

POWERSHIFT TRANSMISSION

1. Specifications	5-3
2. Structure	5-4
2.1 Torque converter.....	5-4
2.2 Transmission.....	5-5
2.3 Power Train Line.....	5-6
2.4 Control Valve	5-7
2.5 Main Regulator Valve.....	5-7
2.6 Torque Converter Drive Transmission Hydraulic System Schematic	5-8
2.7 Automatic 2-speed Shifting Mechanism.....	5-9
2.8 Torque Converter Drive Control System.....	5-10
3. Suggestions for Removal and Installation	5-11
3.1 Removal.....	5-11
3.1.1 Transmission Removal.....	5-11
3.1.2 Torque Converter Removal.....	5-11
3.2 Installation.....	5-12
4. Disassembly and Reassembly	5-13
4.1 Torque converter.....	5-13
4.1.1 Disassembly.....	5-13
4.1.2 Inspection and Repair	5-14
4.1.3 Reassembly	5-16
4.2 Transmission (2nd)	5-18
4.2.1 Disassembly.....	5-18
4.2.2 Inspection and Repair	5-26
4.2.3 Reassembly	5-30
4.3 Control Valve	5-37
4.3.1 Disassembly.....	5-37
4.3.2 Inspection and Repair	5-39
4.3.3 Reassembly	5-40
4.4 Main Regulator Valve.....	5-41
4.4.1 Disassembly.....	5-41
4.4.2 Inspection and Repair	5-41
4.4.3 Reassembly	5-41
5. Readjust	5-42
5.1 Oil Pressure Measurement	5-42
5.1.1 Preparation.....	5-42

5.2 Clutch Valve Test..... 5-43

5.2.1 Preparation..... 5-43

5.2.2 Testing procedure 5-43

5.3 Stall Speed Measurement..... 5-44

5.3.1 Measurement procedure 5-44

5.4 10m (33 ft) Start Acceleration Test 5-45

5.4.1 Testing procedure 5-45

5.5 Confirming the function of “Automatic 2-speed transmission” 5-45

5.6 Inching Pedal Adjustment 5-46

5.6.1 Preparation..... 5-46

5.6.2 Readjust 5-47

6. Troubleshooting 5-48

7. Service Data..... 5-53

7.1 Stall Speed..... 5-53

7.2 Pump boss 5-53

7.3 Pilot boss 5-54

7.4 Oil Pump 5-54

7.5 Stator 5-55

7.6 Flexible plate..... 5-55

7.7 Clutches..... 5-56

7.8 Input shaft, Counter shaft and Transmission Cover..... 5-57

7.9 Backlash of Gears..... 5-58

7.10 Control Valve 5-59

7.11 Main Regulator Valve..... 5-60

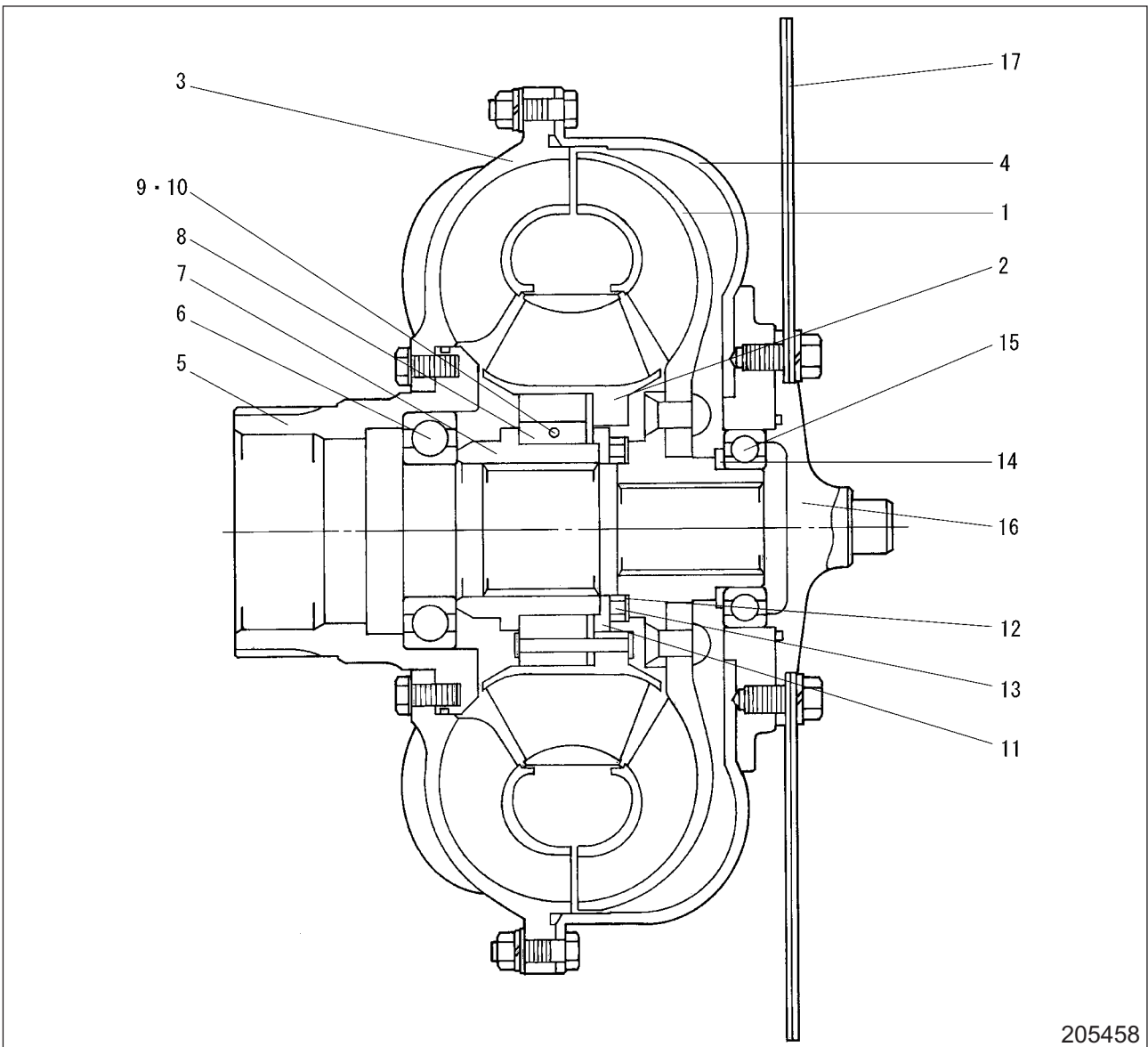
7.12 Inching Pedal Control..... 5-61

1. Specifications

Truck model		DP60	DP70
Torque converter	Type	3-element, 1-stage, 2-phase	
	Maker model	ML15	
	Stall torque ratio	2.9	
Transmission	Operation method	Forward/ Reverse	Forward/reverse switching electrical column shift
		Reverse	H/L automatic drive
	Reduction ratio	Forward	1st: 2.138 2nd: 0.685
		Reverse	1st: 2.138 2nd: 0.685

2. Structure

2.1 Torque converter

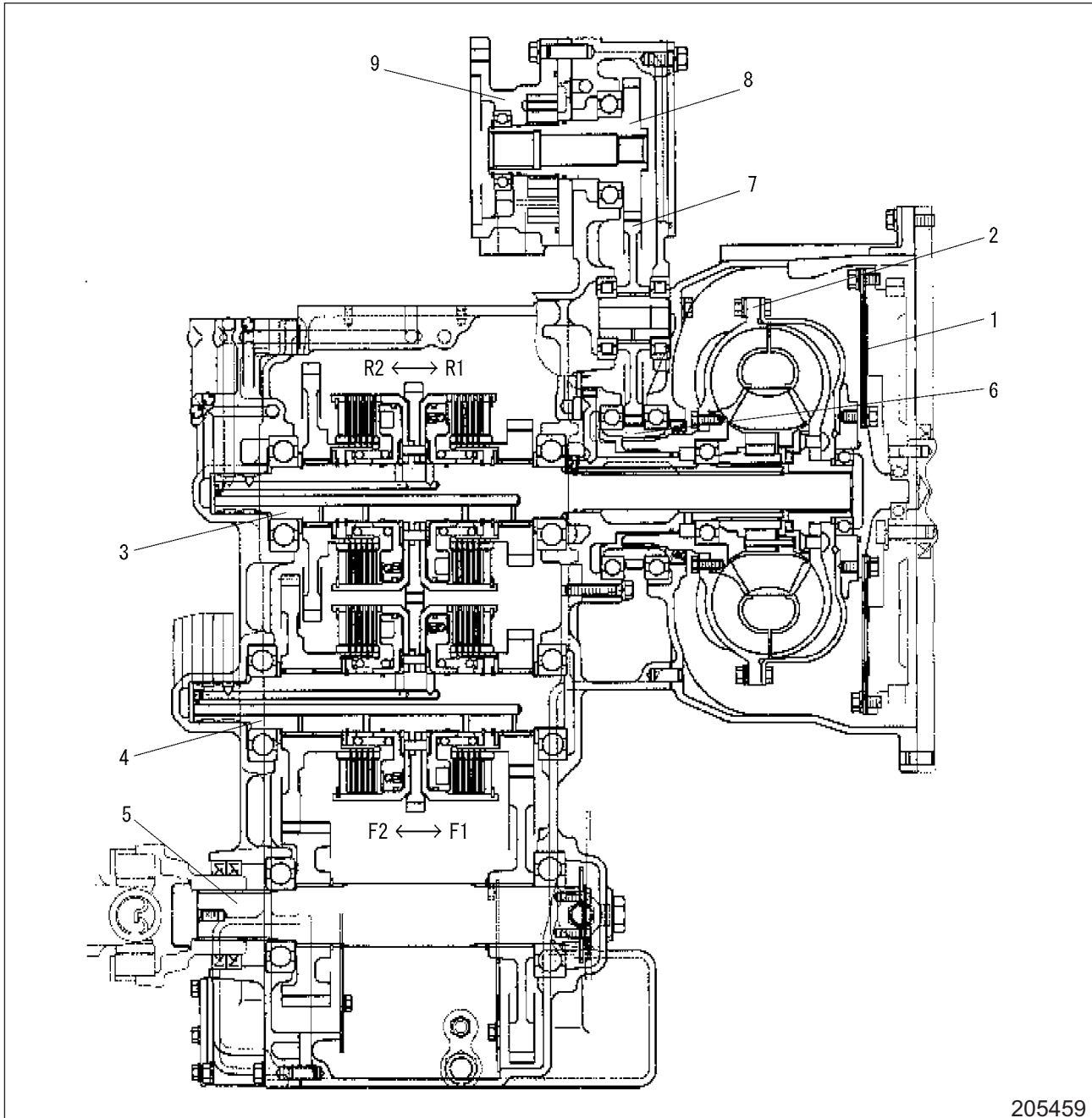


- 1 Turbine runner
- 2 Stator assembly
- 3 Pump impeller
- 4 Drive cover
- 5 Pump boss
- 6 Ball bearing

- 7 Hub
- 8 Roller
- 9 Spring
- 10 Spring cap
- 11 Thrust washer
- 12 Thrust washer

- 13 Thrust bearing
- 14 Spacer
- 15 Ball bearing
- 16 Pilot boss
- 17 Flexible plate

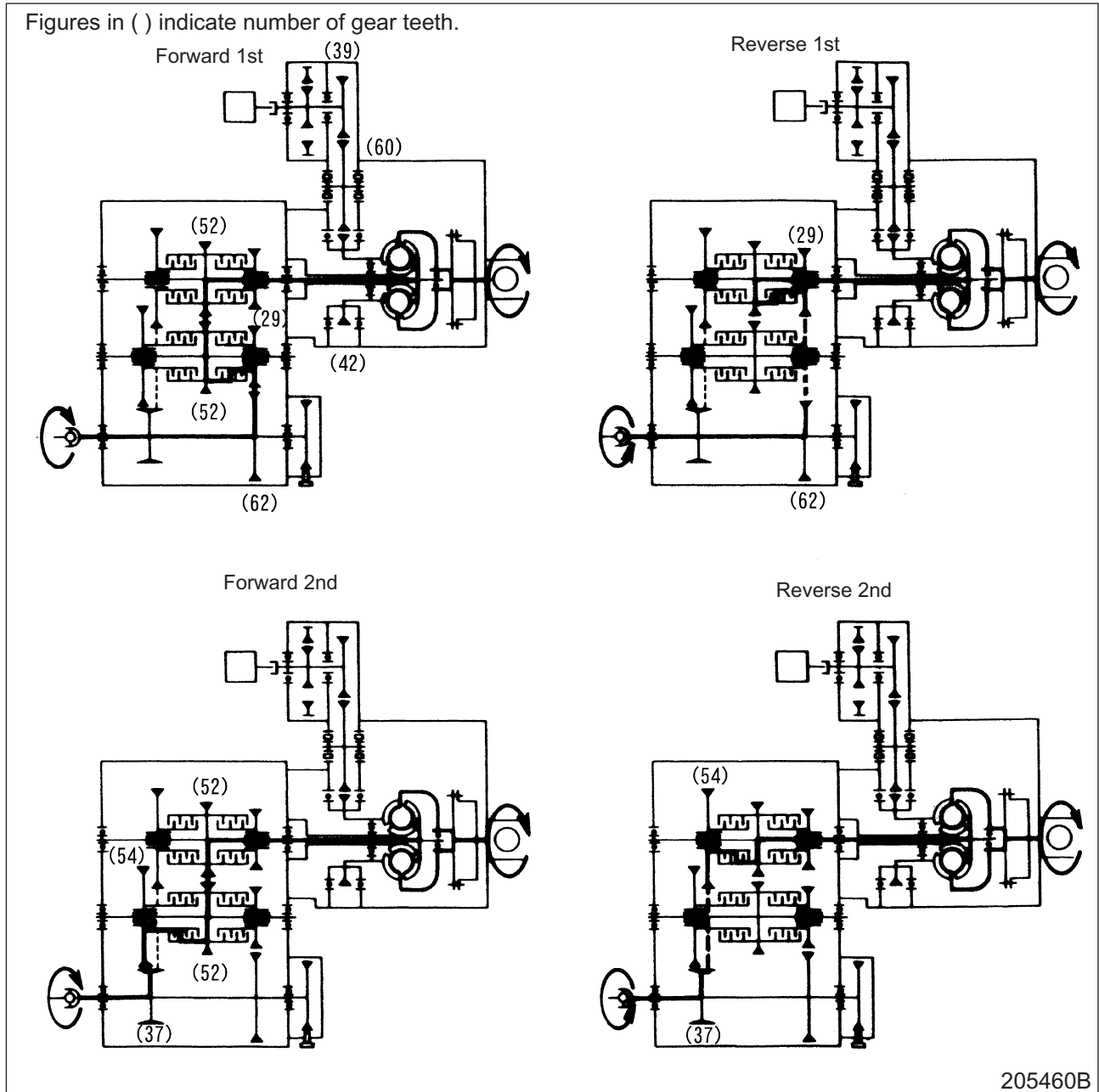
2.2 Transmission



- | | | |
|-----------------------------|------------------|-------------------|
| 1 Flexible plates | 4 Countershaft | 7 Pump idler gear |
| 2 Torque converter assembly | 5 Output shaft | 8 Pump drive gear |
| 3 Input shaft | 6 PTO drive gear | 9 Pump case |

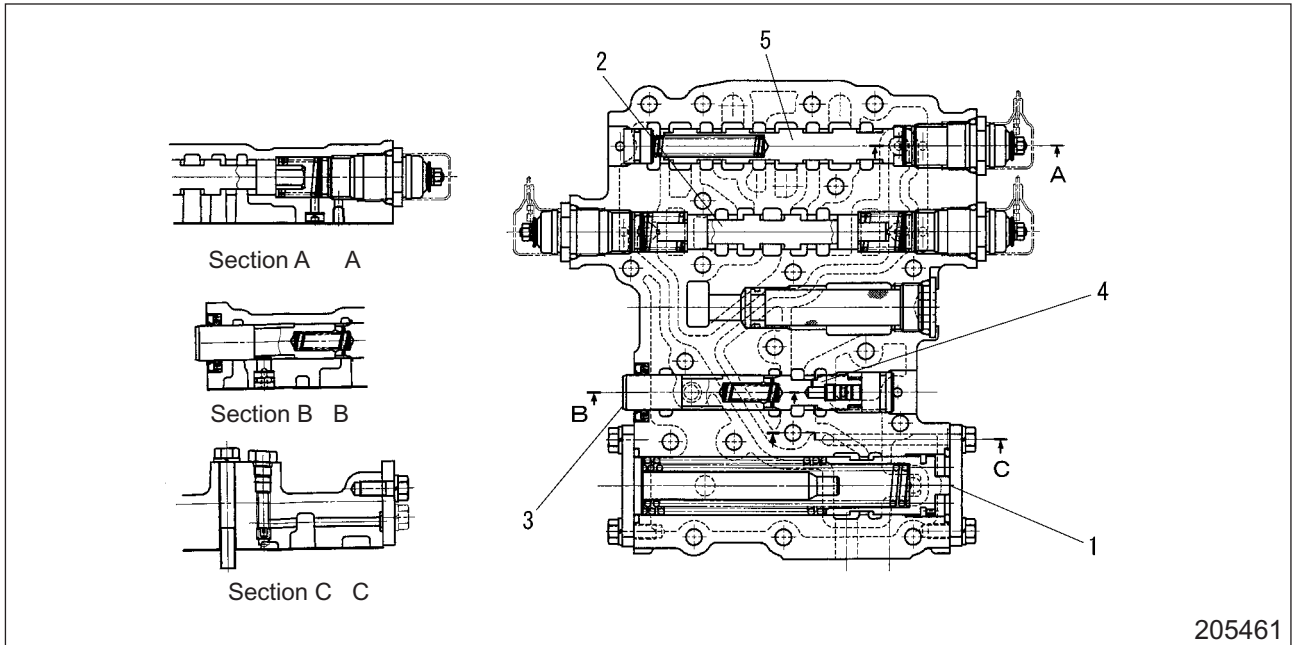
The transmission is the powershift type and has two speeds forward and two speeds reverse. The gear shifting is a power-shift type implemented by the hydraulic multi-disc type clutch.

2.3 Power Train Line



Speed		Gears engaged	Gear ratio
Forward	1st	$52/52 \times 62/29$	2.138
	2nd	$52/52 \times 37/54$	0.685
Reverse	1st	$62/29$	2.138
	2nd	$37/54$	0.685
PTO gear		$60/42 \times 39/60$	0.929

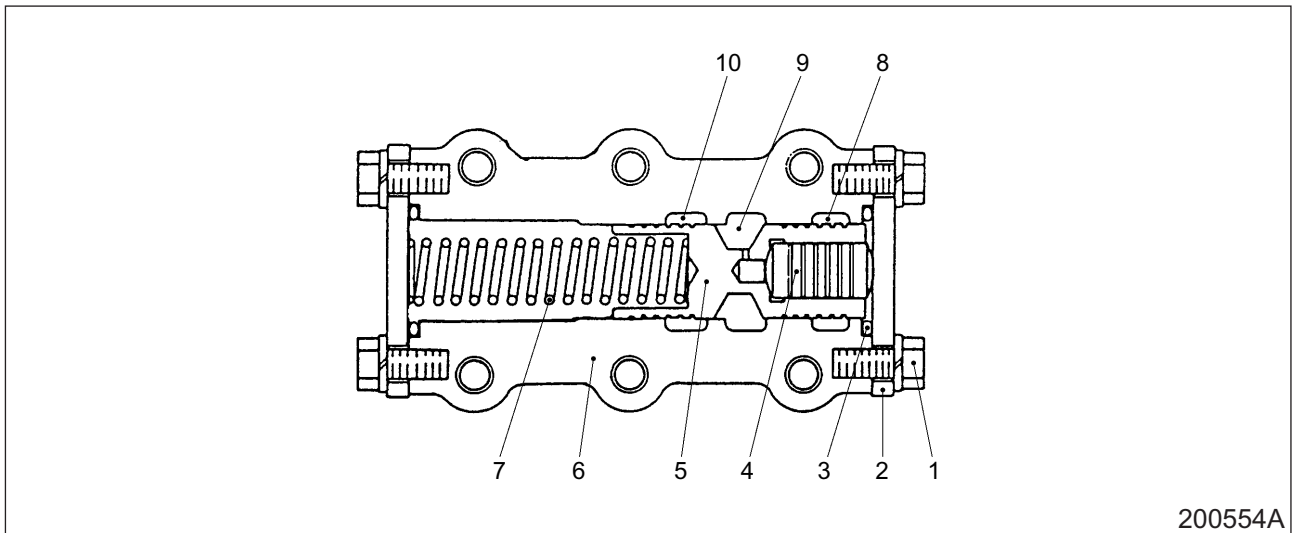
2.4 Control Valve



205461

- | | | |
|---------------------|------------------------|---------------------|
| 1 Accumulator valve | 3 Clutch valve plunger | 5 Speed (H/L) valve |
| 2 Directional valve | 4 Clutch valve | |

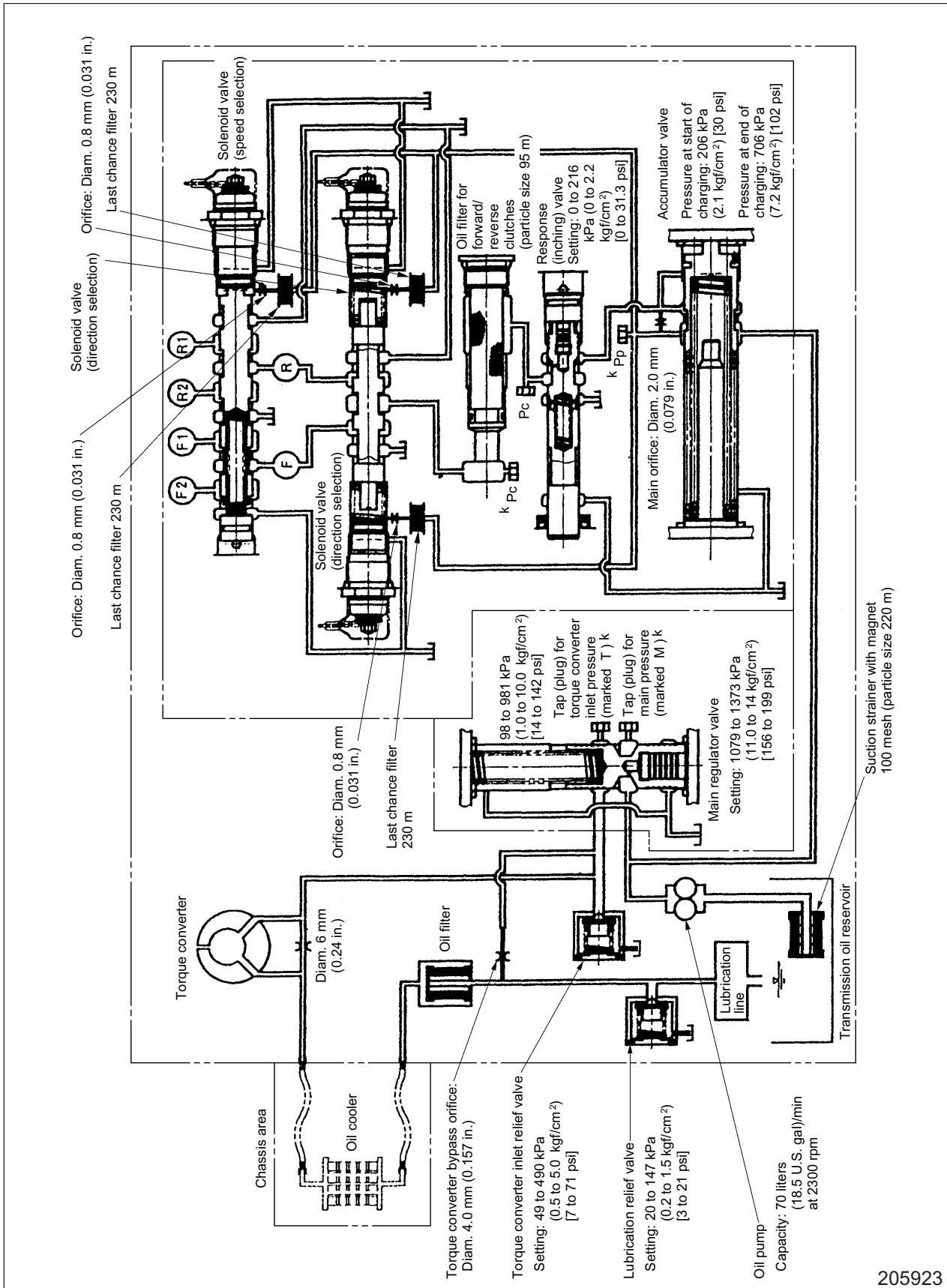
2.5 Main Regulator Valve



200554A

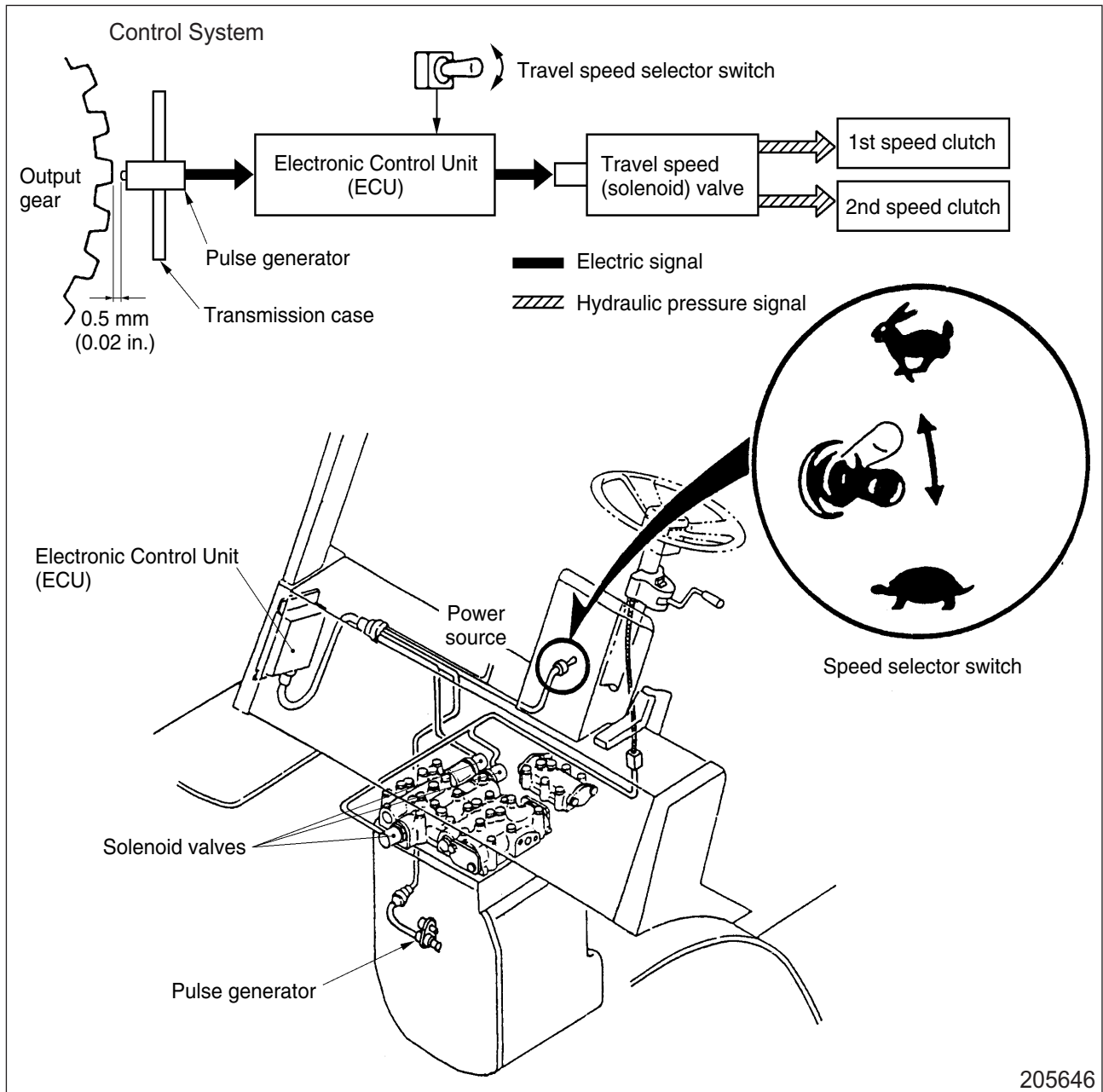
- | | | |
|----------|----------|---|
| 1 Bolt | 5 Spool | 8 Drain port |
| 2 Cover | 6 Body | 9 Main pressure port |
| 3 O-ring | 7 Spring | 10 Torque converter inlet pressure port |
| 4 Slug | | |

2.6 Torque Converter Drive Transmission Hydraulic System Schematic



205923

2.7 Automatic 2-speed Shifting Mechanism



205646

The automatic 2-speed transmission is made up of a combination of the torque converter drive transmission enabling 2 speeds for each of the forward and reverse directions with the dedicated control system, which consists of the pulse generator, ECU, and solenoid valves.

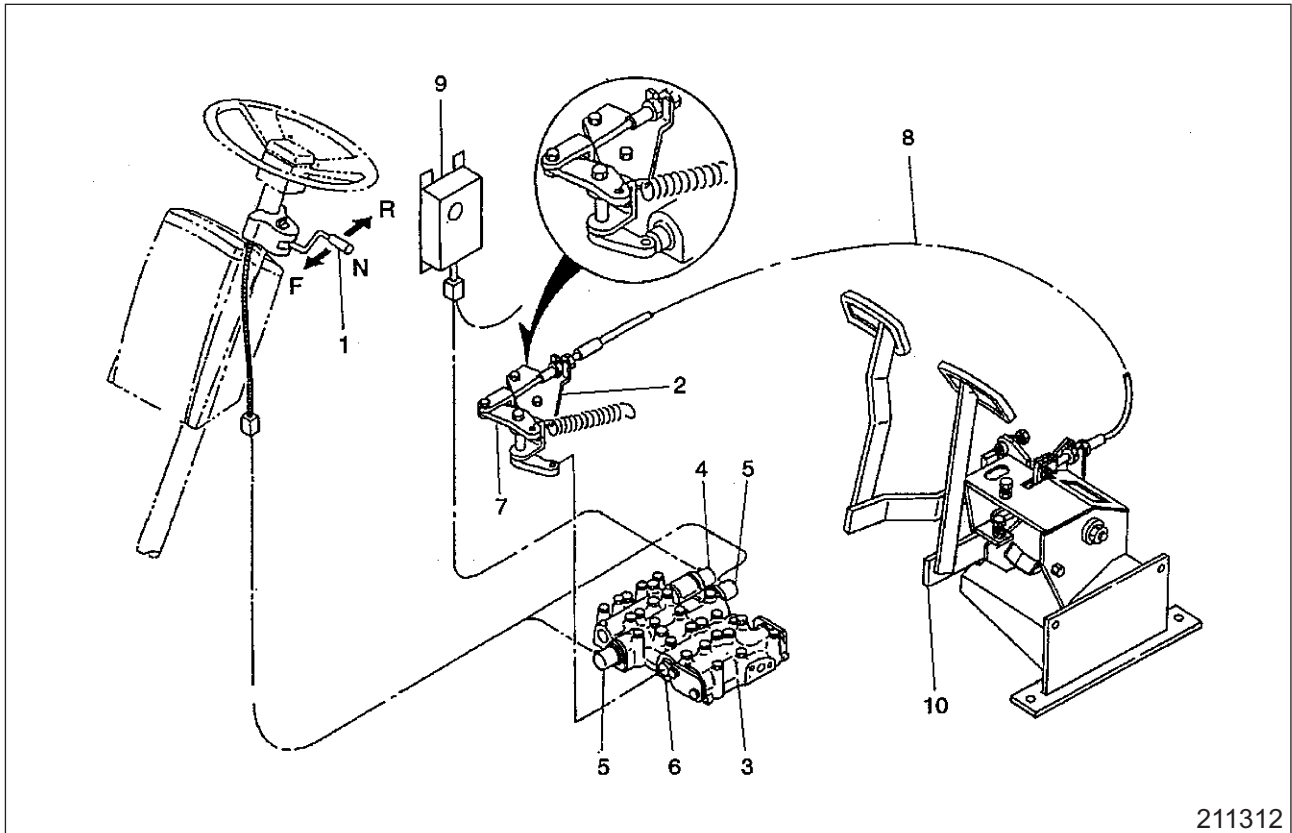
With the speed selection switch, it is possible to shift the travel speed manually between the “Automatic 2-speed” and “Fixed 1st speed” modes whichever is more suitable for the current operational situation.

Selector switch position (mode)	Travel speed	
	Automatic 2-speed	1st
2nd		6 to 27.5 km/h (6.2 to 17.1 mph)
Fixed 1st speed	0 to 10 km/h (0 to 6.2 mph)	

NOTE

ECU is an acronym of Electronic Control Unit.

2.8 Torque Converter Drive Control System



211312

- | | |
|--|------------------------|
| 1 Direction lever | 6 Clutch valve plunger |
| 2 Inching bracket | 7 Inching lever |
| 3 Control Valve | 8 Cable |
| 4 Solenoid valve (for 1st and 2nd) | 9 ECU |
| 5 Solenoid valve (for forward/reverse) | 10 Inching pedal |

3. Suggestions for Removal and Installation

When installing and removing the transmission assembly to/from the truck, handle it as an unit of the engine. For the actual operation practices refer to “4. POWER TRAIN”.

3.1 Removal

3.1.1 Transmission Removal

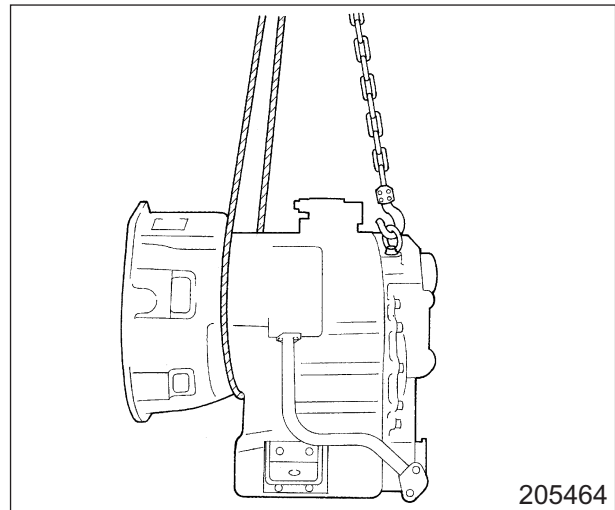
- (1) Place the engine on a stable stand, since it will be left as a single unit after the transmission is separated from it. Make the whole unit stable by additionally supporting the transmission part with the placed wooden blocks.
- (2) Remove the hydraulic gear pump from the transmission.
- (3) Hoist the transmission with wire ropes and lift it just enough to take the weight of the transmission.
To lift the transmission, tie a wire rope around the torque converter case. To lift the transmission, screw a washer-based eye bolt into the transmission cover, and hitch a chain with the eye bolt. Use this 2-point lifting method with the leveling block inserted under the transmission to ensure its level.
- (4) Remove the flexible plate fastening bolts through the access hole in the transmission case.
- (5) Separate the transmission from the engine by lifting the transmission with the hoist.

3.1.2 Torque Converter Removal

- (1) The torque converter can be removed easily, since it is merely inserted into the stator shift, PTO drive gear, and input shaft of the transmission, which is just removed as an assembly.

NOTE

Because the torque converter does not have a drain plug, it is not possible to completely drain the remaining oil. The oil must be drained by facing the pump boss side down during removal.



205464