifts. During high load, low speed operation the pressure will be near the high end of the operating range. Conversely, during low load, high speed operation the pressure will be near the low end. Reverse operation will cause the pressure to be higher, but it should not exceed 250 psi for 4-speed models, or 260 for 6-speed models.

Although abnormal pressures may occur temporarily during certain operating conditions, consistently abnormal pressures require investigation. Refer to the Troubleshooting portion in this manual.



# **MAINTENANCE INSTRUCTIONS**

# INSIDE THE 3000 SERIES

## **Torque Converters**

The fixed-capacity and variable capacity torque converters function as a torque multiplier and as a fluid coupling, depending upon load and operating conditions. The variable capacity converter has the additional capability to divert a portion of the engine horsepower to the vehicle-furnished power takeoff.

## **Lockup Clutch**

The automatically controlled lockup clutch is designed to hydraulically engage and disengage at predetermined vehicle speeds. When engaged, the clutch connects the engine directly to the range gearing. When disengaged, the converter is free to act as a torque multiplier or as a fluid coupling.

## **Planetary Gearing**

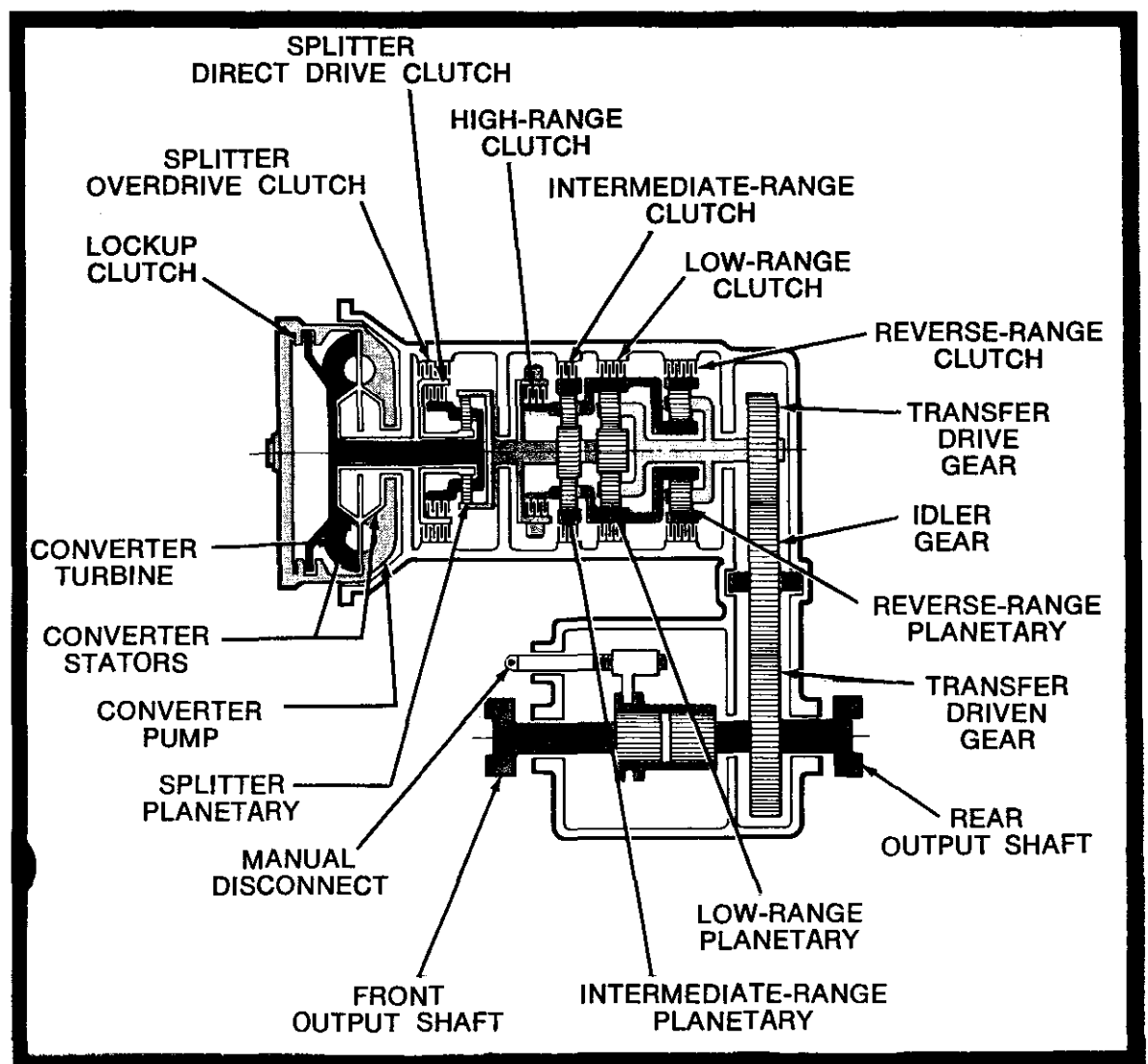
The planetary gear train consists of four, constant mesh, spur gear sets. The forward set is the splitter planetary, and the three rear sets are the intermediate-, low-, and reverse range planetaries. These planetaries are combined with six clutches to produce either four speeds forward and two speeds reverse, or six speeds forward and one speed reverse. (The specific four-speed or six-speed combination is determined by the control valve body assembly and its related parts.) The operator controls the application of the various clutch combinations by moving the range selector lever.

## Drop-Box Models

Some models are equipped with a transfer gear housing which places the transmission output 20 inches below the input centerline. The transfer gear housing also permits a forward output. Manual disconnects may be provided, depending on the drop-box configuration, at the front output, lower rear output, and upper rear output locations.

## Hydraulic System

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



# TROUBLESHOOTING

The operator must be alert to evidences of poor performance of the vehicle. The remedy, in some cases, may be beyond the on-site technical skills or tools. 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.

## Ⓐ 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. External oil leakage	4. Tighten bolts, fittings; replace gaskets
5. Internal wear or failure	5. Overhaul transmission, or repair subassembly

## Ⓑ OVERHEATING

1. Improper 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 coolant overheated	5. Correct engine overheating
6. Cooler oil or water line kinked or clogged	6. Clean or replace line
7. Operating in wrong gear	7. Downshift to a lower gear
8. Internal failure	8. Overhaul transmission or repair subassembly

9. Range selector linkage out of adjustment
10. Vehicle brakes dragging

9. Adjust linkage

10. Check service and parking brakes

**© AERATED (foaming) OIL**

1. Incorrect type oil used
2. High oil level
3. Low oil level
4. Air leaks at input oil pump(s)

1. Change oil; use proper type
2. Restore proper oil level
3. Restore proper oil level
4. Repair oil pump(s)

**Ⓓ LOSS OF POWER**

1. Engine malfunction
2. Aerated oil
3. Range selector linkage out of adjustment
4. Low clutch apply pressure
5. Internal wear or failure
6. Failure in variable-capacity converter
7. Failure in variable-capacity converter controls

1. Refer to engine service manual
2. Refer to ©
3. Adjust linkage
4. Refer to Ⓐ
5. Overhaul transmission, or repair subassembly
6. Repair or replace
7. Repair or replace

**Ⓔ VEHICLE WILL NOT TRAVEL**

1. Low clutch apply pressure
2. Range selector linkage broken or out of adjustment
3. Internal failure
4. Final drive failure

1. Refer to Ⓐ
2. Repair or adjust linkage
3. Overhaul transmission
4. Refer to vehicle service manual

**Ⓕ VEHICLE DRIVES IN SOME RANGES AND STALLS IN OTHERS**

1. Failed clutch(es)

1. Replace clutch(es)

**Ⓖ VEHICLE WILL NOT OPERATE IN LOCKUP (lockup models only)**

1. Internal wear or failure

1. Repair or replace control valves or piston sealings

**Ⓗ LOSS OF POWER AT ENGINE-DRIVEN PTO (VCLT model only)**

1. Low clutch apply pressure
2. Failed actuating device
3. Defective stator control valve assembly
4. External oil leaks
5. Defective stator vanes

1. Refer to Ⓐ
2. Repair or replace
3. Repair or replace
4. Tighten bolts and fittings; replace gasket
5. Repair or replace

# CARE AND MAINTENANCE

## PERIODIC INSPECTION

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

For easier inspection, the transmission should be kept clean. Make periodic checks for loose bolts and leaking oil lines, oil seals, and splitlines. Check the engine cooling system occasionally for evidence of transmission oil which would indicate a faulty oil cooler. Regularly check the control linkages to the range selector valve. Also check the linkages for the driveline disconnects (if used).

## MAINTAIN 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 oil supply. This condition can result in poor performance or transmission failure. If the level is too high, the oil will become foamy. This can result in overheating during normal operation.

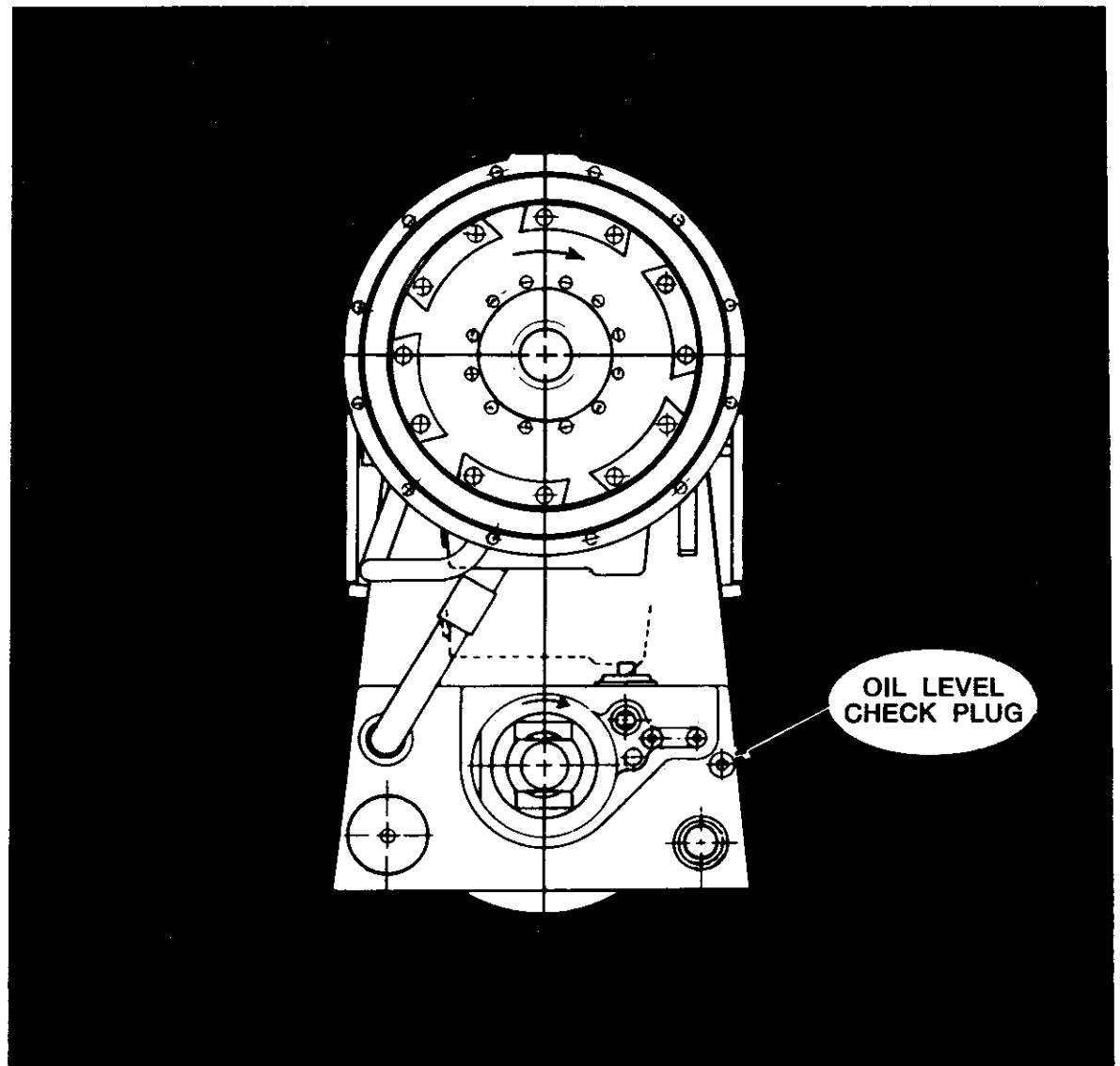
Engine speed and oil temperature cause the oil level to vary significantly—an increase in oil temperature raises the level; an increase in engine speed lowers the level. Therefore, it is important that the procedures described in the Cold and Hot Checks be followed.

# OIL LEVEL CHECK PROCEDURES

## Cold Check

The cold check is conducted to determine if there is sufficient oil in the sump for safe starting.

- Remove the dipstick and observe the oil level line. If the oil is at the Full mark, or slightly above, there is sufficient oil to permit a safe start. Add oil, if necessary, to bring the level to the Full mark.
- On the drop-box models without a dipstick, remove the oil level check plug from the transfer gear housing. A flow of oil from the hole indicates sufficient oil to permit a safe start. Add oil, if necessary, to cause a flow from the oil level hole.



## Hot Check

The hot check is conducted to determine if, after thermal expansion of the oil has occurred and the hydraulic circuits are fully charged, a sufficient volume of oil is present in the sump.

- Bring the transmission to *normal* operating temperature (usually 150-200°F). It is recommended that the vehicle be operated in its normal work cycle to insure that the temperature has stabilized at a point that is normal for the transmission.
- Stop the vehicle and operate the engine at 1200 to 1500 rpm to keep the hydraulic circuits fully charged.
- Then within the time span of 1 minute idle the engine, shift to neutral, and check the oil level. A time span of greater than one minute will allow drainage to return to the sump which will result in an incorrect check level.
- The proper oil level, between the Add and Full marks, should be indicated on the dipstick. Add or drain oil as required to bring the level within the proper range.

*CAUTION: On in-line models, it is important not to add oil above the Add mark until the transmission has been run long enough to reach its operating temperature.*

- On drop-box models without dipsticks, remove the oil level check plug from the transfer gear housing. The oil should be level with the plug hole in the housing. Add or drain oil to bring the level to the plug hole.

## OIL SPECIFICATION

Only Type C-2 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 Type C-2 fluids have been approved for Allison Powershift transmissions. 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 500 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. Also change the oil any time it shows evidence of contamination.

### Oil Contamination

Metal particles in the oil (except for minute particles trapped in the oil filter) indicate damage has occurred in the transmission. When these particles are found in the sump or on a magnetic drain plug, the transmission must be disassembled and closely inspected to find the source. Metal contamination also requires complete cleaning of all transmission components, internal and external hydraulic circuits, cooler, filter, and any other areas where particles could lodge.

At each oil change examine the drained oil 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.

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.

- **On in-line models with a deep sump,** remove the magnetic drain plug (see illustration), and examine the plug for evidence of metal contamination. Discard the drain plug gasket. Remove the filter cover and related parts. Remove and discard the disposable filter.
- **On in-line models with a standard sump,** remove the screen cover and related parts. Remove the oil screen and remove the gaskets from each end. Clean the screen in mineral spirits and dry it with compressed air. Inspect the sealings to determine they are suitable for reuse.
- **On drop-box models,** remove the drain plug (see illustration). Remove the oil screen cover and related parts. Remove the oil screen and clean it in mineral spirits. Dry the screen with compressed air.

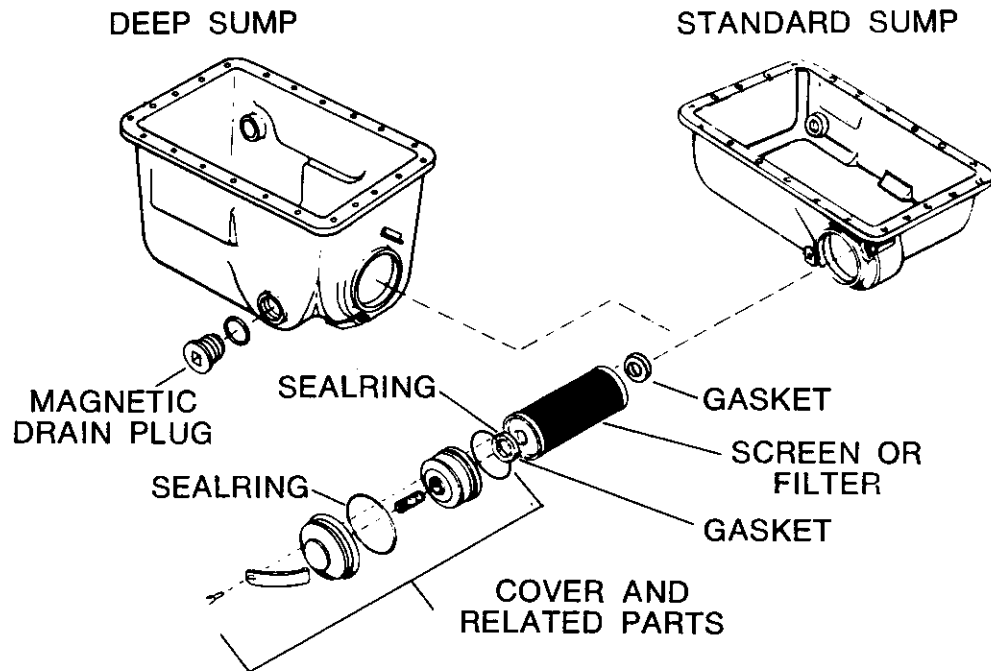
## Refilling Oil Sump

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

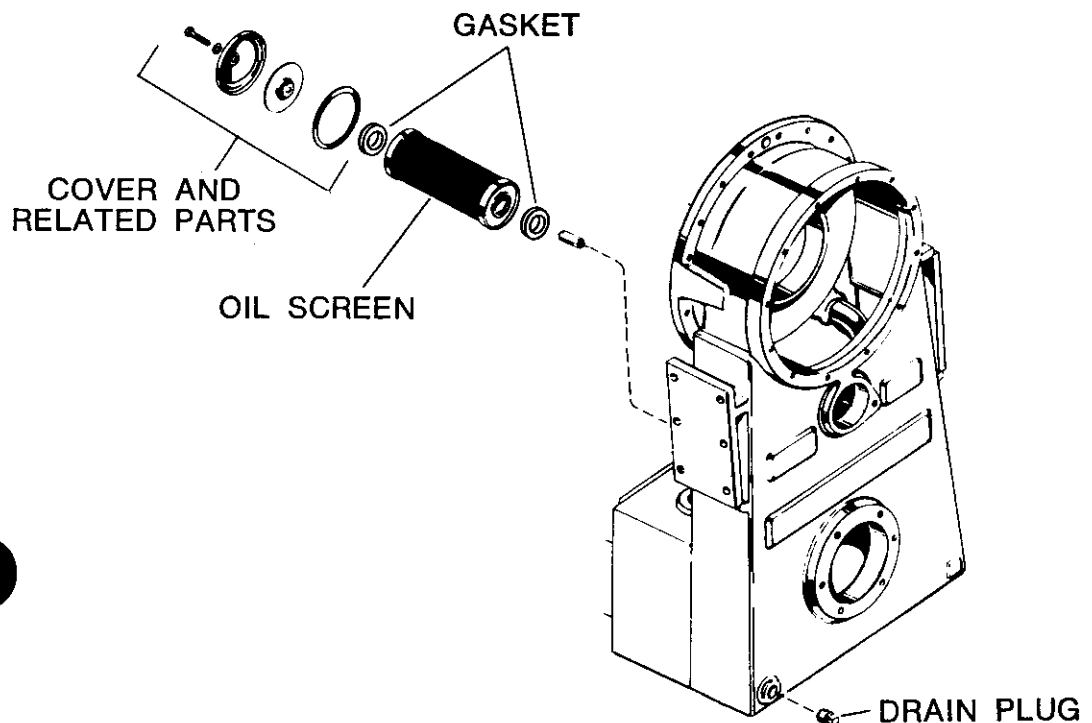
- **On in-line models with a deep sump,** install the magnetic drain plug and new gasket. Tighten the plug sufficiently to crush the gasket and prevent leakage. Install the two sealings and a new oil filter. Retain the screen assembly with the cover and its related parts. Tighten the cover bolt to 11-14 lb ft torque.
- **On in-line models with a standard sump,** cement a new gasket to each end of the screen. Allow the cement to cure, and install the two sealings and the screen assembly. Retain the screen assembly with the cover and related parts. Tighten the cover bolt to 11-14 lb ft torque.

- On drop-box models, install the drain plug, and tighten it sufficiently to prevent leakage. Install the oil screen, and retain it with the cover and related parts. Tighten the cover bolt to 8-10 lb ft torque.

## In-Line Models



## Drop-Box Models



## Refill Capacity

Transmission	US Gallons*
Deep sump	7
Standard sump	5½
Drop-box sump	5½

\*This volume of oil does not include the amount required to fill the external filters and circuits.

Add the required amount of oil, and check for leaks at the drain plugs and the filter and screen covers. Conduct the oil level check (cold and hot), as previously described, and reinspect for leakage.

## CHECKING AND ADJUSTING LINKAGE

Refer to the vehicle manual for specific instructions. The design of control linkages for the output disconnect (drop-box models only), range selector, and parking brake depends on the particular installation. Because the control linkages are provided by the manufacturer, only general instructions for adjustment can be provided in this manual.

Periodically check the linkage for binding and for worn, cracked, or bent parts; check the condition of the cotter pin. Replace any defective parts.

## Range Selector

The selector linkage must be adjusted so that the markings on the operator's control coincide with the position of the selector valve.

- Make the initial adjustment for the neutral position.
- Then shift through all range positions to make sure the selector valve is in full detent position for each marking on the operator's control.

## Output Disconnects drop-box models only)

The adjustment of the disconnect shaft is a two-step procedure. The disconnect shaft must be adjusted first, then the control linkage must be adjusted to 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 the housing) to the engaged position. (A spring-loaded detent will indicate positive engagement.)
- Adjust the distance the shaft protrudes from the housing by rotating the shaft.
- **For the front disconnect**, rotate the shaft, as necessary, until the center of the clevis pin hole is  $\frac{5}{8}$  inch from the surface of the housing.
- **For upper-rear and lower-rear disconnect**, rotate the shaft, as necessary, until the center of the clevis pin hole is  $\frac{3}{4}$  inch from the rear surface adjacent to the shaft seal.
- Attach the control linkage and adjust it so that the engaged and disengaged positions of the disconnect shaft correspond exactly with the same positions on the operator's control.

## Detroit Diesel Allison (DDA)- furnished Parking Brakes

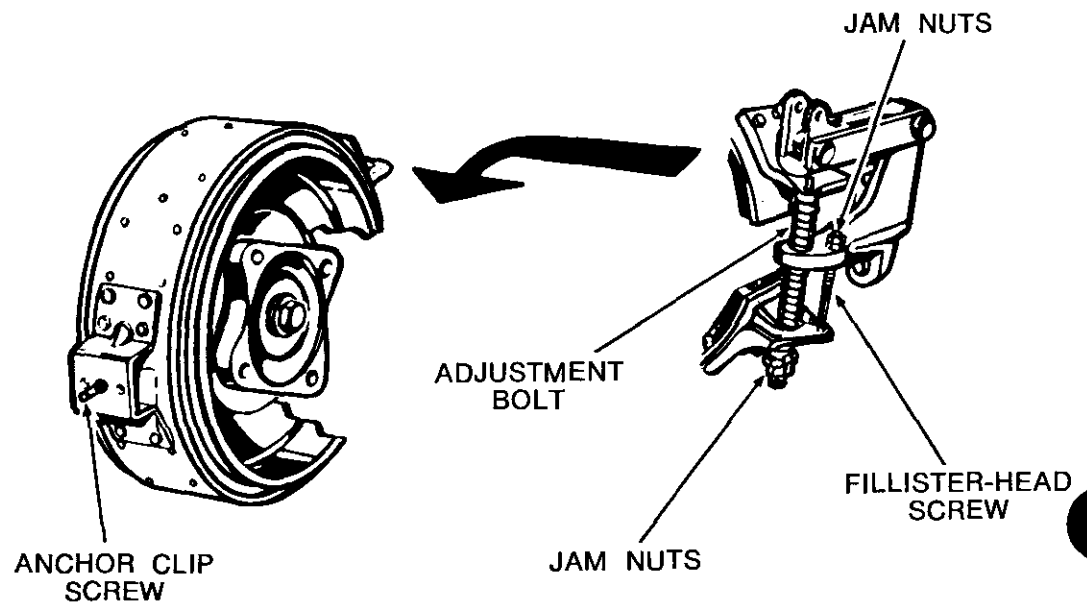
*NOTE: The following instructions pertain only to the DDA-furnished parking brakes, and do not necessarily define the procedures to be used for other parking brakes furnished by the vehicle manufacturer.*

DDA furnishes two types of parking brakes—expanding shoe and contracting band. The expanding shoe is adjusted by changing the length of the vehicle-furnished control linkage. Therefore refer to the vehicle service manual for adjustment instructions. The contracting band-type, however, is adjusted by changing the settings of the adjustment screws which are part of the brake assembly.

- To adjust the contracting-band brake, tighten (or loosen) the brake anchor

clip screw until there is 0.015-in. (feeler gage) clearance between the brake band and the brake drum at the clip screw location. Secure the clip screw in position with lockwire. Draw the lockwire through the slotted head of the screw and fasten to the smaller holes in the screw bracket.

- Tighten the fillister-head screw until there is 0.030-in. clearance between the lower end of the brake band and the brake drum. The 0.030-in. clearance must be met while a 0.010-in. shim is inserted between the brake band and drum approximately 180° from the lower end of the brake drum.
- Remove the 0.010-in. shim and reinsert it approximately 180° from the upper end of the brake band. Tighten the adjustment bolt (using the jam nuts) until there is 0.030-in. clearance between the upper end of the brake band and the brake drum. Remove the 0.010-in. shim and tighten the jam nuts on the adjusting bolt and on the fillister-head screw.



## RESERVATION 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.

### **One-Year Storage Without Oil**

- 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.

- 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 10 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.

- 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.

\* 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).

- 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.

## **SERVICE LITERATURE**

A service manual and parts catalog can be obtained from the dealer or distributor. These publications will provide the necessary servicing, overhaul and replacement parts information for your Allison transmission.

- 3340-3461 Parts Catalog, SA 1079
- 3340-3461 Service Manual, SA 1096