Service Manual

2005 OCTOBER

SM4014EN

Allison Transmission

ALLISON 4TH GENERATION CONTROLS VOCATIONAL MODELS

4000 EVS	4500 EVS	4700 EVS	4800 EVS	B 500
4000 HS	4500 HS	4700 RDS	4800 SP	T 425
4000 MH	4500 RDS	4700 SP		T 450
4000 RDS	4500 SP			T 525
4000 SP				
4000 TRV				

Allison Transmission

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1–11. ELECTROMAGNETIC/RADIO FREQUENCY INTERFERENCE

All electrical and electronic systems generate electromagnetic fields that can interfere with other electronic systems. Allison Transmission's electronic transmission controls comply with Federal Communications Commission (FCC) regulations and other guidelines concerning emitted radio frequency interference for transportation electronics. Some radio-telephone or two-way communications radios (land-mobile radio), or the manner in which they are installed, can be affected by other vehicle components or adversely affect vehicle operation. Manufacturers and installers of EMI/RFI emitting equipment are responsible for adhering to FCC regulations and other guidelines concerning emitted radio frequency interference for transportation electronics. Radio or other two-way communication antenna, power, or ground leads near the transmission wiring harness, control devices, or power leads may create or be subject to electromagnetic interference (EMI) from the transmission control system. Refer to the Allison 4th Generation Controls Troubleshooting Manual (TS3989EN) for detailed instructions regarding EMI problems.

1–12. OPERATING INSTRUCTIONS

Detailed transmission operation information is in the 3000 and 4000 Product Families Principles of Operation PO4016EN manual or in vocational model Operator's Manual. Refer to the latest revision.

1–13. SPECIFICATIONS AND DATA

The following specifications and data provide a quick reference to the major characteristics of the transmission.

Table 1–1. Specifications and Data Chart*

GEAR DATA:

Type — Planetary helical, constant mesh

Range	Close-Ratio†	Wide-Ratio†	Widest-Ratio Coverage†
First	3.51:1	4.70:1	7.63
Second	1.91:1	2.21:1	3.51
Third	1.43:1	1.53:1	1.91
Fourth	1.00:1	1.00:1	1.43
Fifth	0.74:1	0.76:1	1.00
Sixth	0.64:1	0.67:1	0.74
Seventh	—	—	0.64
Reverse	–4.80:1	–5.55:1	–4.80:1

ENGINE-DRIVEN POWER TAKEOFF PROVISION:

Positions — 8 o'clock and 1 o'clock (viewed from rear)

PTO Unit Ratings at the Transmission:

PTO Drive Gear — Maximum torque through one pad: 930 N·m (685 lb ft)
Maximum torque through both pads simultaneously: 1595 N·m (1175 lb ft)

NOTE: *No more than 930 N·m (685 lb ft) allowed through any single pad.*

* All data and specifications are subject to change without notice.

† Gear ratios do not include torque converter multiplication.

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Vocational Model	CR/WR	Maximum Forward Ranges	PTO	Retarder	Deep Sump	Shallow Sump	OLS
4000 EVS	CR	6	STD	OPT	STD	OPT	STD
4000 HS	CR	6	N/A	OPT	STD	N/A	STD
4000 MH	CR	6	OPT	OPT	STD	OPT	STD
4000 RDS	CR	6	STD	OPT	STD	N/A	STD
4000 SP	CR	6	STD	OPT	STD	OPT	STD
4000 TRV	CR	6	OPT	OPT	STD	N/A	STD
4500 EVS	WR	6	STD	OPT	STD	OPT	STD
4500 HS	WR	6	N/A	OPT	STD	N/A	STD
4500 RDS	WR	6	STD	OPT	STD	N/A	STD
4500 SP	WR	6	STD	OPT	STD	OPT	STD
4700 EVS	WR	7	STD	OPT	STD	OPT	STD [1]
4700 RDS	WRC	7	STD	OPT	STD	N/A	STD [1]
4700 SP	WRC	7	STD	OPT	STD	N/A	STD
4800 EVS	WRC	7	STD	OPT	STD	OPT	STD [1]
4800 SP	WRC	7	STD	OPT	STD	N/A	STD
B 500	CR	6	OPT	OPT	STD	OPT	STD
T 425	CR	5	OPT	OPT	STD	OPT	STD
T 450	CR	5	OPT	OPT	STD	OPT	STD
T 525	CR	5	OPT	OPT	STD	OPT	STD

[1]—OLS not available on 7-speed models with retarders.

1–7. EXPLODED (DISASSEMBLED) VIEWS

Exploded views illustrate 4000 Product Family transmission parts in relation to each other. The parts numbering system in the exploded views is used in all procedures described in the text.

1–8. DIAGNOSIS

NOTE:

Refer to Allison 4th Generation Controls Troubleshooting Manual (TS3989EN) for in-depth troubleshooting procedures.

a. Before Starting. Before attempting to repair the transmission, the faulty condition and its probable cause should be identified.

b. CHECK TRANS Light. Continued illumination of the **CHECK TRANS** light during vehicle operation indicates the TCM has signaled a diagnostic code. At start-up, the **CHECK TRANS** light will briefly illuminate to indicate that the light is functioning properly.

NOTE:

The Strip Pushbutton Shift Selector has no display or diagnostic capabilities. Use the Allison DOC™ For PC–Service Tool to display diagnostic trouble codes.

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2. If a bearing must be removed or installed without an installation sleeve, drive or press only on the race which is adjacent to the mounting surface. If a press is not available, carefully seat the bearing with a drift and a hammer, driving against the supported race.

j. Bushings. Whenever a new bushing is being installed, NEVER allow the pressing tool to bottom against a needle thrust bearing. ALWAYS make sure that the pressing tool bottoms against the part that the bushing is being pressed into.

k. Electrical Components. For inspection and repair of electrical components, refer to the 3000 and 4000 Product Families Troubleshooting Manual TS3989EN.

3–7. REMOVING TRANSMISSION FROM VEHICLE (Figure 3–5)

a. Drain Fluid

WARNING!

Avoid contact with the hot fluid or the hot sump when draining transmission fluid. Direct contact with the hot fluid or the hot sump may result in bodily injury.

1. Drain the transmission fluid before removing the transmission from the vehicle. The transmission fluid should be warm to promote complete drainage.
2. Remove the drain plug from the control module. Examine the drained fluid for evidence of contamination (see Paragraph 2–11). Reinstall the drain plug. If the drain plug threads are damaged, see Paragraph 2–12 for corrective action.
3. Remove transmission fill tube if it interferes with transmission removal.

WARNING!

DO NOT disconnect the hydraulic fluid line between the accumulator and the retarder until air and hydraulic pressure have been bled from the line.

NOTE

A significant amount of fluid may drain from a hydraulic hose when it is disconnected from the transmission.

4. Disconnect all hydraulic hoses from the transmission. If a retarder is installed, disconnect the accumulator line from the retarder housing. Remove the hoses from the vehicle if they interfere with the transmission removal. Plug all openings to keep dirt from entering the hydraulic system.
5. If an integral cooler is used, drain coolant from the cooler and disconnect coolant hoses. Remove the hoses from the vehicle if they interfere with transmission removal. Plug all openings to keep dirt from entering the cooling system.

b. Disconnecting Controls

1. Disconnect or completely remove controls. If controls are not removed from the transmission, position them so that they do not interfere with transmission removal.
2. Loosen bolt in 20-way transmission feedthrough harness connector.
3. Disconnect the transmission external harness from the 20-way transmission feedthrough harness connector. Also disconnect the external harness from the engine, output, and turbine speed sensors (Figure 3–5). Place a cover on the transmission electrical connector to keep out dirt. Also be sure to disconnect the transmission feedthrough harness from the harness bracket.
4. If PTO(s) are used, disconnect the PTO(s) harness.
5. Disconnect the transmission external harness from the retarder temperature sensor and the retarder control valve body.

c. Uncoupling Transmission From Vehicle and Engine Driveline

1. Disconnect the vehicle drive shaft from the transmission output flange or yoke. Position the disconnected shaft to avoid interference with removing the transmission.

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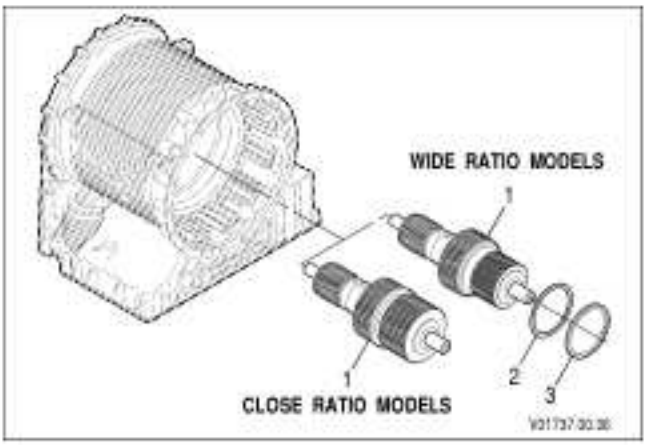
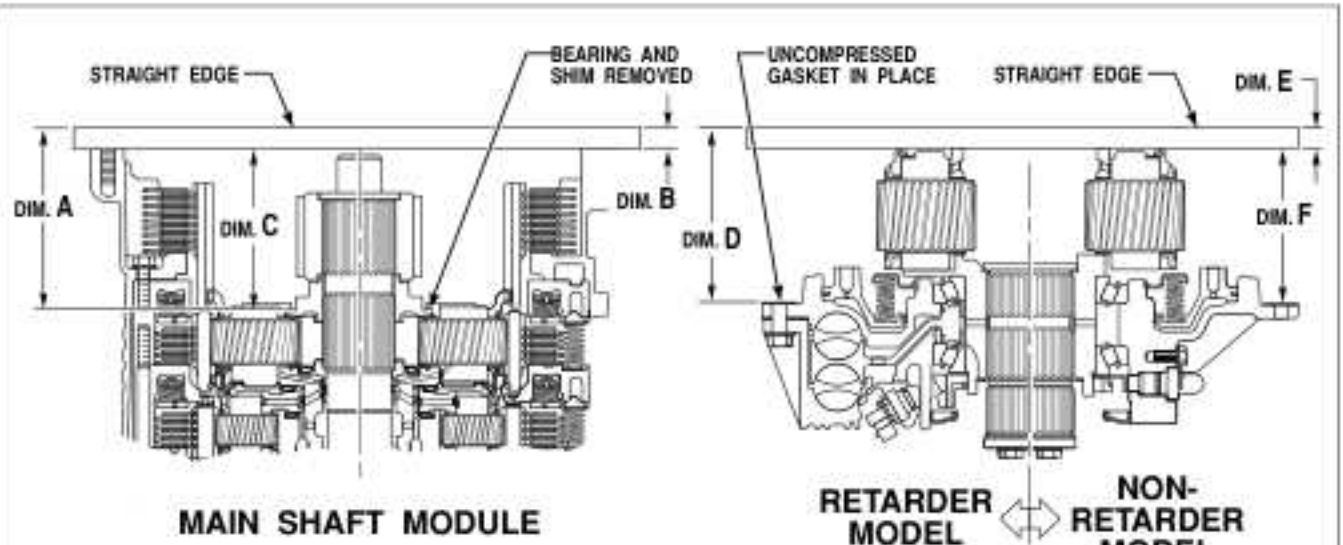


Figure 6–6. Main Shaft Module Installation

h. Installation of Main Shaft Module (4700 and 4800 Models). Install main shaft module as assembled in Section 5.

i. Main Shaft Selective Shim Measurement (Close Ratio Models) *(Figure 6–7)*

1. Place a straight edge across the retarder or rear cover mounting surface of the main housing.
2. Measure dimension **A**, from top of the straight edge to the selective shim thrust surface on the main shaft bearing spacer.
3. Measure dimension **B**, thickness of straight edge. Subtract dimension **B** from dimension **A**—the remainder is dimension **C**.
4. Place the retarder or rear cover module output end down (facing the bench top). Install an uncompressed gasket on the retarder or rear cover mounting surface and place a straight edge across the P3 planetary carrier.
5. Measure dimension **D**, from top of the straight edge to the gasket.
6. Measure dimension **E** from the top of the straightedge to the thrust bearing contact surface on the P3 planetary carrier. Subtract dimension **E** from dimension **D**—the remainder is dimension **F**.
7. Dimension **G** is the remainder of "**C** minus **F**" and determines the thickness of the selective shim.
8. Install the proper thickness selective shim and the thrust bearing.



PROCEDURE: FORMULA (C)–(F)=G

DIM. G	USE P/N	SHIM ID
5.7135–6.033 mm 0.231–0.237 in.	29501117	1 NOTCH
6.034–6.303 mm 0.238–0.247 in.	29501118	2 NOTCHES
6.304–6.573 mm 0.248–0.258 in.	29501119	3 NOTCHES
6.574–6.843 mm 0.259–0.269 in.	29501120	4 NOTCHES

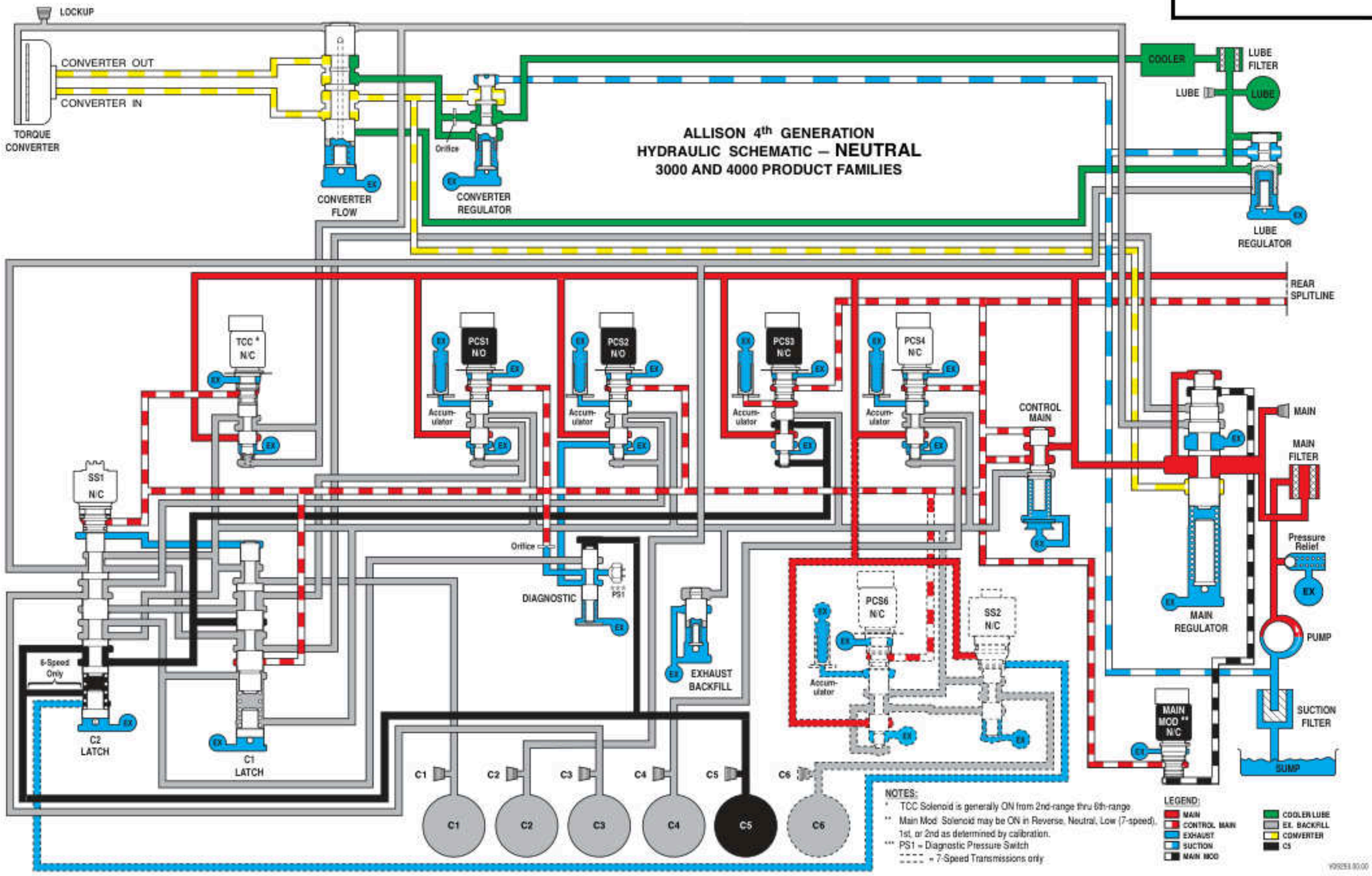
DIM. G	USE P/N	SHIM ID
6.844–7.113 mm 0.270–0.280 in.	29501121	5 NOTCHES
7.114–7.383 mm 0.281–0.290 in.	29501122	6 NOTCHES
7.384–7.484 mm 0.291–0.295 in.	29512774	0 NOTCHES

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Figure 6–7. Main Shaft Selective Shim Measurement for 4000 Product Family—Close Ratio

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Foldout 13. 4000 Product Family Hydraulic Schematic—Neutral

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