SECTION 29 - HYDROSTATIC TRANSMISSION

Chapter 1 - Hydrostatic Transmission

CONTENT

SPECIFICATIONS

Hydrostatic Transmission

Manufacturer . . . . . Kayaba Industry Co. Ltd., Japan
Type HVFD-28C37-M
Theoretical Displacement of the Pump . . . . . 0 - 28.1 cm^3/rev.
Theoretical Displacement of the Motor
  Low . . . . . 0 - 37.2 cm^3/rev.
  High . . . . . 0 - 22.0 cm^3/rev.
Theoretical Displacement of the Charge Pump . . . . . 6.2 cm^3/rev.
Maximum Input Speed . . . . . 2700 rpm
Maximum Working Pressure . . . . . 345 bar (5000 PSI)
Output Speed
  Low . . . . . 0 - 1950 rpm (at 97 bar [1400 PSI])
  High . . . . . 0 - 3328 rpm
Output Torque . . . . . 60 N·m (44 ft.-lbs.) at 245 bar (3550 PSI)
Charge Pressure . . . . . 8 - 12 bar (114 - 170 PSI) at 2600 rpm
Swash Plate Tilt Angle (Pump) . . . . . 0 ± 17.8°
Swash Plate Tilt Angle (Motor)
  Low . . . . . 15.0°
  High . . . . . 9.0°
Operating Moment . . . . . Maximum 16 N·m (12 ft.-lbs.) at 3000 PSI

Hydraulic Tests

NOTE: *Warm the oil to 25 ° - 50 °C (80 ° - 120 °F) before performing any hydraulic test.*

High Pressure Relief Valve . . . . . 345 bar (5000 PSI) at 16 min.
Charge Pump Relief Valve . . . . . 7.86 - 11.72 bar (114 - 170 PSI) at 2600 rpm
Check Valve . . . . . 1.2 bar (17.5 PSI) pressure differential

Torque Specifications

Hydrostatic Transmission Cover Screws . . . . . 2 - 2.5 N·m (1.4 - 1.9 ft.-lbs.)
Charge Pump Housing Bolts . . . . . 17.6 N·m (13 ft.-lbs.)
HST Port Block Retaining Bolts . . . . . 70.6 N·m (52 ft.-lbs.)
Transmission housing with rear axle (buckle-up bolts) . . . . . 81 N m (60 ft.-lbs.)
Check and High Pressure Relief valve Retaining Plug . . . . . 63.7 N·m (47 ft.-lbs.)
High and Low speed Control Spool Retaining Plug . . . . . 51 N·m (37.6 ft.-lbs.)
Swash plate Cover Retaining Screw . . . . . 6.9 N·m (5.1 ft.-lbs.)
High Pressure Relief valve Inspection Adapter . . . . . 29.4 N·m (21.7 ft.-lbs.)
High Pressure Relief valve Inspection plug . . . . . 14.7 N·m (10.8 ft.-lbs.)

HST Foot Control Pedals (Neutral Gear)

Forward Pedal Stop . . . . . 22 - 23 mm (0.866″ - 0.905″)
Reverse Pedal Stop . . . . . 27.5 - 28.5 mm (1.08″ - 1.12″)
Spring
  Length (Hook to Hook) . . . . . 120 mm ± 2.0 mm (4-11/16″ ± 5/64″)
Cruise Control Magnet to Transmission Pivot WA Plate . . . . . 0.5 - 1.5 mm (0.020″ - 0.060″)

TC35DA/TC40DA/TC45DA Transmission Speeds

Forward Speeds	With AG 13.6-24 Tire	With AG 14.9-24 Tire	With R4 17.5L-24 Tire	With Turf 44x18.0-20 Tire
I Range Low	5.61 kph (3.49 mph)	5.89 kph (3.66 mph)	5.69 kph (3.53 mph)	5.06 kph (3.14 mph)
I Range High	9.49 kph (5.9 mph)	10.0 kph (6.21 mph)	9.62 kph (6.0 mph)	8.56 kph (5.32 mph)
II Range Low	13.0 kph (8.20 mph)	13.6 kph (8.45 mph)	13.1 kph (8.14 mph)	11.7 kph (7.27 mph)
II Range High	21.9 kph (13.6 mph)	23.0 kph (14.3 mph)	22.2 kph (13.8 mph)	19.8 kph (12.3 mph)

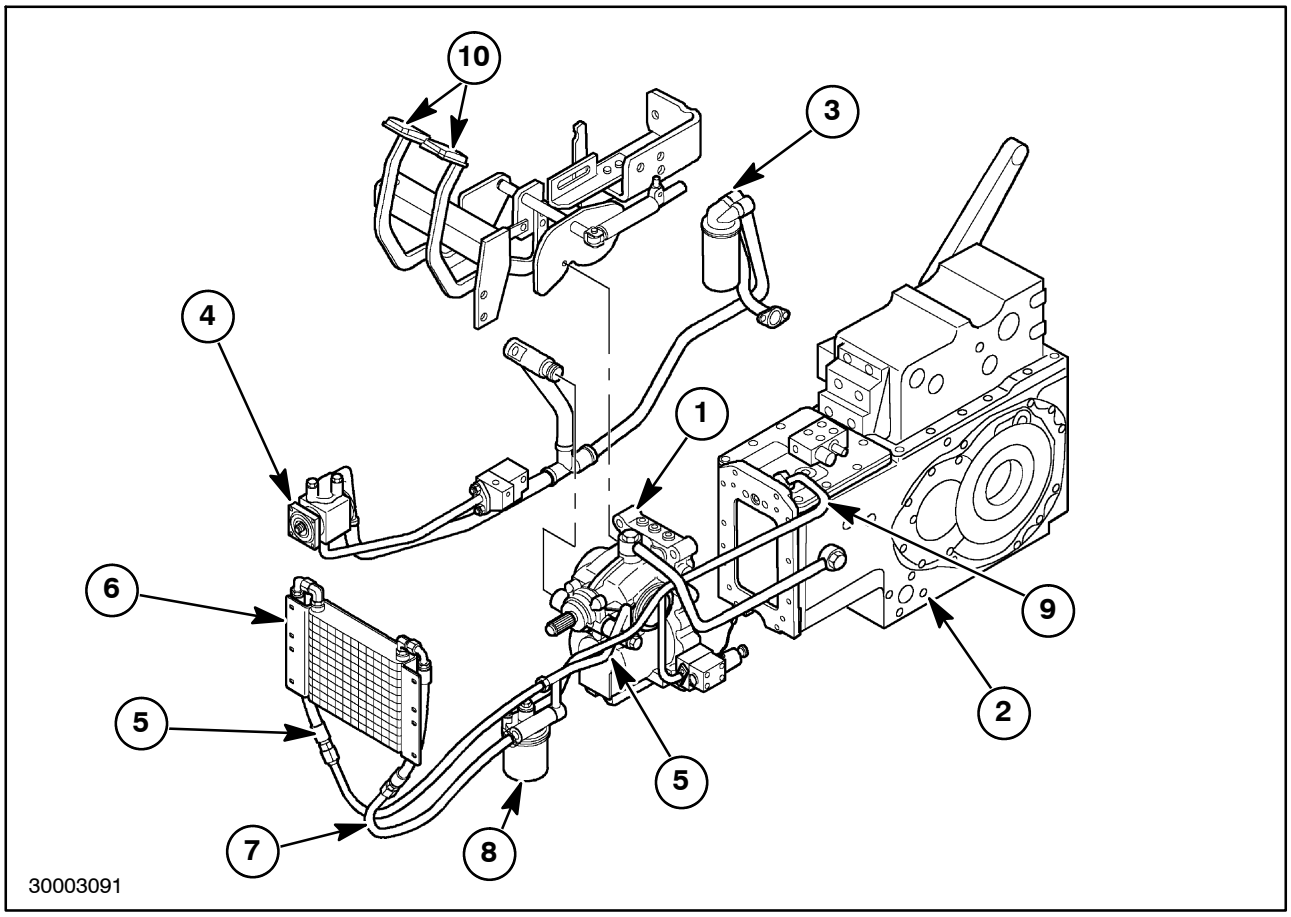
NOTE: *Reverse has same speed capability as forward and depends on stop setting. Theoretical stop setting is at 75% of forward.*

METRIC BOLT TORQUE SPECIFICATIONS

Bolt Size	Grade No.	Coarse Thread			Fine Thread		
		Pitch (mm)	Foot-Pounds	Newton Meters	Pitch (mm)	Foot-Pounds	Newton-Meters
M5	4T, 4.8	0.70	2.8 - 4.0	3.8 - 5.4	------	------	------
	7T, 8T, 8.8		4.9 - 6.9	6.9 - 9.3			
	10T, 10.9, 11T		6.7 - 9.4	9.0 - 12.7			
M6	4T, 4.8	1.0	3.6 - 5.1	4.9 - 6.9	------	------	------
	7T, 8T, 8.8		6.1 - 8.3	8.3 - 11.3			
	10T, 10.9, 11T		8.7 - 11.6	11.8 - 15.7			
M8	4T, 4.8	1.25	9.4 - 12.3	12.7 - 16.7	1.0	11.2 - 14.8	15.2 - 20.1
	7T, 8T, 8.8		16.6 - 21.0	22.6 - 28.4		19.5 - 25.3	26.5 - 34.3
	10T, 10.9, 11T		21.0 - 26.8	28.4 - 36.2		22.4 - 29.7	30.4 - 40.2
M10	4T, 4.8	1.5	18.8 - 24.6	25.5 - 33.3	1.25	21.0 - 26.8	28.4 - 36.3
	7T, 8T, 8.8		32.5 - 41.2	44.1 - 55.9		36.2 - 46.3	49.0 - 62.8
	10T, 10.9, 11T		39.8 - 51.4	53.9 - 69.9		42.7 - 54.2	57.9 - 73.5
M12	4T, 4.8	1.75	27.5 - 34.7	37.3 - 47.1	1.25	31.8 - 40.5	43.1 - 54.9
	7T, 8T, 8.8		48.5 - 61.5	65.7 - 83.4		55.0 - 69.4	74.5 - 94.1
	10T, 10.9, 11T		68.0 - 85.4	92.9 - 116		73.1 - 93.3	99.0 - 127
M14	4T, 4.8	2.0	46.3 - 59.3	62.8 - 80.4	1.5	51.4 - 64.4	69.6 - 87.3
	7T, 8T, 8.8		76.7 - 96.9	104 - 131		86.1 - 109	117 - 148
	10T, 10.9, 11T		102 - 129	139 - 175		108 - 137	147 - 186
M16	4T, 4.8	2.0	63.6 - 81.0	83.3 - 110	1.5	67.3 - 84.6	91.3 - 115
	7T, 8T, 8.8		110 - 136	149 - 184		116 - 142	157 - 192
	10T, 10.9, 11T		152 - 188	206 - 255		163 - 199	221 - 270
M20	4T, 4.8	2.5	106 - 132	144 - 179	1.5	127 - 156	172 - 211
	7T, 8T, 8.8		177 - 213	240 - 289		203 - 246	275 - 333
	10T, 10.9, 11T		268 - 325	363 - 441		293 - 358	397 - 485

SPECIAL TOOLS

Gauge–(6000 PSI)	OEM 1464
Gauge–(300 PSI)	OEM 1457
HST High Pressure Test Fitting	CNH299007
HI/LOW Pressure Test Fitting	FNH00011



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1. Hydrostatic transmission
2. Rear transmission reservoir
3. Hydraulic suction filter
4. Hydraulic pump
5. Oil cooler inlet hose
6. Oil cooler
7. Oil cooler outlet hose
8. HST inlet oil line
9. HST pedal assembly

Op. 29 202

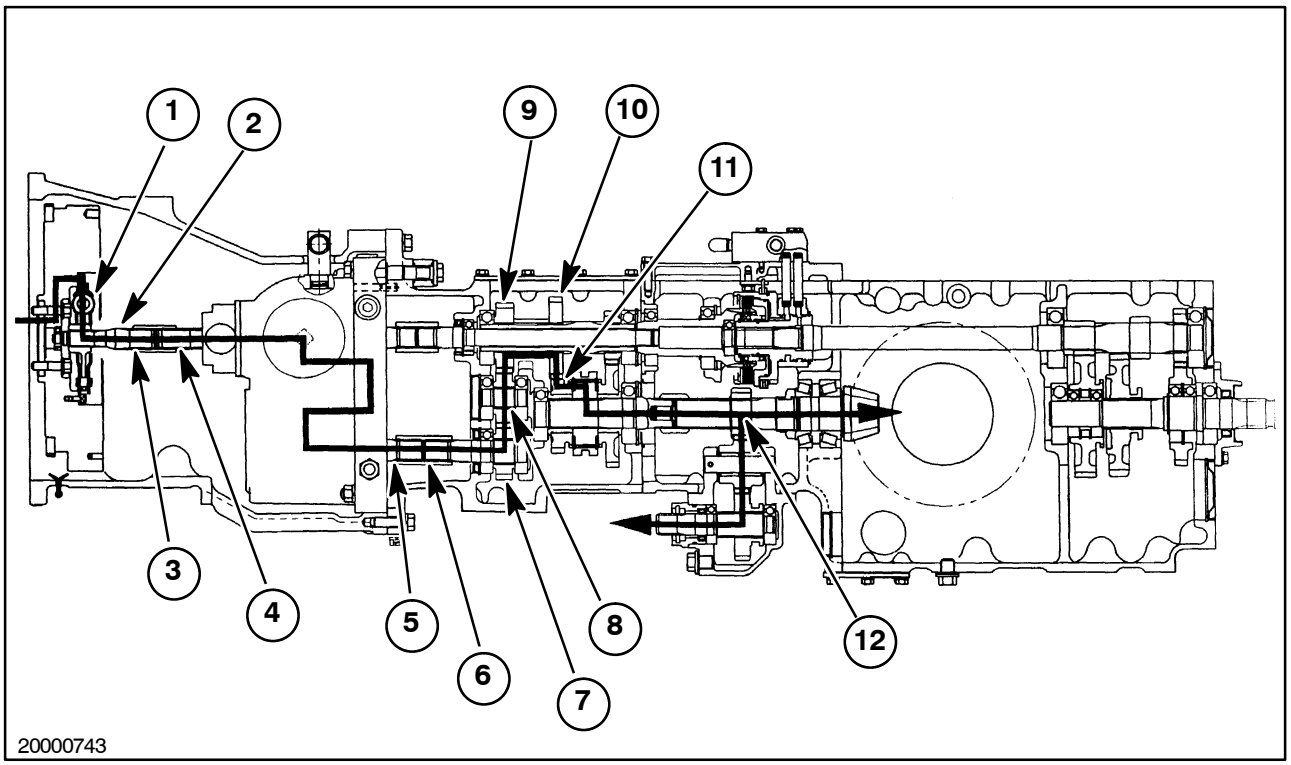
DESCRIPTION OF OPERATION

The hydrostatic transmission assembly, 1, consists of a gerotor type charge pump, a variable displacement piston type hydraulic pump and a two-speed piston type hydraulic motor, which are located in the transmission clutch housing. The hydrostatic transmission is driven by an adapter plate that is bolted to the engine flywheel. The charge pump circuit is supplied with oil from the rear transmission reservoir, 2, and is filtered by the hydraulic suction filter, 3, before entering the charge pump. The charge pump shares the rear transmission reservoir and hydraulic suction filter with the hydraulic system pump, 4. The output from the charge pump is routed by outlet line, 5, to the oil cooler, 6, oil then exists the oil cooler by outlet hose, 7 and is routed to the HST filter, 8.

NOTE: *If the oil cooler circuit is restricts the flow from the charge pump, a by pass valve located in the HST filter base will open, the oil flow will by pass the cooler but will still be filtered by the HST filter, before entering the HST assembly.*

After the oil is filtered the oil enters the hydrostatic pump via line, 9. The pump supplies oil to the hydrostatic motor that drives the transmission gearbox.

Forward and reverse motion is controlled by pedal assembly, 10.



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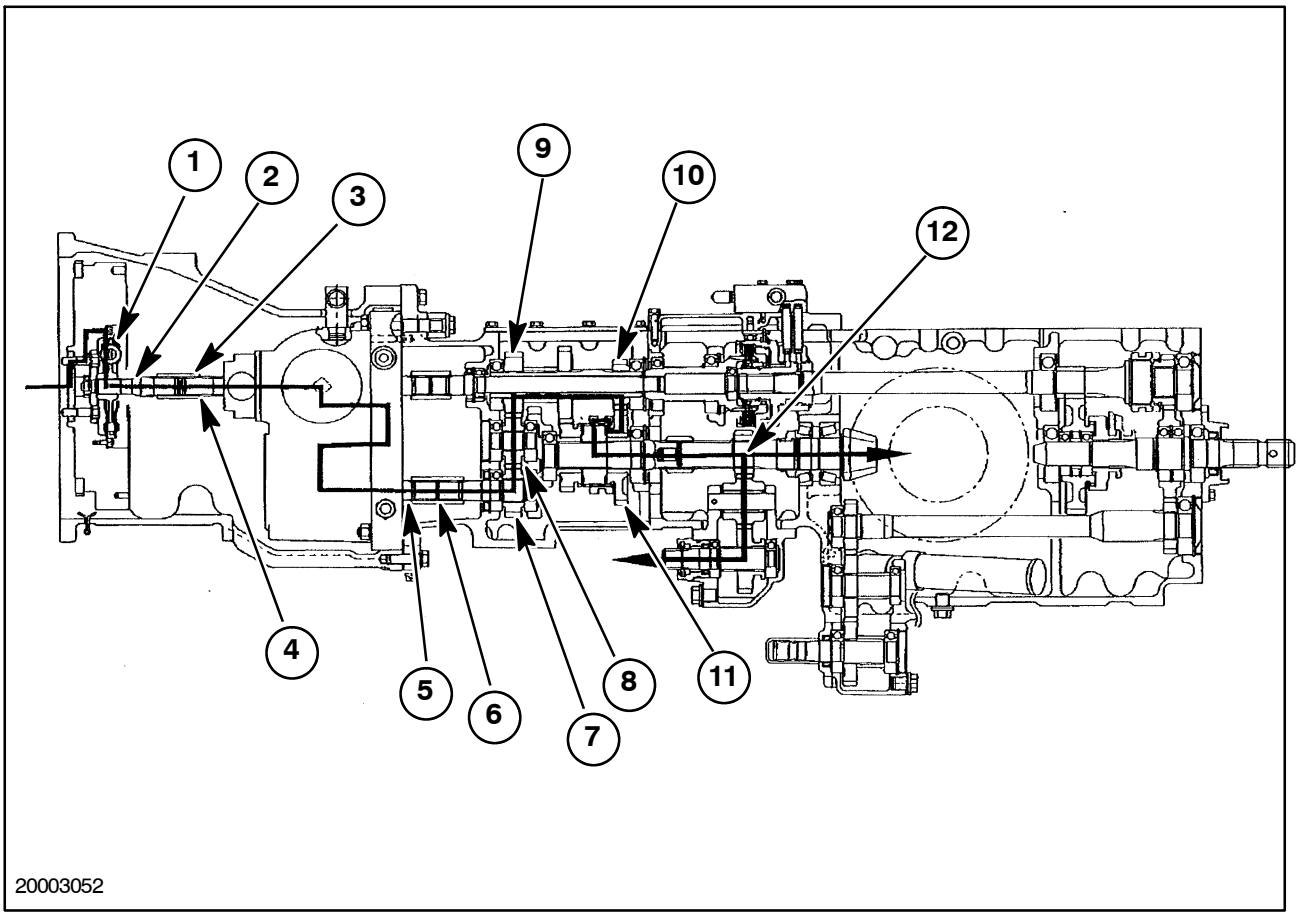
POWER FLOW

High Range

Power flow as follows:

1. Engine adapter plate
2. Input shaft
3. Input shaft splined coupler
4. Input shaft hydrostatic transmission
5. Output shaft hydrostatic transmission
6. Output shaft splined coupler
7. Lower 20-tooth counter shaft gear
8. Mid 21-tooth counter shaft gear
9. Upper front 26-tooth fixed gear
10. Upper mid 31-tooth fixed gear
11. 29-tooth high range gear and coupler
12. Output to rear pinion and FWD drop box



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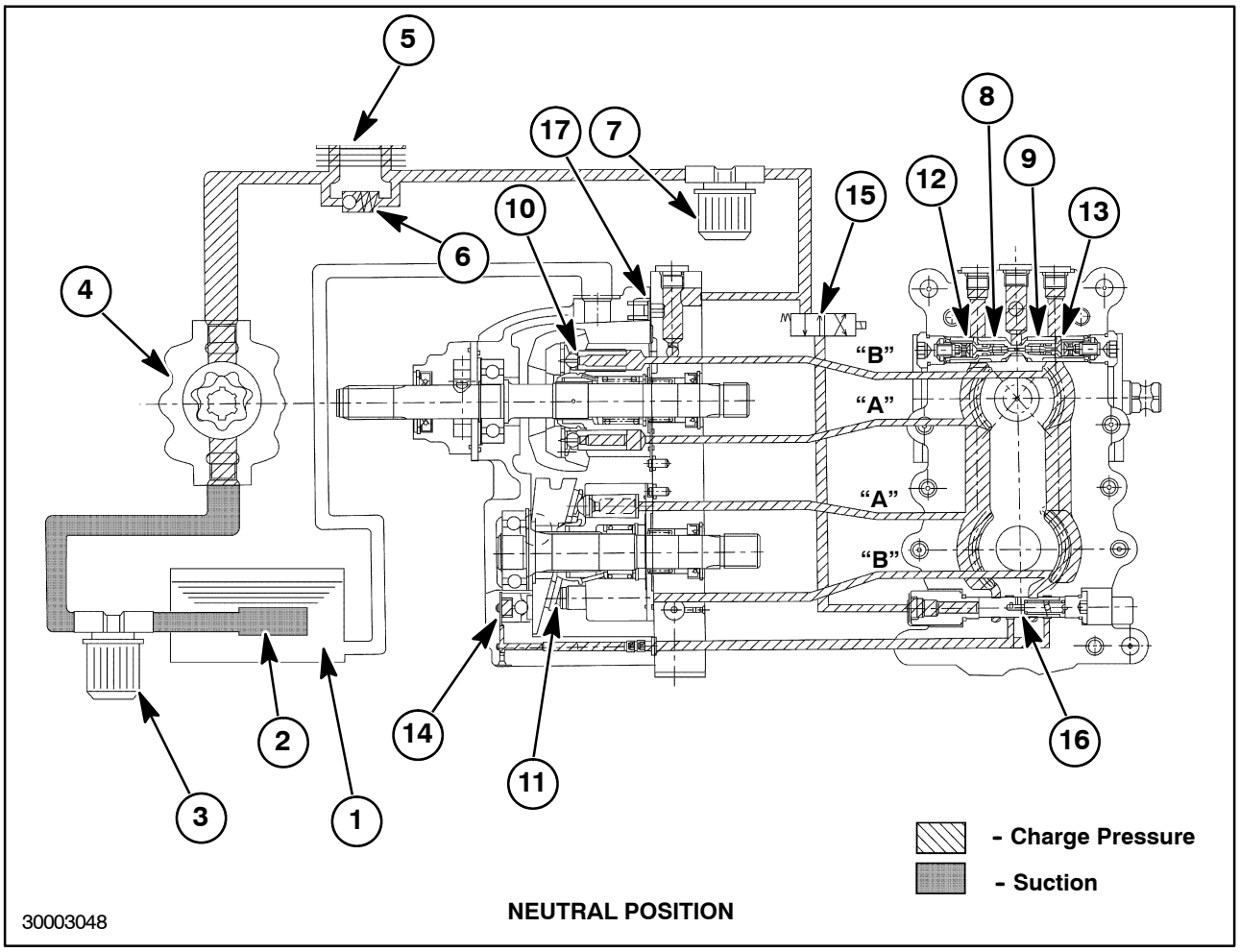
Low Range

Power flow as follows:

1. Engine adapter plate
2. Input shaft
3. Input shaft splined coupler
4. Input shaft hydrostatic transmission
5. Output shaft hydrostatic transmission
6. Output shaft splined coupler
7. Lower 20-tooth counter shaft gear
8. Mid 21-tooth counter shaft gear
9. Upper front 26-tooth fixed gear
10. Upper rear 19-tooth fixed gear
11. 41-tooth high range gear and coupler
12. Output to rear pinion and FWD drop box



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1. Reservoir
2. Suction screen
3. Hydraulic filter
4. Charge pump
5. HST oil cooler
6. Cooler bypass valve
7. HST oil filter
8. Check valve "A"
9. Check valve "B"
10. Hydrostatic pump
11. Hydrostatic motor
12. Forward high pressure relief valve
13. Reverse high pressure relief valve
14. Hi/Low piston
15. Hi/Low solenoid valve
16. Hi/Low shift spool
17. Charge pump relief valve

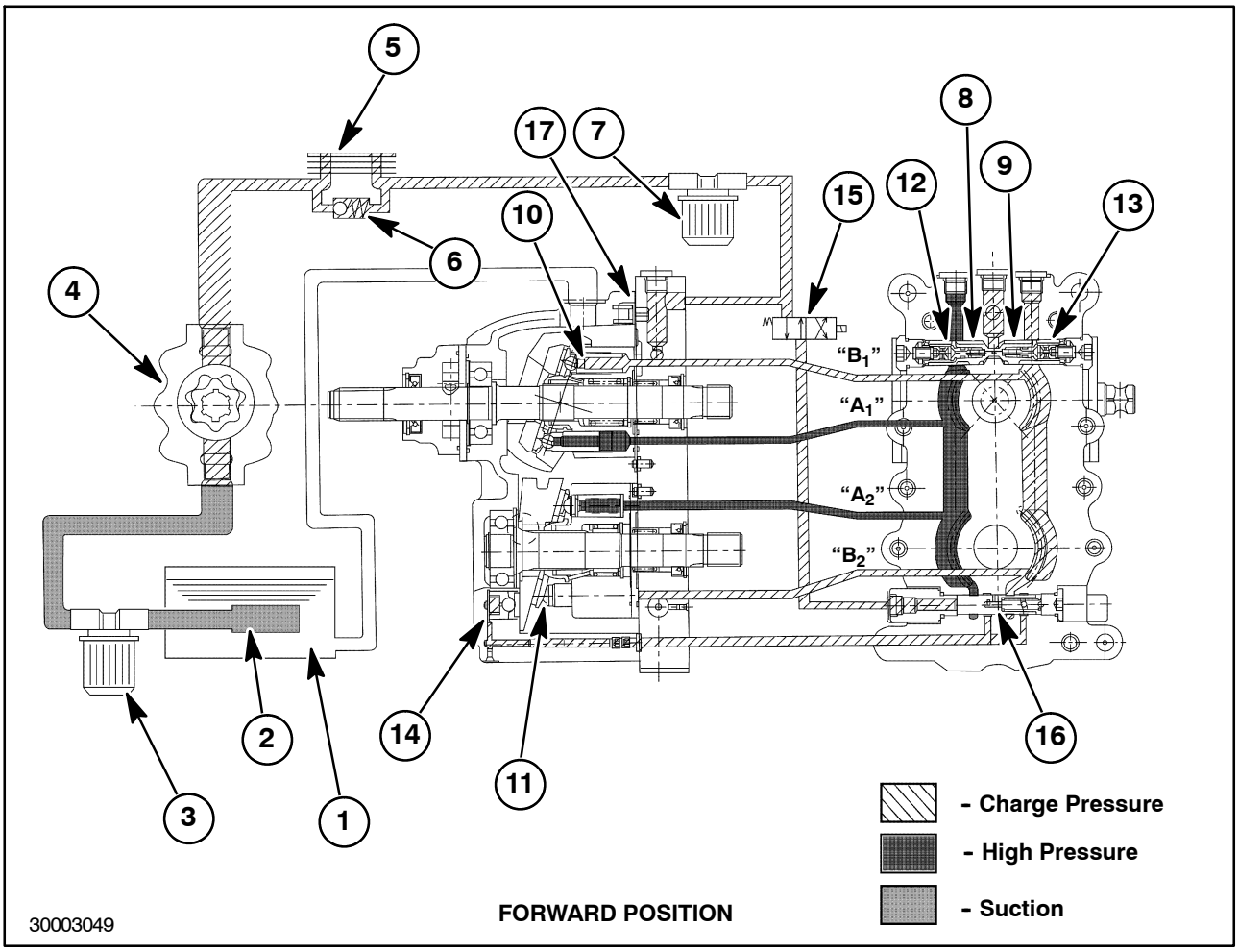
OIL FLOW

Neutral Position

Oil is drawn from the transmission reservoir, 1, through the suction screen, 2, and hydraulic filter, 3, by the rotor type charge pump, 4. The pressurized oil flows from the charge pump to the oil cooler, 5, and then to the HST filter, 7. If the cooler will not allow flow through it, the cooler by pass valve, 6, will open and the oil flow will by pass the oil cooler but still flow through the HST filter, 7. From the HST filter the oil flows to both check valve, 8, and check valve, 9, and then returns to sump via the charge pump relief valve, 17.

The charge pump relief valve, 17, maintains 7.86 – 11.72 bar (114 – 170 psi). Pressure to the check valves 8 and 9 at all times. Oil flow past the check valves pressurizes the passages "A" and "B" and the pump and motor cylinder blocks.

Because of equal pressures in passages "A" and "B" the motor does not rotate.



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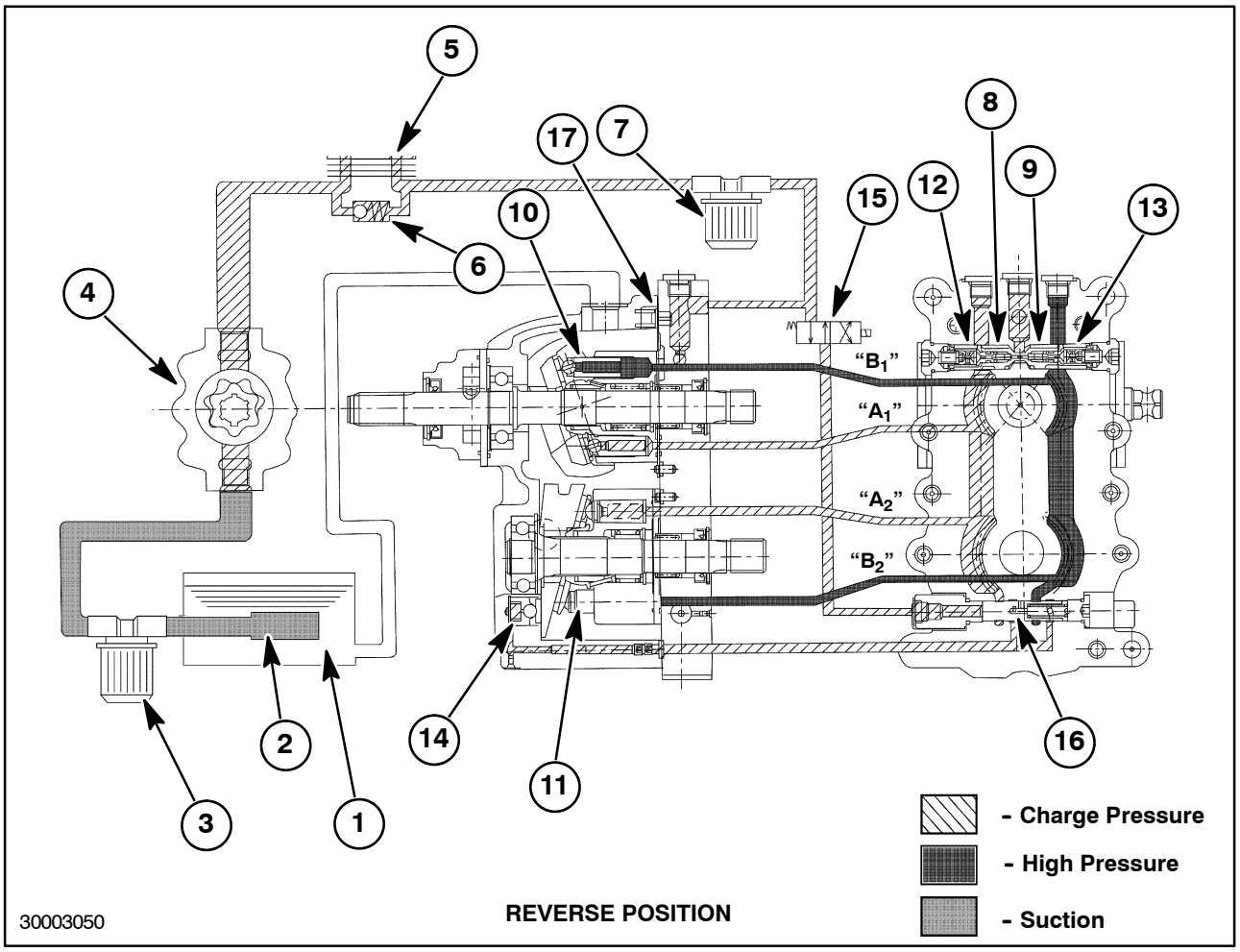
1. Reservoir
2. Suction screen
3. Hydraulic filter
4. Charge pump
5. HST oil cooler
6. Cooler bypass valve
7. HST oil filter
8. Check valve “A”
9. Check valve “B”
10. Hydrostatic pump
11. Hydrostatic motor
12. Forward high pressure relief valve
13. Reverse high pressure relief valve
14. Hi/Low piston
15. Hi/Low solenoid valve
16. Hi/Low shift spool
17. Charge pump relief valve

Forward Position

When the hydrostatic piston pump, 10, is rotating and the forward pedal is depressed, moving the pump cam–plate from neutral, oil flows from the piston pump, through passage “A”. Pump pressure on the back of the check valve, 8, closes the check valve and pressure increases in passage “A1”. All fluid from passage “A1” flows to the hydrostatic motor, 11, through passage “A2” causing the motor to rotate and moves the unit forward. When the forward pedal is depressed further the increased oil flow rotates the motor faster increasing wheel speed. Fluid discharged from the hydrostatic motor at B2 into passage “B” flows back to the hydrostatic pump, 10, through passage “B1” to complete the cycle. When fluid leakage in the system causes a drop in pressure on the suction passage “B1” below 6.4 – 8.3 bar (92–120 PSI) check valve, 9, opens and provides make–up fluid from the charge pump to replenish the oil in the low pressure side of the loop. Excess fluid from the charge pump is returned to the sump via the charge pump relief valve, 17.

The high pressure relief valve, 12, protects the motor, 11, opening when pressure is above 345 bar (5000 PSI).



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1. Reservoir
2. Suction screen
3. Hydraulic filter
4. Charge pump
5. HST oil cooler
6. Cooler bypass valve
7. HST oil filter
8. Check valve “A”
9. Check valve “B”
10. Hydrostatic pump
11. Hydrostatic motor
12. Forward high pressure relief valve
13. Reverse high pressure relief valve
14. Hi/Low piston
15. Hi/Low solenoid valve
16. Hi/Low shift spool
17. Charge pump relief valve

Reverse Position

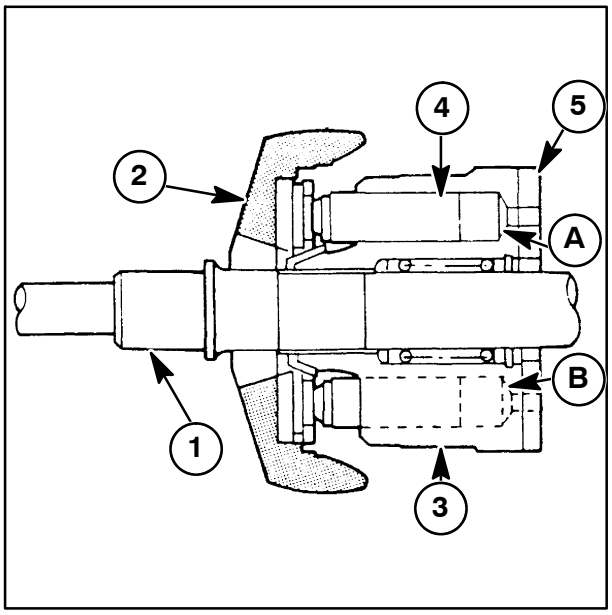
When the hydrostatic piston pump, 10, is rotating and the reverse pedal is depressed, moving the pump cam–plate from neutral, oil flows from the piston pump, through passage “B”. Pump pressure on the back of the check valve, 9, closes the check valve and pressure increases in passage “B1”. All fluid from passage “B1” flows to the hydrostatic motor, 11, through passage “B2”, causing the motor to rotate and moves the unit rearward. When the reverse pedal is depressed further the increased oil flow rotates the motor faster increasing wheel speed. Fluid discharged from the hydrostatic motor at “A2” into passage into passage “A” flows back to the hydrostatic pump, 10, through passage “A1”, to complete the cycle. When fluid leakage in the system causes a drop in pressure on the suction passage “A1” below 6.4 – 8.3 bar (92–120 PSI) check valve, 8, opens and provides make–up fluid from the charge pump to replenish the oil in low pressure side of the loop. Excess fluid from the charge pump is returned to the sump via the charge pump relief valve, 17.

The high pressure relief valve, 13, protects the motor, 11, opening when pressure is above 345 bar (5000 PSI).

Op. 29 212

VARIABLE DISPLACEMENT PUMP

The cylinder block, 3, and pistons, 4, are splined to the input shaft, 1, and rotate with the shaft. In the neutral position, the swash plate, 2, is in the vertical position, at right angle to the pistons and the pistons do not stroke. When in neutral position, the displacement in the cylinders, “A” and “B” are equal and no fluid flows through the pump or motor valve port plate, 5.



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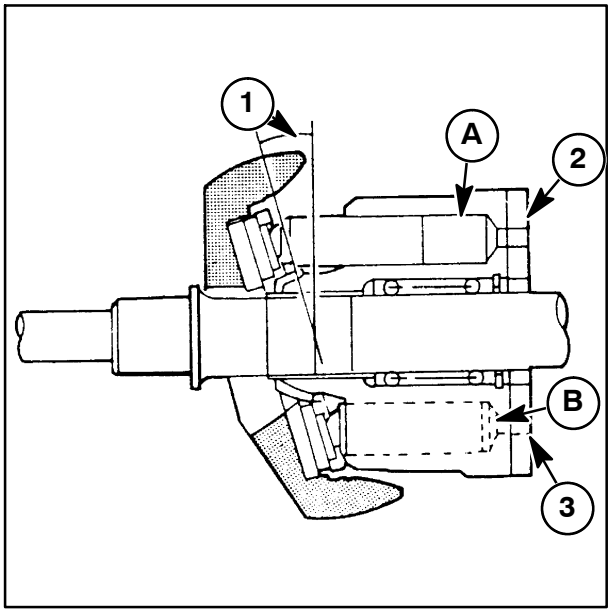
When the swash plate is tilted at an angle, 1, fluid in the cylinder in position “A” is discharged out through port, 2, in the valve plate, 3, as the cylinder is rotated to position “B”. Maximum fluid flow is obtained when the swash plate is at maximum tilt angle.



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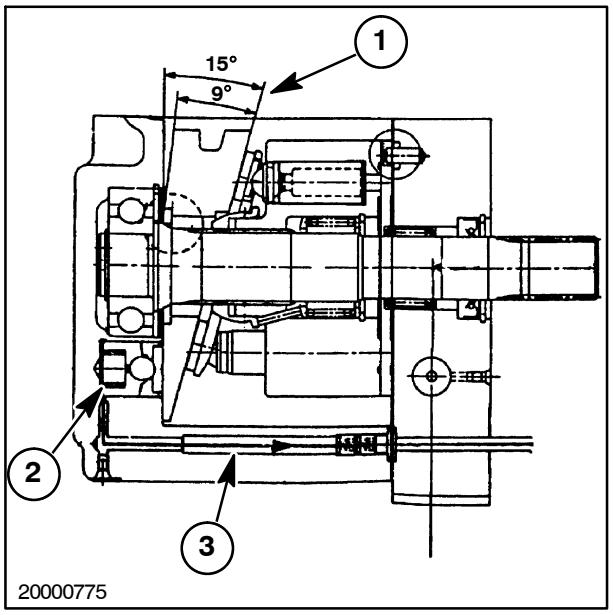
Op. 29 212

TWO POSITION DISPLACEMENT MOTOR

The two-position displacement motor assembly has a displacement of 15° and 9°, at 1, for low transmission and high transmission operation respectively. Displacements are obtained by the raising and lowering of two pistons, 2, with the flow of fluid pressure in line, 3.



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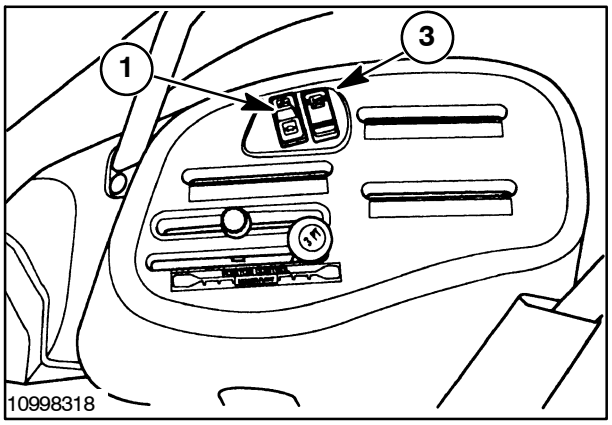
Op. 29 134

HI/LO SPEED CONTROL/CONTROL POD

The speed control switch, 1, is located on the right-hand control pod. It has two positions. The “Turtle” (Lo) position operates the HST unit at below normal speed. The “Rabbit” (Hi) position operates the HST unit at above normal speed. The Hi/Lo speed control can be operated with both ranges of the transmission.



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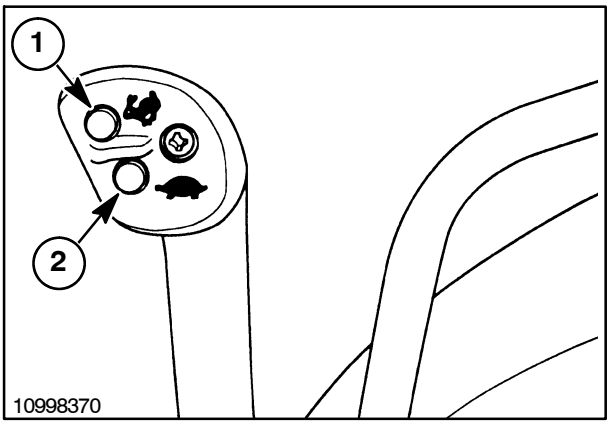
HL/LO SPEED CONTROL

Optional Hi/low speed control is located on the front remote control valve joystick handle. Press the “Rabbit”, 1, for high range or the “Turtle”, 2, for low range.

NOTE: *When the tractor is shut off, Hi/Lo defaults to Low.*



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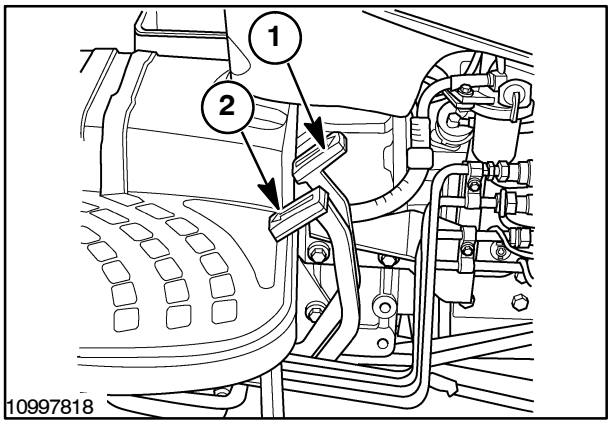
Op. 29 200

FOOT CONTROL PEDALS

The hydrostatic unit is operated by two-foot control pedals; pedal, 1, for forward operation and pedal, 2, for reverse operation. The foot pedals automatically return to neutral (stopped) position when released. The speed is controlled by varying the amount of movement of the pedal from neutral position. When a constant forward speed is desired on level terrain, setting the speed control (cruise) switch, 3 (Figure 10), to the “SET” position will hold the foot pedal in the fixed position and permit the operator to remove his foot from the pedal. When the speed (cruise) control switch is “RELEASED” the foot pedal automatically returns to the neutral position and the tractor stops.

NOTE: *The operator can depress the pedal further from the set position to travel at a faster speed momentarily. The pedal (cruise) control can also be set in reverse.*



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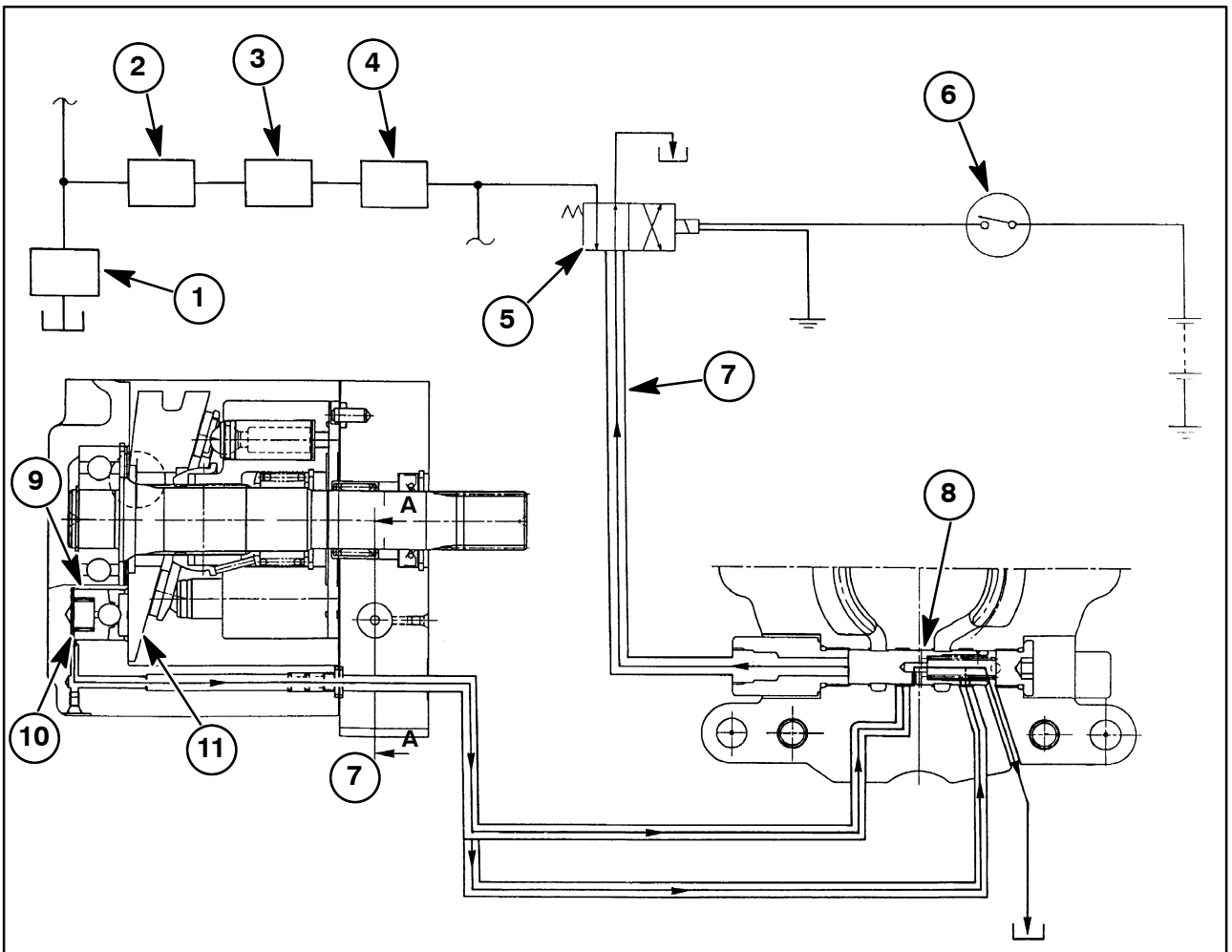

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"LOW" OR TURTLE POSITION

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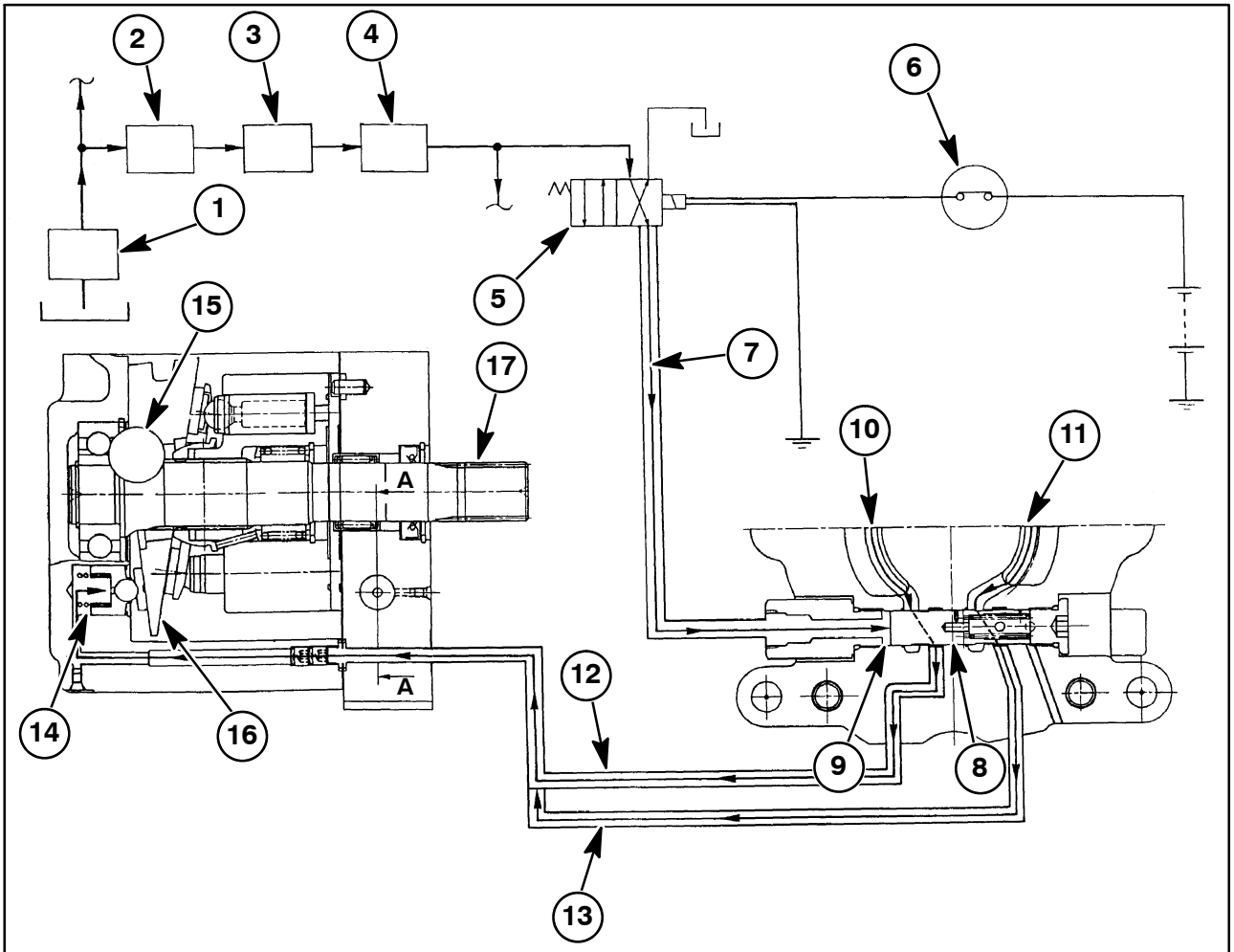
1. Hydraulic suction filter
2. HST charge pump
3. Oil cooler
4. HST oil filter
5. Solenoid valve
6. Hi/Low switch
7. Oil passage
8. Hi/Low spool (located in HST center valve section)
9. Piston
10. Cylinder
11. Motor swash plate

When the Hi/Low switch, 6, is moved to the low or turtle position, electrical current is not supplied to the solenoid valve, 5. Without current supplied, the solenoid valve stays closed, routing the pressurized charge pump oil to sump. The oil in the swash plate piston cylinders, 10, is forced out of the cylinders by the swash plate, 11, pushing on the pistons, 9, this oil is returned to sump via the Hi/Low spool, 8. The swash plate, 11, is set at 15° for low speed transmission operation.



"HIGH" OR RABBIT POSITION

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14

1. Hydraulic suction filter
2. HST charge pump
3. Oil cooler
4. HST oil filter
5. Solenoid valve
6. Hi/Low switch
7. Charge pressure oil passage
8. Hi/Low spool
9. Spool port
10. High pressure port
11. High pressure port
12. Cylinder passage
13. Cylinder passage
14. Piston
15. Steel pivot ball
16. Swash plate
17. Motor output shaft

When the Hi/Low switch, 6, is moved to the high or rabbit position, electrical current is supplied to the solenoid valve, 5. With current supplied, the solenoid valve, 5, moves to the open position, routing the pressurized charge pump oil to the Hi/Low spool, 8.

The pressurized charge pump oil shifts the Hi/Low spool against the spool return spring, as the spool shifts, high pressure passages, 10 and 11 are connected to the cylinder passages, 12 and 13 allowing HST high pressure oil to be routed to the swash plate pistons, 14. The pistons exert pressure onto the backside of the swash plate, 16, and using the steel pivot balls, 15 as fulcrum the swash plate changes its angle of operation from15° to 9° for high speed operation of motor output shaft, 17.

TROUBLESHOOTING

PROBLEM	CHECK	POSSIBLE CAUSE	CORRECTION
Transmission fails to operate, erratic or abnormal noise when operated.	Input shaft rotation	Input shaft failure	Repair or replace as required
	Transmission fluid level	Low oil supply	Fill to proper level
	Charge relief valve pressure	Low charge pressure	Check charge relief valve
		Clogged suction strainer	Clean strainer
		Oil viscosity high	Replace oil
		Charge pump defective	Replace charge pump
		Defective charge relief valve	Replace relief valve
	High pressure relief valve	Defective High pressure relief valve	Replace valve
		Defective cylinder block	Replace cylinder block
Tractor fails to stop at neutral	Pedal neutral position binding linkage	Linkage out of adjustment	Adjust neutral position
		Neutral cannot be adjusted	Replace trunnion shaft joint
Oil leakage	Charge pump pressure	Charge pressure too high, (above 12 kg/cm^2 [170 PSI])	Replace charge pump relief valve
		Pressure loss in filter excessive	Replace filter
		Return oil line restricted	Repair as required
Low power	High pressure relief valve	Valve pressure setting too low	Replace high pressure relief valves or replace port block as required
		Worn cylinder block	Overhaul
		Worn wear plates	Overhaul
Oil overheating	Cooler	Dirty cooler fins	Clean cooler fins
		Incorrect oil	Replace oil
	Check valve in HST filter base for proper operation	Binding valve or broken spring	Clean or replace spring
		Binding charge pressure relief valve	Clean or replace charge pressure relief spring

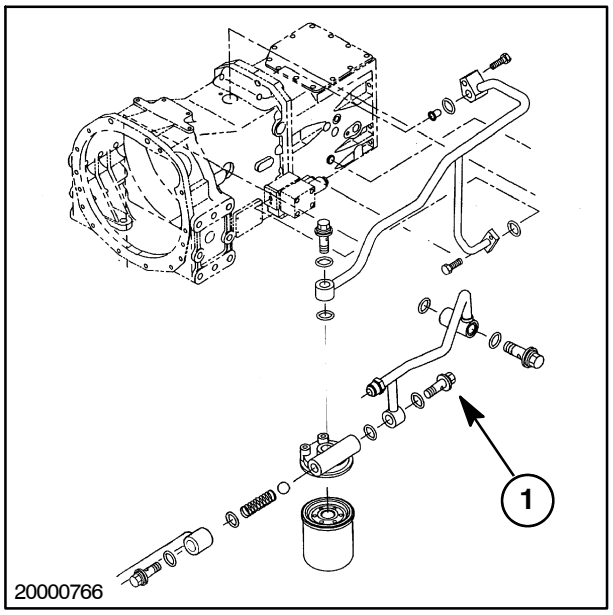
PROBLEM	CHECK	POSSIBLE CAUSE	CORRECTION
High range will not engage	(F5) 7.5 amp fuse	Blown fuse	Replace 7.5 amp fuse
	Hi/Low switch	Defective hi/low switch	Replace hi/low switch
	"Hi" range relay	Defective relay	Replace relay
	Hi/Low solenoid	Defective solenoid	Replace solenoid
	Solenoid valve	Spool binding	Clean and lubricate spool
	Adapter block screen	Plugged screen	Clean screen
	HST cylinder block spool	Spool binding	Clean and lubricate spool
	Low charge pressure	Stuck charge pressure relief valve	Remove, clean or replace charge relief valve
		Defective charge pump	Replace charge pump
	Swash plate angling pistons	Stuck or oil blowing by pistons	Check piston fit in piston bore
Low range will not engage	Solenoid valve not de-energizing	Faulty electrical circuit	Check electrical circuit to solenoid repair as needed
	Swash plate angling pistons	Stuck piston in bore	Check piston fit in bore repair as needed

CHARGE PUMP RELIEF VALVE

Test

Operate the tractor to warm the oil to 25° - 50° C (80° - 120° F) before performing this hydraulic test.

1. Remove the oil pipe banjo bolt, 1, on the oil filter base.



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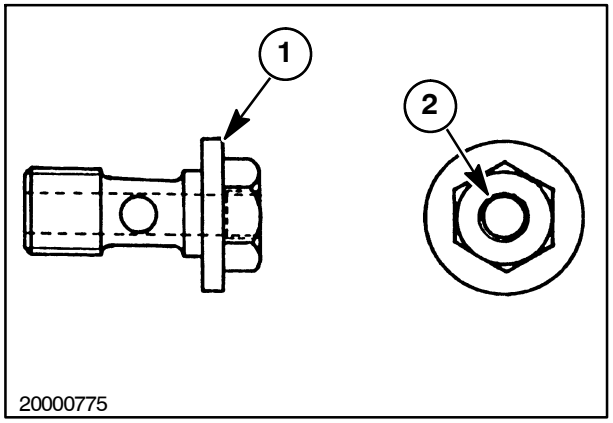
1. Banjo bolt

2. Install the modified banjo bolt, 1, for pressure check. Modify banjo bolt locally.
3. Install a 0 - 20 bar (0 - 300 PSI) gauge into the banjo bolt.
4. Set the range selector lever in neutral.
5. Set the engine throttle at 2600 rpm. Read the pressure gauge. Pressure reading should read between 7.8 - 11.7 bar (114 - 170 PSI).

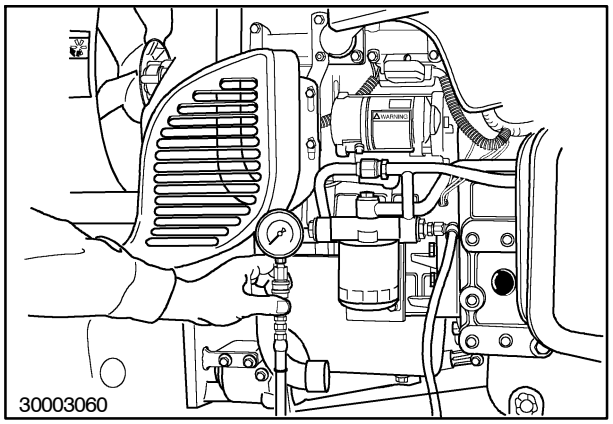
If the charge pressure reading is low, check the following:

- Restricted suction filter.
- Charge pump relief valve and spring (replace if required).
- The charge pump (repair if required).



16

1. Banjo Bolt (for pressure check) SBA398480240
2. Drill and tap - 1/8″ NPT



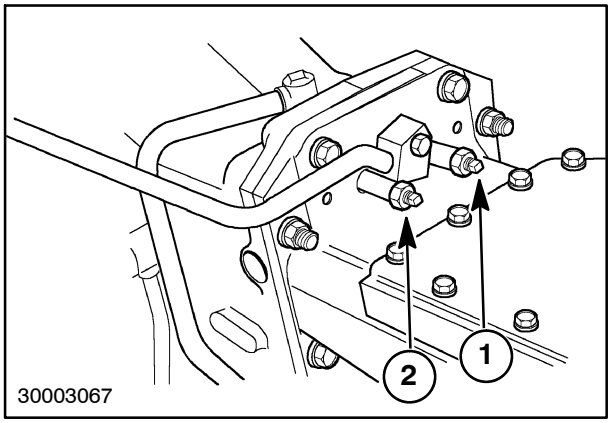
17

PRESSURE TESTING AND ADJUSTMENTS

HIGH PRESSURE RELIEF VALVE

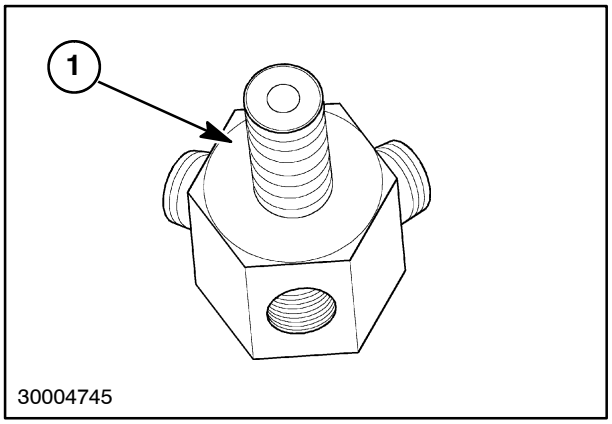
Operate the tractor to warm the hydraulic oil to 25° - 50°C (80° -120°F) before performing this hydraulic test.

1. Remove the rubber floor mat and cover from the center of the operator's platform.
2. Remove the test port plug, 1, if testing reverse; port, 2, if testing forward.
   - Right side port - Reverse
   - Left side port - Forward



18

3. Install HST Hi-pressure test fitting, 1, Tool No. CNH299007 into the right side test port.



19

4. Install a 0 - 450 bar (0 - 6500 PSI) gauge, 2, to the right side test fitting. **(Reverse testing is shown).**

⚠ CAUTION ⚠

NOTE ORDER OF OPERATION:

1. **Securely lock the parking brake.**
2. **Disengage the range gear and start the engine.**
2. **Place the range lever in the high range position.**

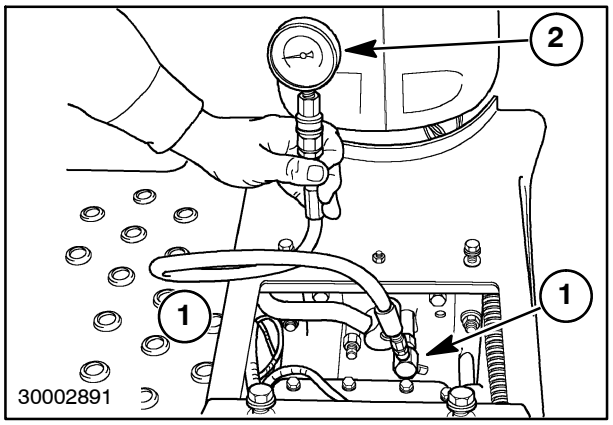
5. Set the throttle speed to 2600 rpm.

6. Be sure the transmission foot pedals are in the neutral position.

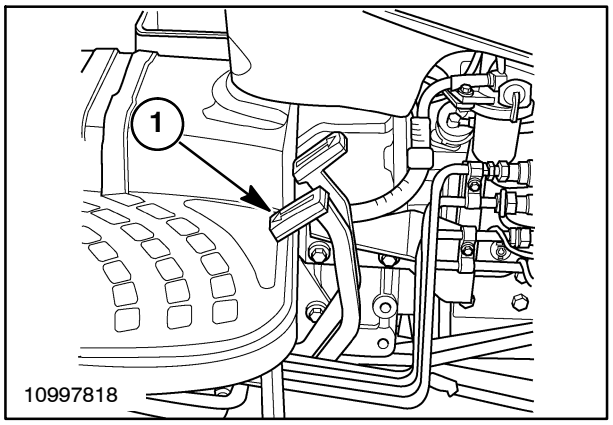
7. With the parking brake engaged, slowly move the reverse foot pedal, 1, to obtain a reading on the pressure gauge. Read the maximum pressure on the gauge. Pressure should be 345 bar (5000 PSI).

IMPORTANT: *Read pressure in the minimum of time to prevent overheating and possible damage to the transmission.*

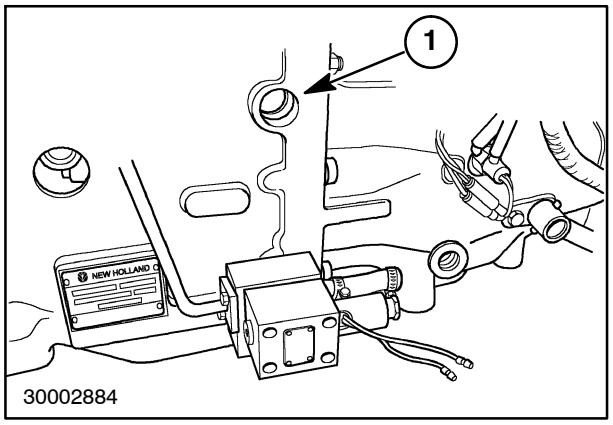
8. If necessary to replace either of the relief valves, the operator's platform has to be removed to gain access to the relief valve ports, 1 (forward port shown on left side of tractor – reverse port on right side of tractor).



20



21

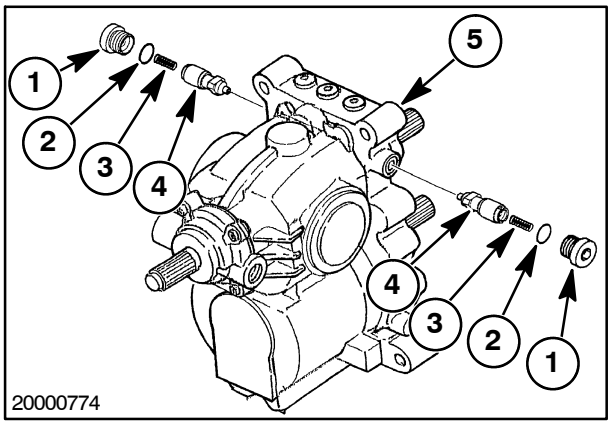


22

9. To remove suspect relief valve, remove port plug, 1, with 10 mm allen wrench, O ring, 2, spring, 3, and relief valve cartridge, 4.

NOTE: *Relief valves are not adjustable, if a relief valve is suspected as faulty, replace suspected valve with new one.*

10. Retest the new relief valve as previously described.



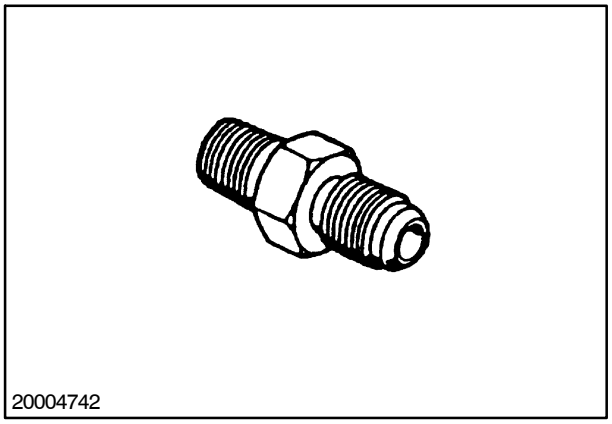
23

1. Plug
2. O ring
3. Spring
4. High pressure relief valve
5. Port block

HI/LOW PRESSURE TEST

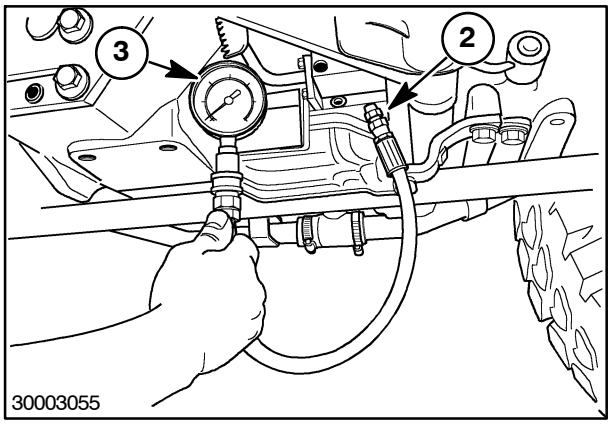
1. Remove pipe plug from rear of HI/LOW adapter block.

2. Install adapter fitting FNH00011 to adapter block port, 2. Fitting is: 1/8″ BSPT x 7/16-20 UNF.



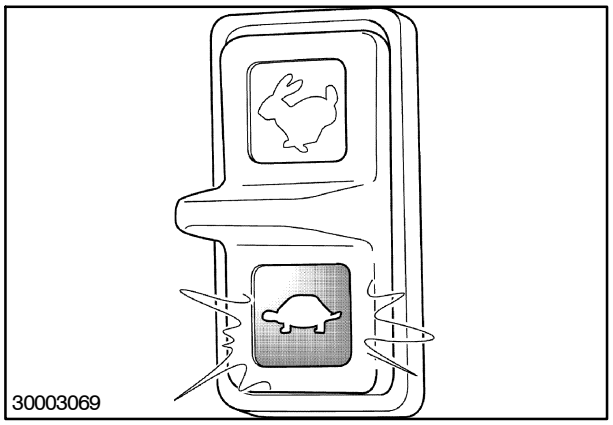
24

3. Install a 0 - 200 bar (0 - 300 PSI) gauge, 3, to adapter fitting.
4. Start tractor, HI/LOW system when initially started will default to “LOW” mode.



25

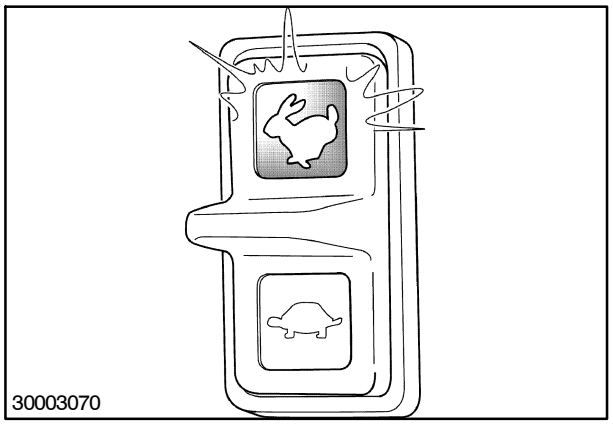
5. While the tractor is running and the valve is in the “LOW/TURTLE” mode, zero pressure should be present at test port.



26

6. While tractor is running switch HI/LOW switch to the “HIGH/RABBIT” mode. When switch is in “HIGH” pressure should be 7.8 - 11.7 bar (114 - 170 PSI).

NOTE: *The HI/LOW circuit is supplied oil by the HST charge pump. The test results of the HST charge pump pressure, that is measured at the HST filter base and HI/LOW pressure test should have the same readings. The HST charge pressure relief valve regulates the pressure in both systems.*



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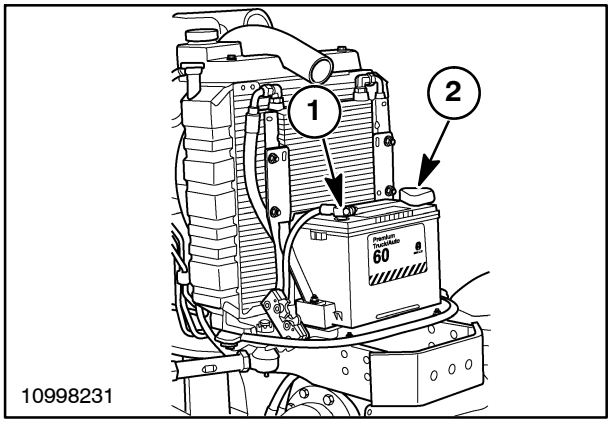
SEPARATING THE TRACTOR

TC35DA, TC40DA, AND TC45DA W/HST TRANSMISSION

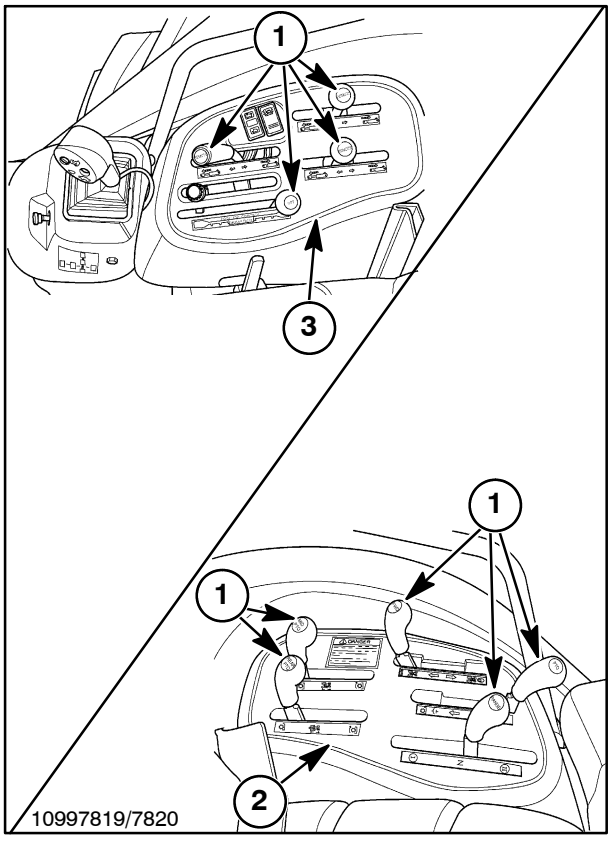
Separating at the HST Housing/Engine

1. Remove the negative (–) battery cable, 1, and the positive (+) battery cable, 2, from the battery.
2. Drain all of the hydraulic fluid from the transmission, differential, and the oil cooler into a suitable container.
3. Disconnect the headlight wire harness plug and remove the hood from the tractor.
4. Remove the seat, and the seat track assembly from the tractor deck.



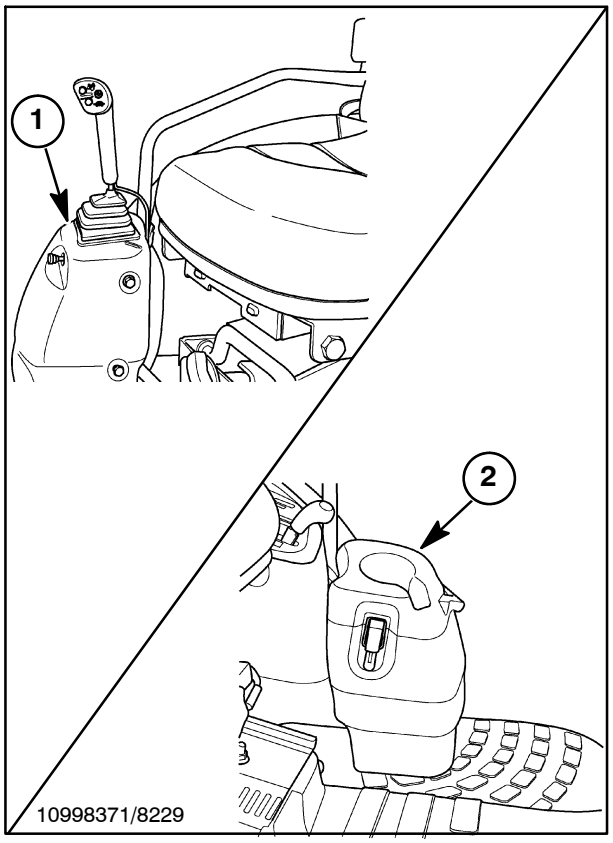
28

5. Remove the control lever grips, 1, from the control levers on both sides of the tractor.
6. Remove the left, 2, and the right, 3, control pods from the fenders.
7. Remove the light bars from the fenders and the ROPS.
8. Disconnect and remove the control levers from the tractor deck and the connecting linkage.



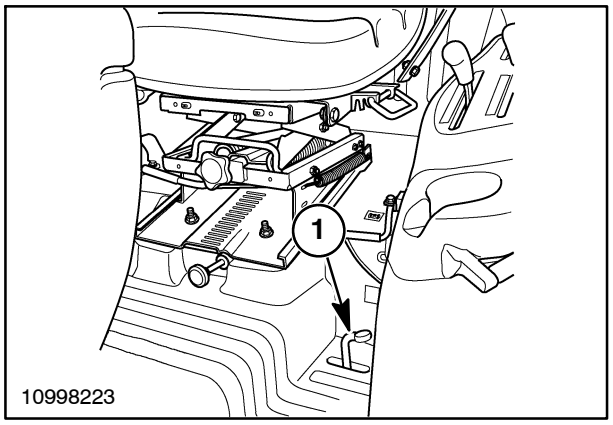
29

9. If equipped, remove the remote, loader control valve, 1, from the right fender, and the cup holder/tool box, 2, from the left fender.
10. Remove the left and right fenders from the tractor.



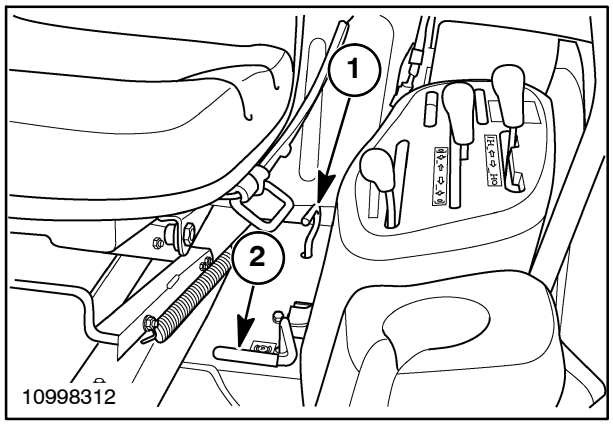
30

11. Disconnect and remove the differential lock pedal, 1.



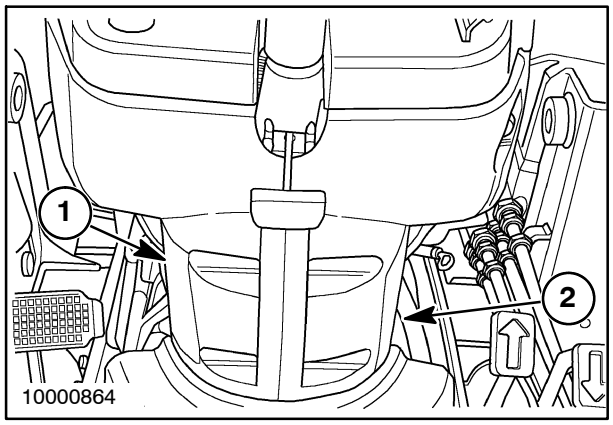
31

12. If equipped, disconnect and remove the fulltime 2WD lever, 1.
13. Disconnect and remove the parking brake handle, 2.



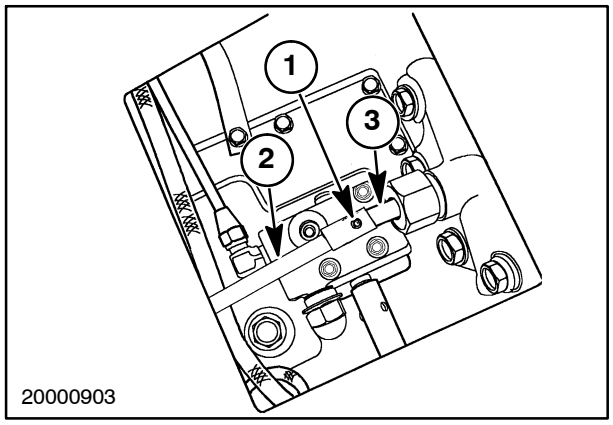
32

14. Remove the left, 1, and right, 2, rear hood side panels.
15. Remove the floor mat from the tractor deck.



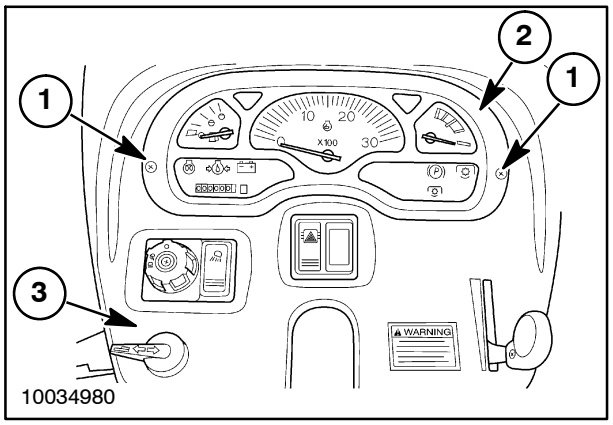
33

16. Drive the roll pin, 1, (or spring clip if equipped) from the HPL speed control shaft, 2, and remove the control shaft from the HPL shaft, 3.
17. Remove the deck from the tractor.



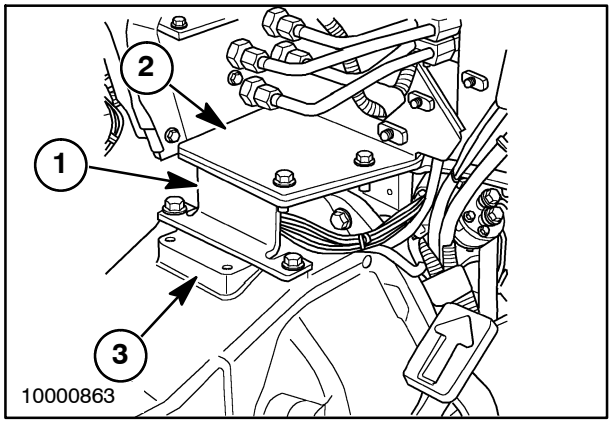
34

18. Loosen and remove the two instrument panel retaining screws, 1. Remove the instrument panel, 2, from the dash housing, 3. Disconnect the wiring connector from the instrument panel.
19. Disconnect the throttle cable from the throttle control lever.
20. Remove the dash housing from the firewall. Disconnect the wiring connectors from the dash switches.
21. Disconnect the two main wiring harness connectors.



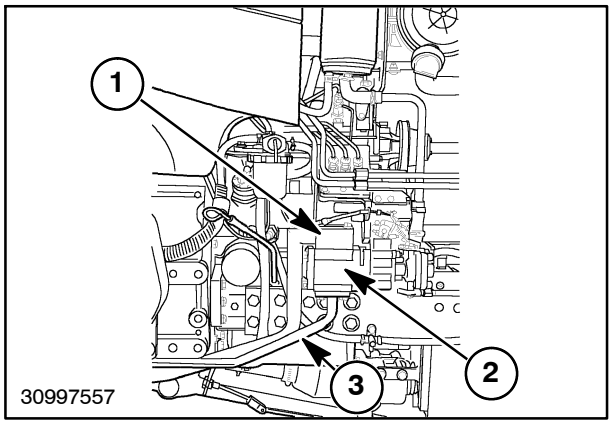
35

22. Remove the firewall support bracket, 1, from the firewall, 2, and the HST housing, 3.



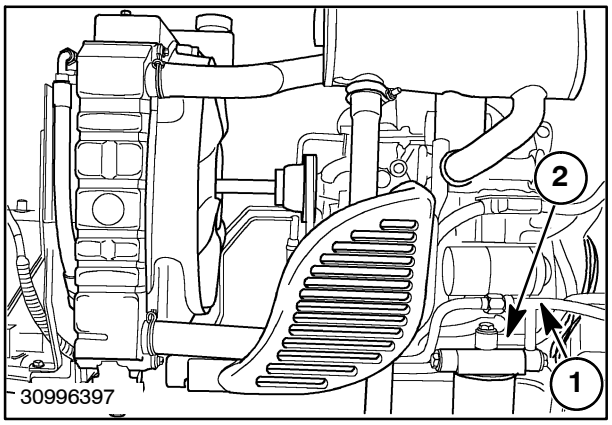
36

23. Remove the hydraulic system inlet tube, 1, from the hydraulic pump, 2.
24. Remove the hydraulic system pressure tube, 3, from the hydraulic pump, 2, and the diverter valve.



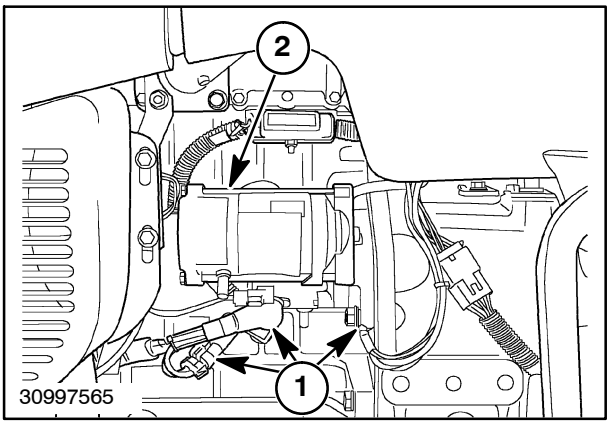
37

25. Remove the HST oil cooler tube, 1, and the HST pressure tube, 2, from the tractor.



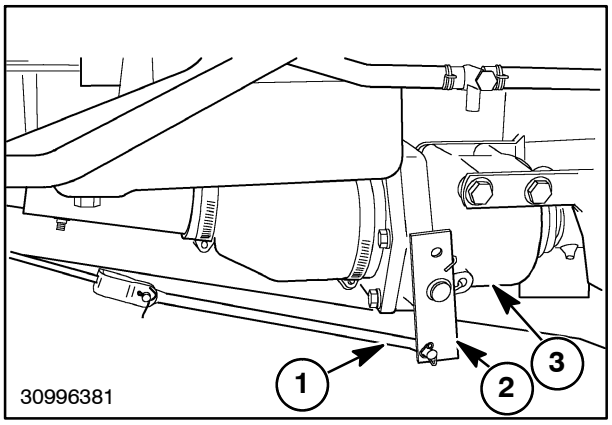
38

26. Disconnect the wires, 1, on the starter, 2, and remove the starter from the tractor.



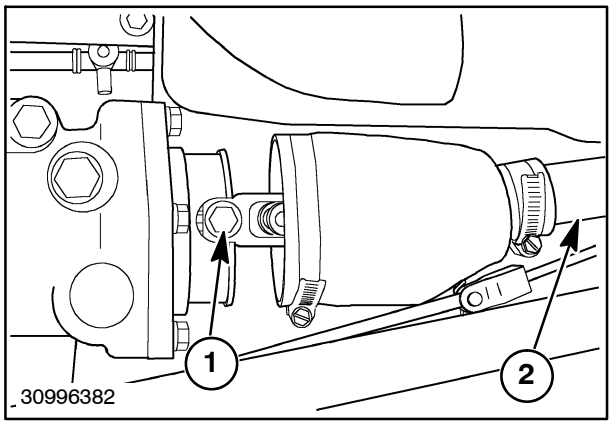
39

27. If equipped, disconnect the Sensitrack linkage, 1, from the control arm, 2, at the Sensitrack clutch, 3.



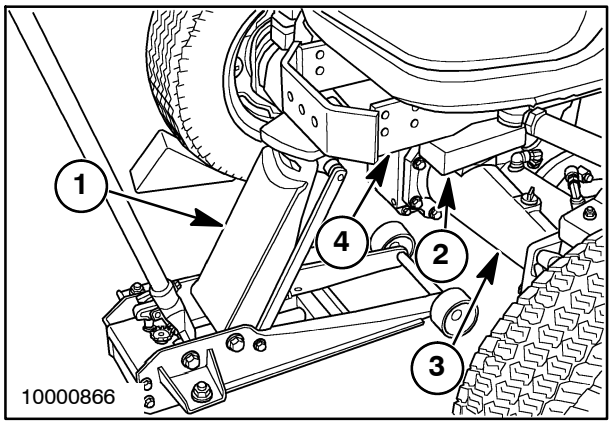
40

28. Remove the two FWD, driveshaft, front and rear, retaining bolts, (one roll pin on standard FWD axle), and remove the driveshaft from the tractor.



41

29. Use a floor jack, 1, to raise the front of the tractor and place wood blocks, 2, between the axle, 3, and the frame, 4. Lower the jack.



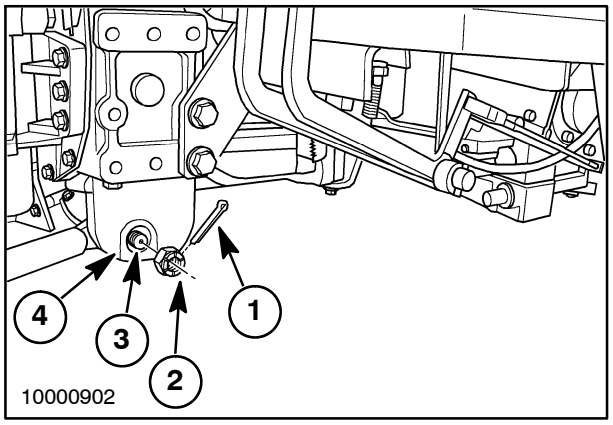
42

30. Remove the cotter pin, 1, and the castle nut, 2, from the support bar, 3, at the rear mounting bracket, 4.

31. Use a brass drift and a hammer to drive the support bar, 3, stud out of the mounting bracket, 4.

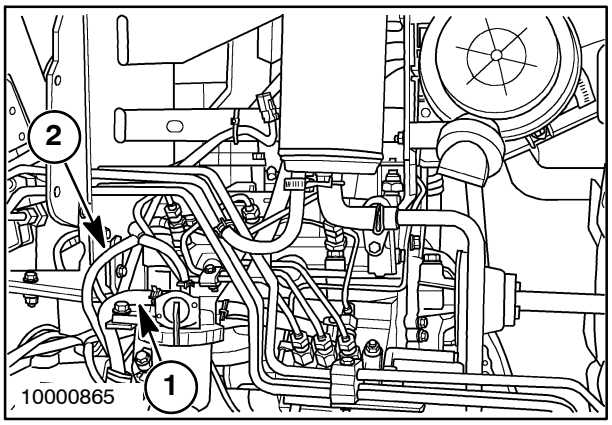
NOTE: *Draining the engine oil and removal of the oil filter is necessary on the TC35DA tractor to gain access to several of the buckle-up bolts.*

32. Drain the engine oil into a suitable container and remove the oil filter.



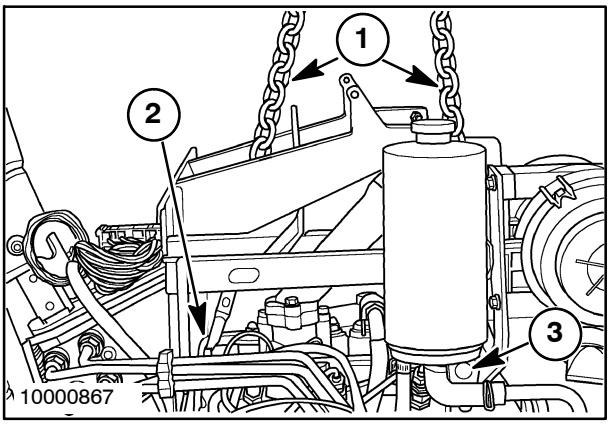
43

33. Remove the fuel supply, 1, and return, 2, lines from the fuel filter, 3.
34. Drain the fuel tank into a suitable container.



44

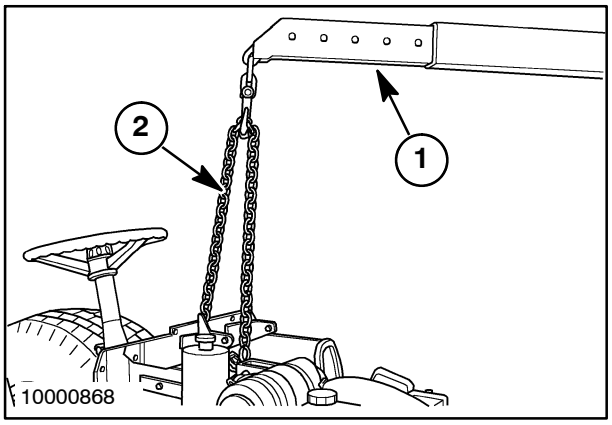
35. Attach a chain sling, 1, to the two hoist eyes, 2 and 3, on the engine.



45

36. Attach a suitable hoist, 1, to the chain sling, 2.

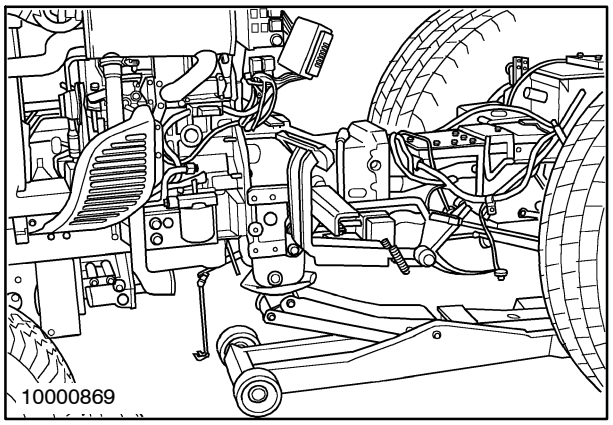
NOTE: *The hoist is used for supporting the engine and axle assembly, not for lifting.*



46

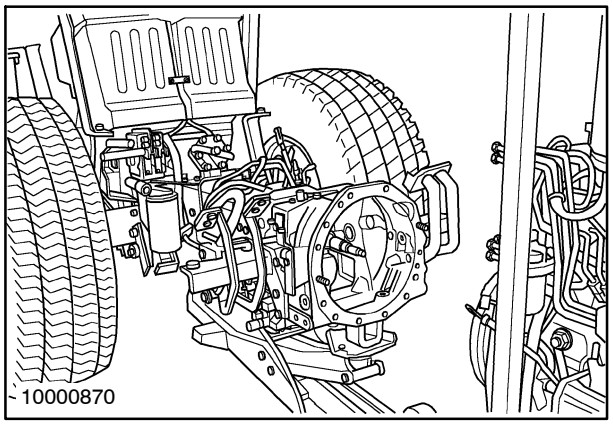
37. Roll a floor jack under the tractor from the rear of the tractor, and place under the HST housing. Raise the jack enough to support the drive train.
38. Remove the buckle-up bolts that secure the engine to the HST housing.

NOTE: *The hoist and/or the floor jack may need to be raised or lowered to allow the separation of the engine from the HST housing.*



47

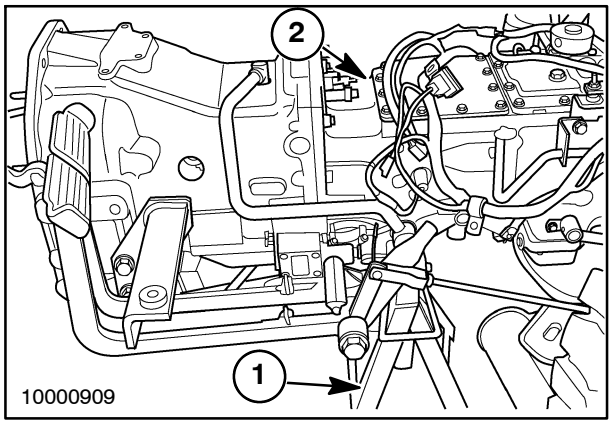
39. Carefully roll the drive train away from the engine, using the floor jack for support.



48

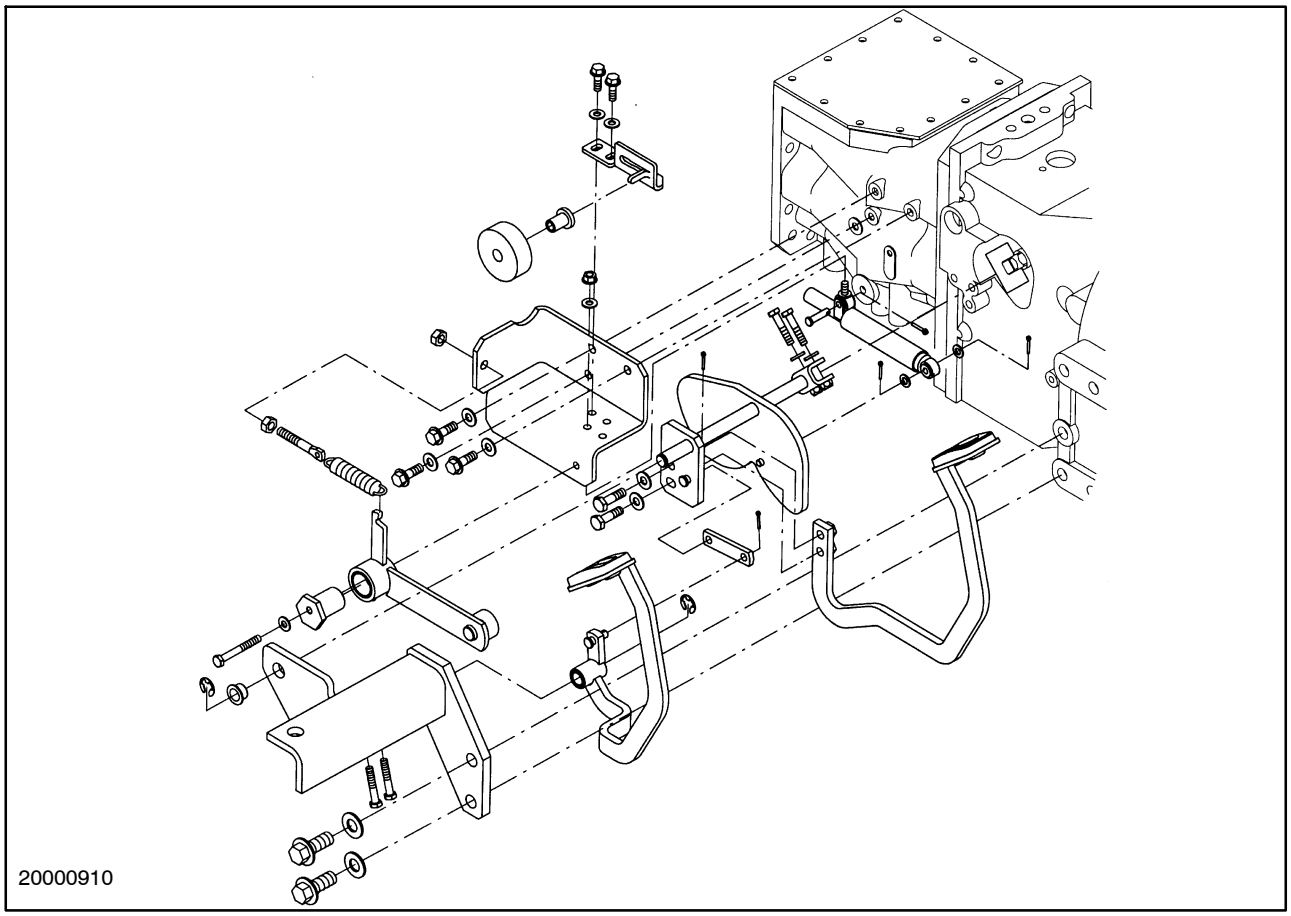
Separating the HST Housing at the Gearbox

1. Place a jack stand, 1, under the gearbox, 2, to support the drive train.



49

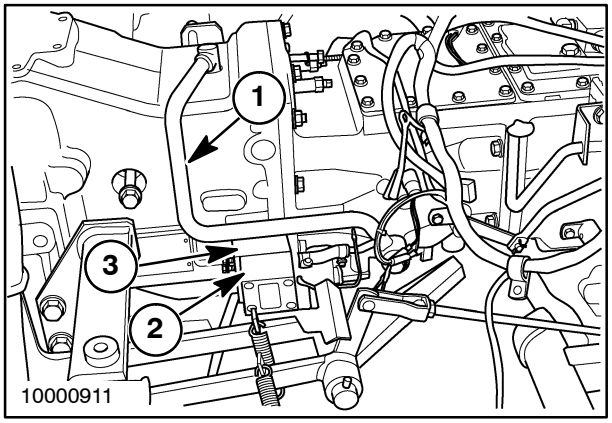
2. Remove the HST pedals and linkage, from the right side of the gearbox, and the HST housing.



50

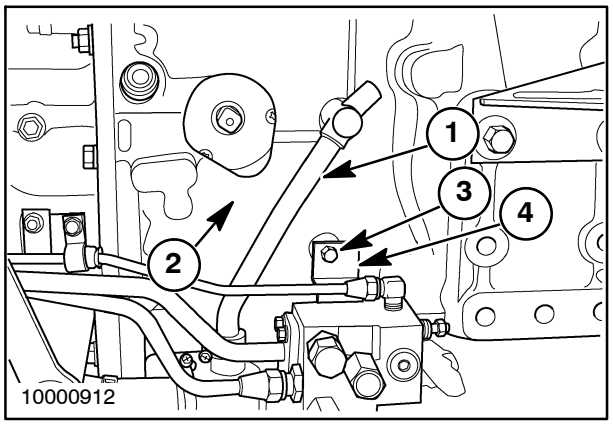
NOTE: *Remove and discard O rings. Replace with new O rings at assembly.*

3. Remove the hydraulic tube, 1, the hydraulic control valve, 2, and the valve body, 3, from the gearbox and the HST housing.



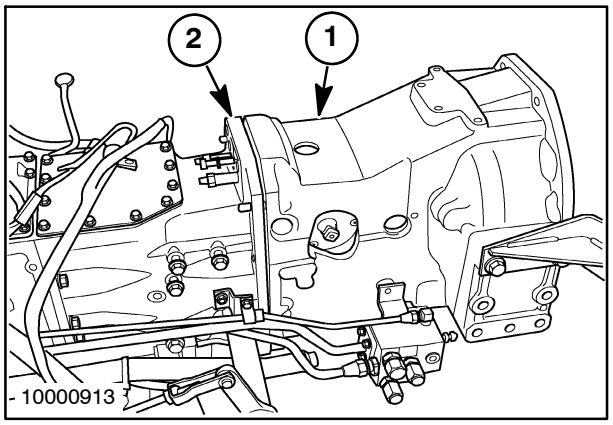
51

4. Remove the hydraulic tube, 1, from the HST housing, 2. Remove the retaining bolt, 3, from the diverter valve bracket, 4.



52

5. Loosen and remove the buckle-up bolts and buckle-up nuts. Separate and remove the HST housing, 1, from the gearbox, 2.



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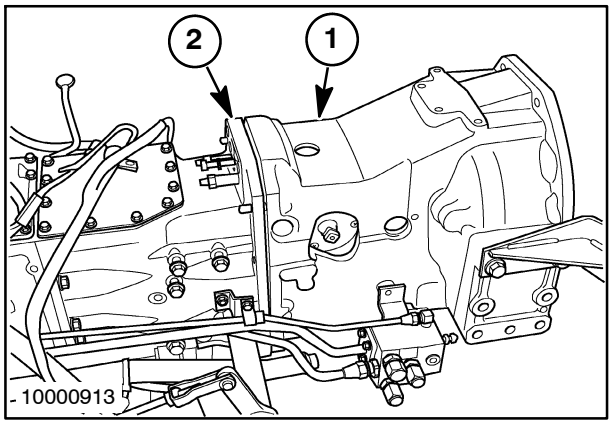
Attaching the HST Housing to the Gearbox

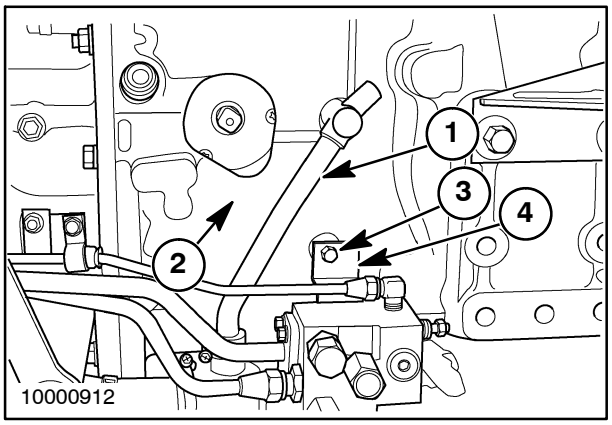
1. Position the HST housing, 1, onto the gearbox, 2, and secure with the buckle-up bolts, and buckle-up nuts. Tighten the bolts and the nuts to 60 ft lbs (81 N·m).



54

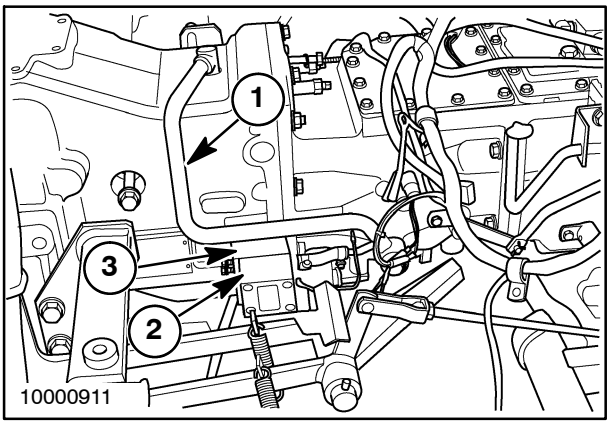
NOTE: *Use new O rings on hydraulic tubes during assembly.*

2. Install and connect the hydraulic tube, 1, to the HST housing, 2. Attach the diverter valve bracket, 4, to the HST housing, 2, and secure with the retaining bolt, 3.



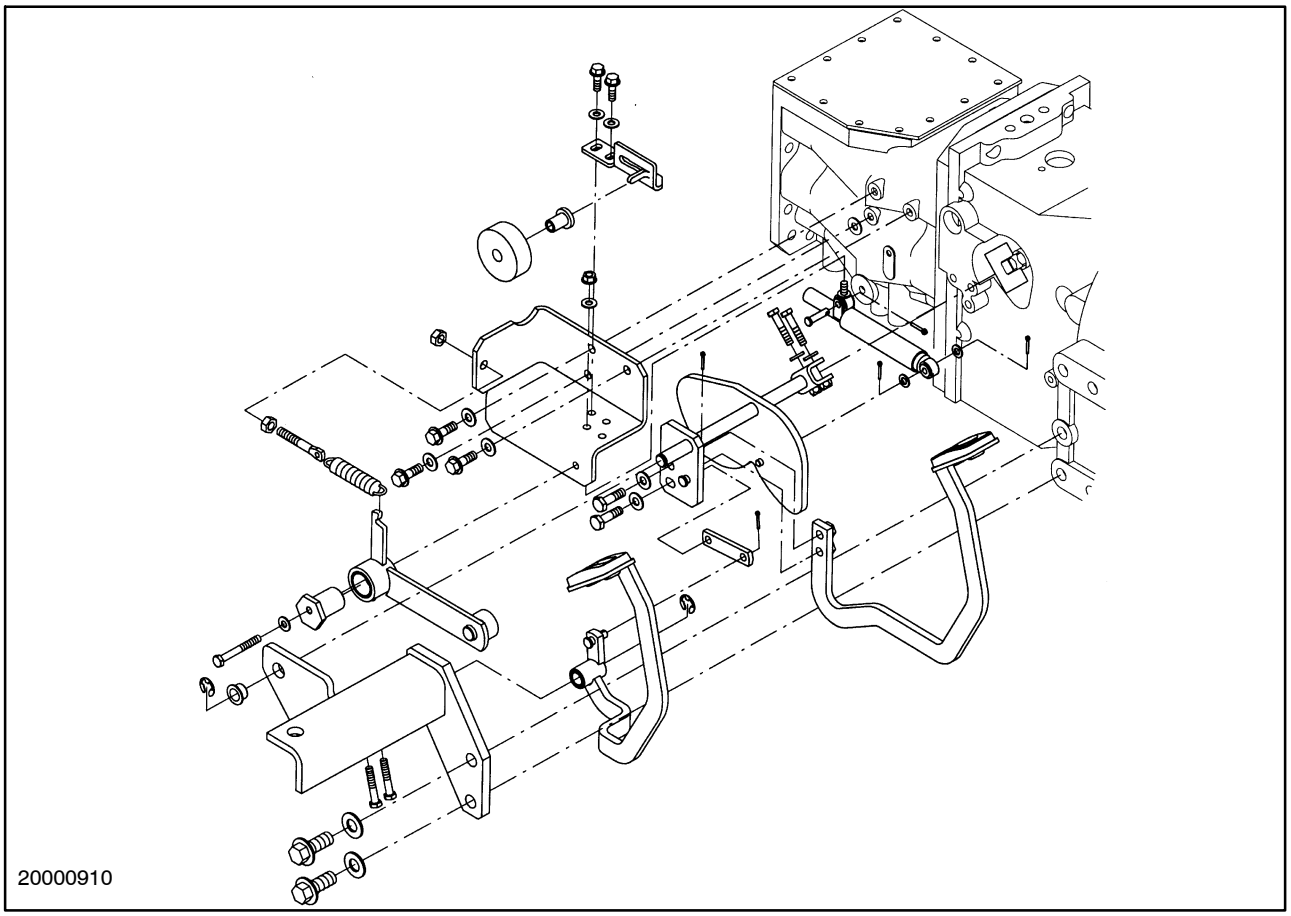
55

3. Install the valve body, 3, the hydraulic control valve, 2, and the hydraulic tube , 1, onto the HST housing and the gearbox.



56

4. Install the HST pedals and linkage, on the right side of the gearbox, and the HST housing.



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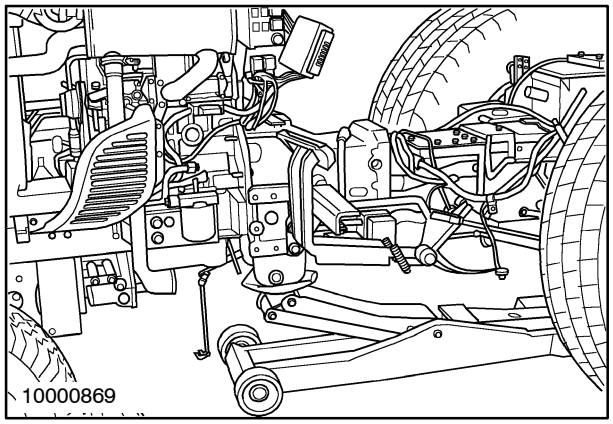
Attaching the HST to the Engine

⚠ WARNING ⚠

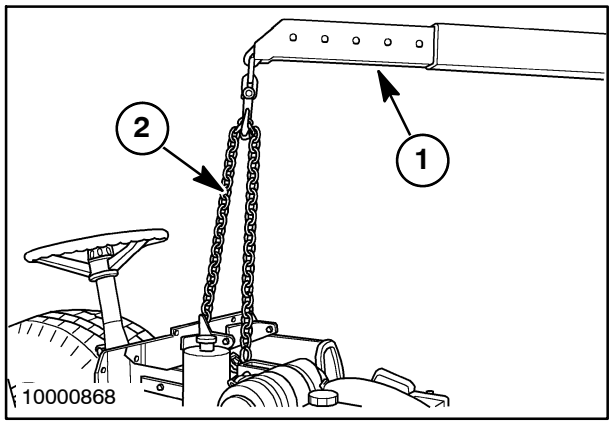
WARNING: Do not use the buckle-up bolts to draw the HST together with the engine. Severe damage to the drive train may result.

1. Carefully roll the drive train into alignment with the engine. Align the splines on the HST input shaft with the coupler on the engine flywheel. Rotate the engine fan to align the input shaft and the coupler. The floor jack or the hoist may need to be raised or lowered to make alignment possible.
2. Connect the HST housing to the engine and install the buckle-up bolts and nuts. Tighten the buckle-up bolts and nuts in a criss-cross pattern. Torque the M10 bolts and nuts to 32-41 ft lbs. Torque the two M12 bolts to 60 ft lbs.



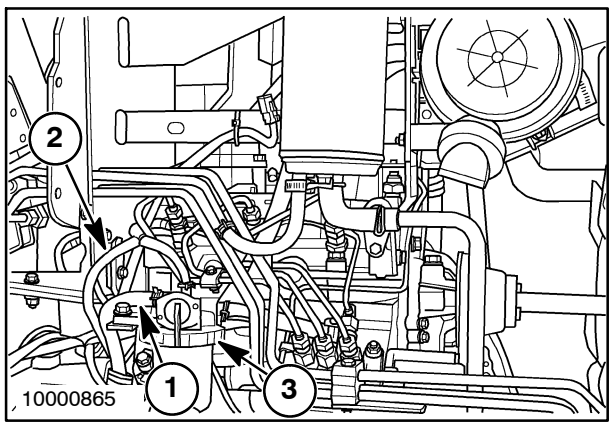
58

3. Remove the chain hoist, 1, and the sling, 2, from the engine hoist eyes. Remove the floor jack from the tractor.



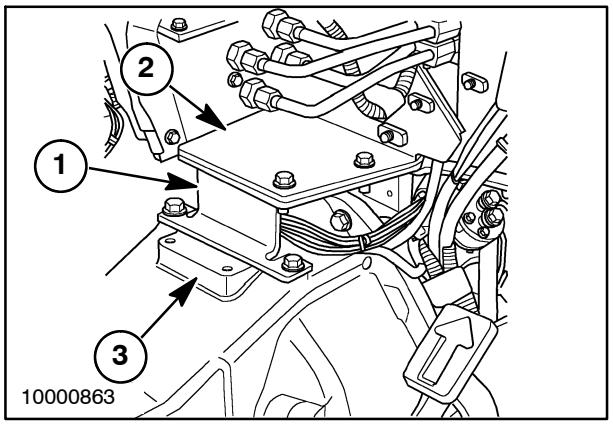
59

4. Connect the fuel supply line, 1, to the fuel shutoff/filter, 3, and connect the fuel tank vent line, 2, to the tee fitting.



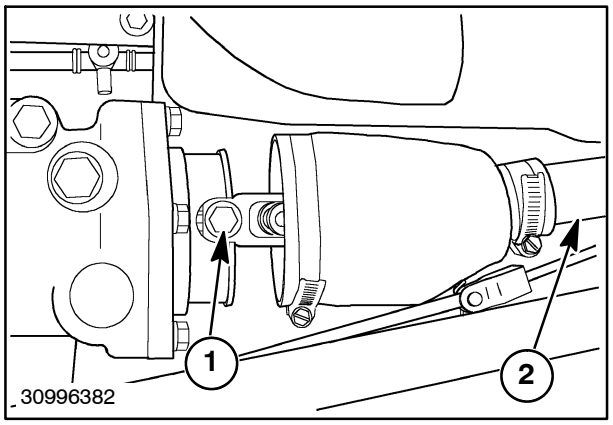
60

5. Attach the firewall support, 1, to the HST housing, 3, and the firewall, 2. Secure with the retaining bolts.



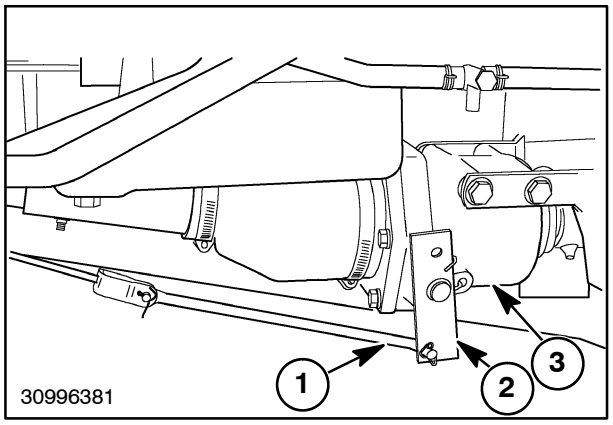
61

6. Install the FWD driveshaft, 2, and secure with the two retaining bolts, 1, (one roll pin on standard FWD axle).



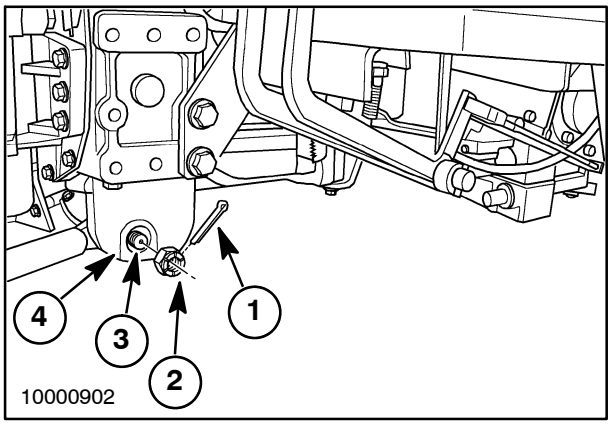
62

7. If equipped, connect the Sensitrack linkage, 1, to the control arm, 2, at the Sensitrack clutch, 3.



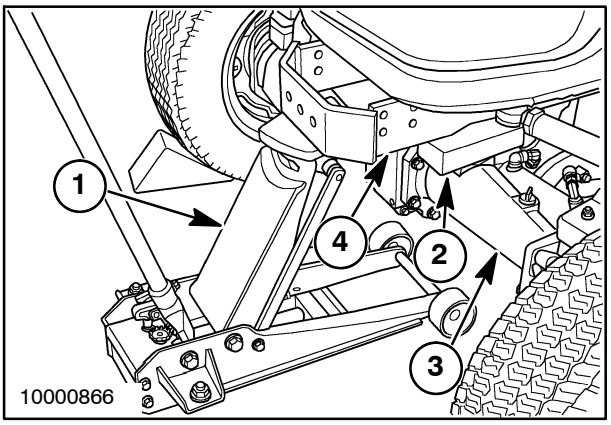
63

8. Install the support bar stud, 3, into the mount, 4, and secure with the castle nut, 2. Torque the castle nut to 100-125 ft lbs. Install a new cotter pin, 1, through the castle nut, 2, and the support bar stud, 3.



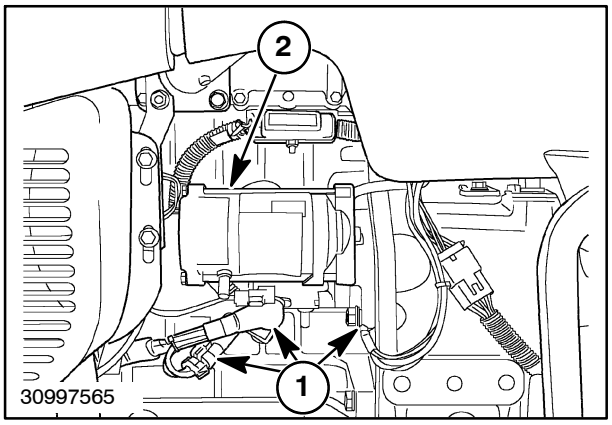
64

9. Place a floor jack, 1, under the front of the tractor, and raise the tractor. Remove the wood blocks, 2, from between the front axle, 3, and the frame, 4.



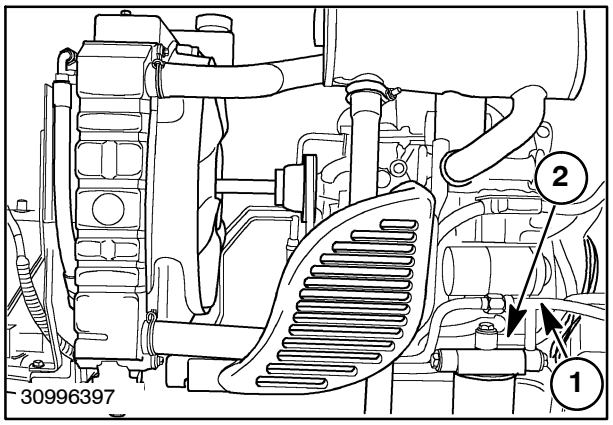
65

10. Install the starter, 2, onto the engine, and secure with the retaining nuts. Connect the wires, 1, to the starter, 2.



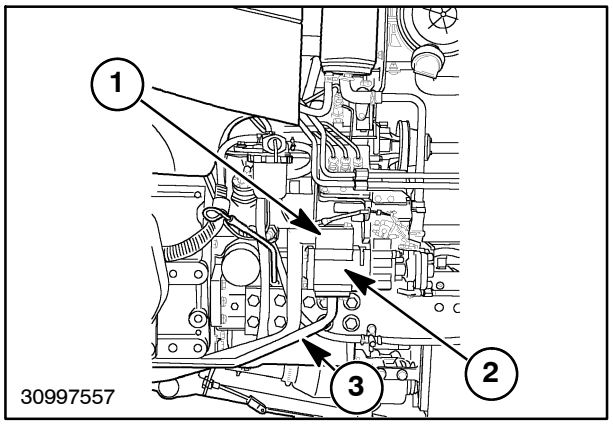
66

11. Install the HST oil cooler tube, 1, and the HST pressure tube, 2, onto the tractor.



67

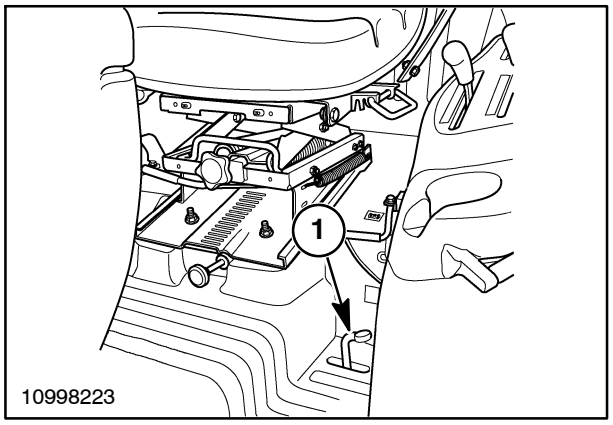
12. Install the hydraulic system pressure tube, 3, on the hydraulic pump, 2, and the diverter valve.
13. Install the hydraulic system inlet tube, 1, onto the hydraulic pump, 2.
14. Connect the two main wiring harness connectors.
15. Install the tractor deck onto the tractor.



68

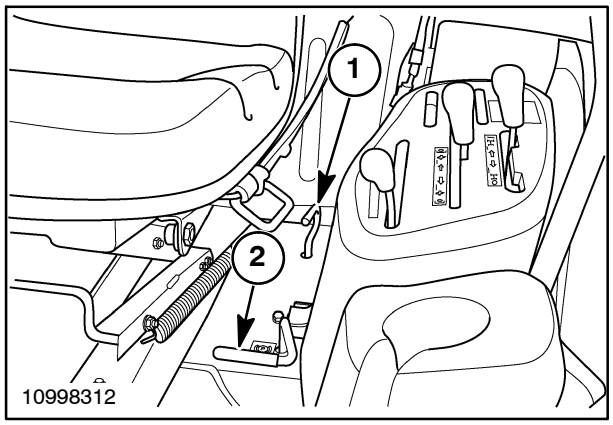
16. Install and connect the differential lock pedal, 1.

NOTE: *For ease of control lever assembly, raise the tractor on a floor jack and remove the rear wheels. This is not required but will ease assembly.*



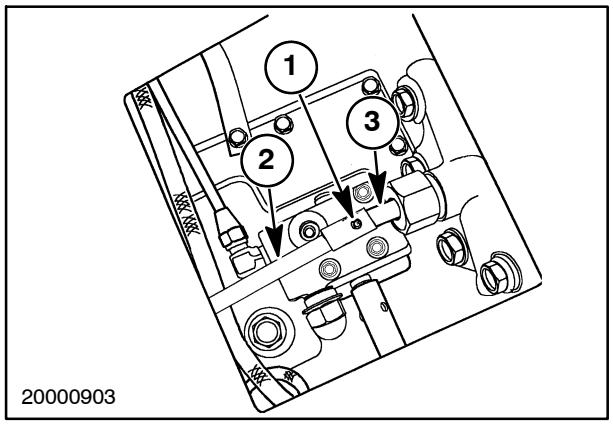
69

17. Install and connect the full time 2WD lever, 1
18. Install and connect the parking brake lever, 2.



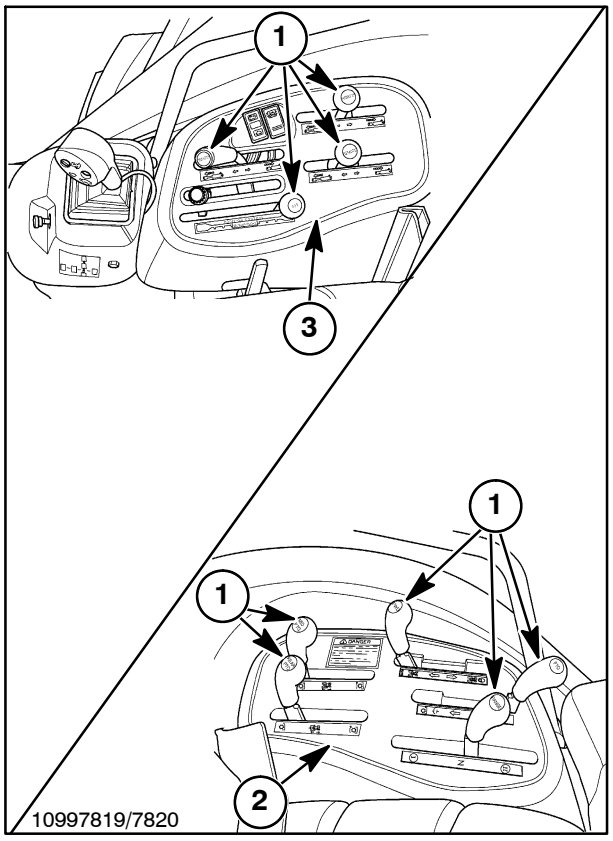
70

19. Install the HPL speed control shaft, 2, onto the HPL shaft, 3.
20. Install and connect the control levers on the left and right side of the tractor deck.
21. Install the left and right fenders on the tractor.



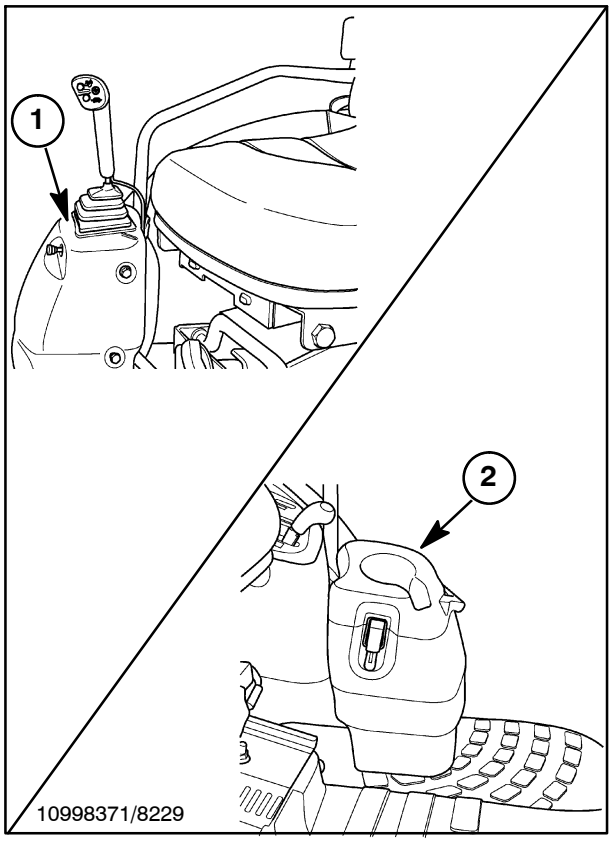
71

22. Install the left, 2, and right, 3, control pods on the fenders. Install the control lever grips, 1, on the control levers.
23. Install the floor mat onto the tractor deck.
24. Install the seat and the seat track on the tractor. Connect the seat safety start switch.
25. Install the light bars onto the fenders and the ROPS.



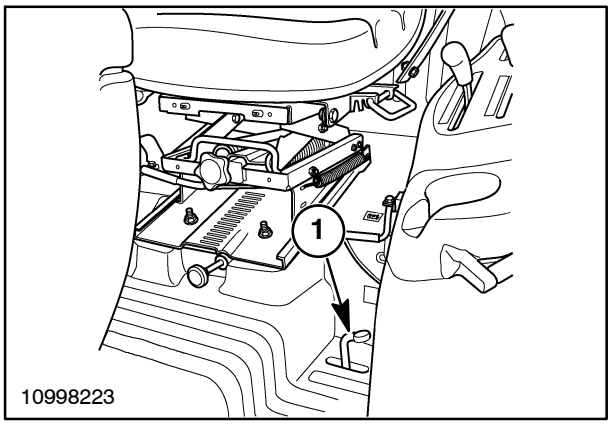
72

26. Install the cup holder/tool box, 2, on the left fender, if equipped.
27. Install the remote, loader control valve, 1, on the right fender, if equipped. Connect the hydraulic tubes.
28. Install the dash housing onto the tractor.
29. Connect the wiring plugs to the dash housing switches.



73

30. Connect the instrument panel wiring plug to the instrument panel. Install the instrument panel, 2, into the dash housing, 3, and secure with two screws, 1.
31. Install the hood on the tractor.

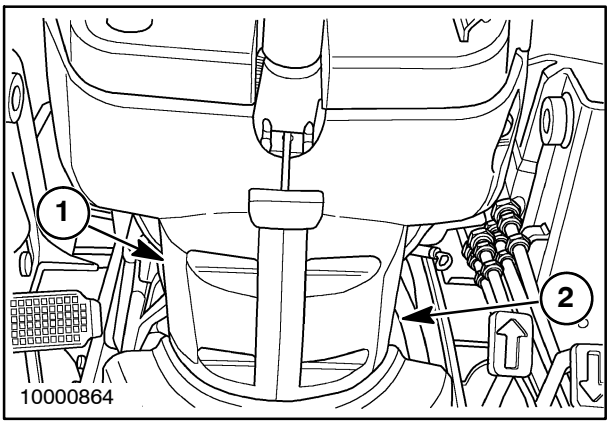


74

32. Install the left, 1, and right, 2, rear hood side panels.
33. If removed, install the left and right rear wheels.
34. Fill the hydraulic reservoir with Ambra Multi G 134 Hydraulic Fluid, to the proper level.

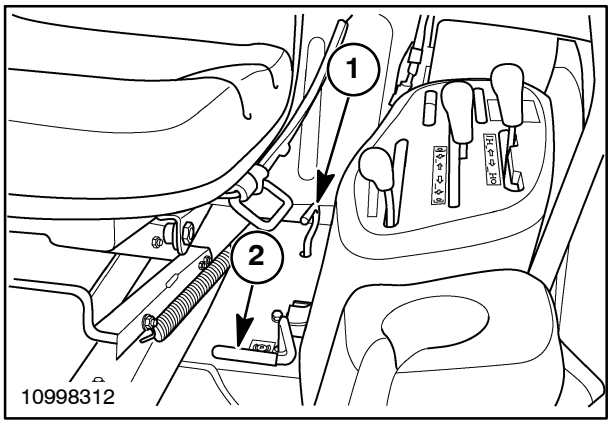
NOTE: *The following step is required on the TC35DA tractor.*

35. If the engine oil was drained, and the oil filter was removed during disassembly, install a new oil filter on the engine, and fill the engine with the recommended oil to the proper level.



75

36. Connect the positive (+), 2, and the negative (-), 1, battery cables to the battery.
37. Check the fluid levels and start the tractor. Check for leaks and proper operation of all systems.
38. Make any adjustments necessary for proper operation of the tractor.



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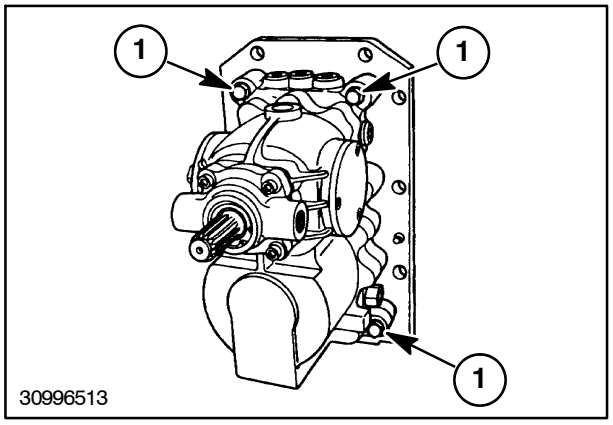
HYDROSTATIC TRANSMISSION

Disassembly

Precautions Before Disassembly

- Thoroughly clean the HST unit and plug all openings to prevent dirt entry.
- Keep the work area clean at all times and use care to not contaminate the internal parts.
- Handle the parts carefully so as not to damage parts during repair.

1. Drain the transmission fluid into a suitable clean container.
2. Separate the tractor between the engine and clutch housing. See “Separating the Tractor”.
3. Remove the clutch housing
4. Remove the two hex nuts and hex head cap screws, 1, and remove the HST from the transmission case.



77

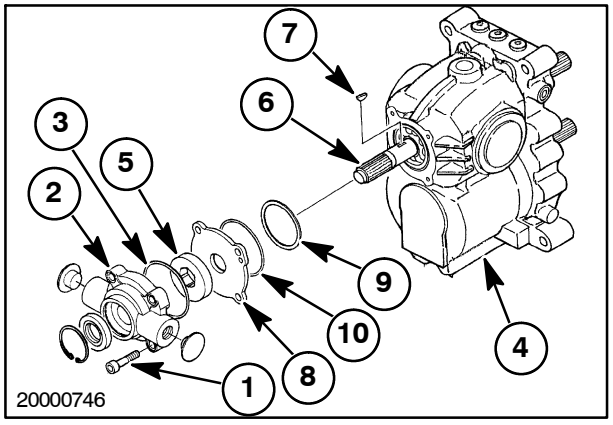
CHARGE PUMP

Removal

1. Remove the socket head bolt, 1.
2. Remove the charge pump case, 2, and O ring, 3, from the housing, 4.
3. Remove the inner and outer rotor assembly, 5, from the input shaft, 6.

NOTE: *Identify the position of the inner and outer rotor so as to re-assembly in their original position.*

4. Remove the key, 7, from the input shaft, 6.
5. Remove the plate, 8, washer, 9, and O ring, 10, from the housing.

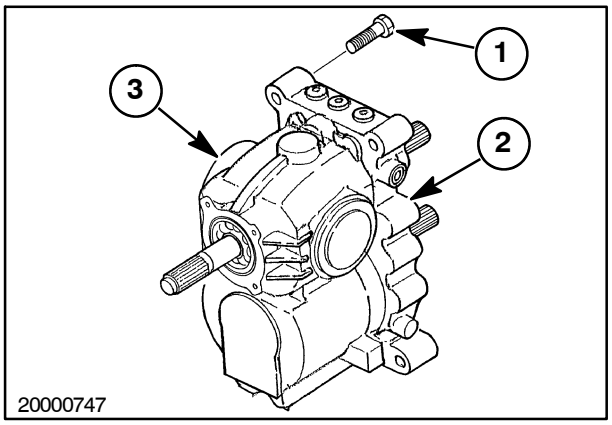


78

PORT BLOCK

Removal

1. Remove the 11 socket head bolts, 1 and remove the port block, 2, from the housing, 3.

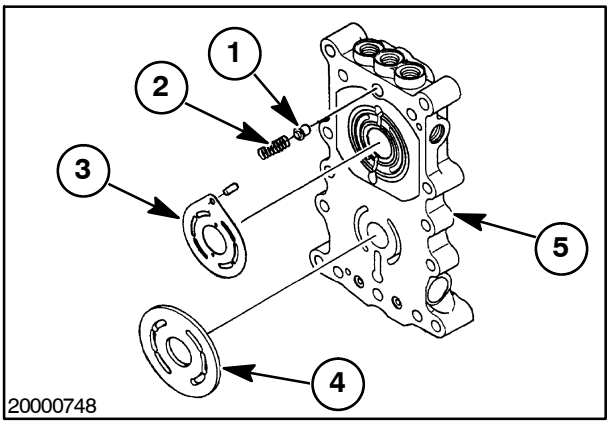


79

2. Remove the charge pressure relief valve, 1, and spring, 2.

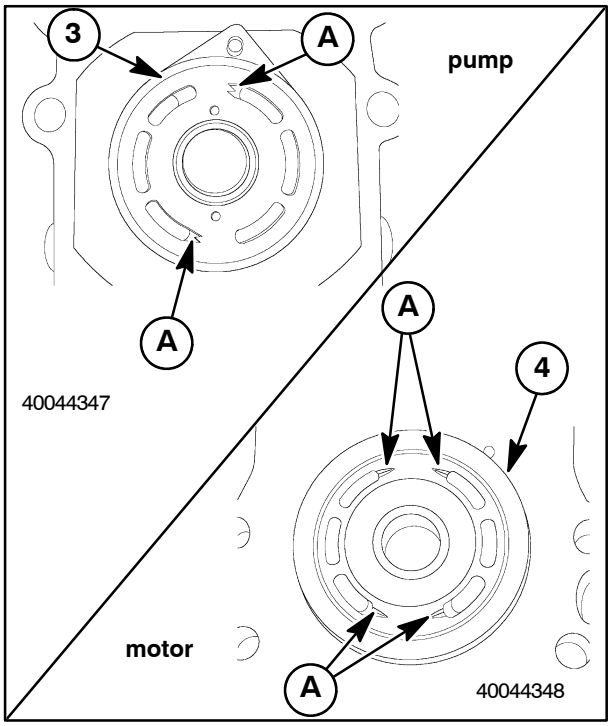
NOTE: *Take care not to drop the valve plates (3 and 4).*

3. Remove pump valve plate, 3 and motor valve plate, 4, from the port block, 5.



80

IMPORTANT: *Take note of the orientation of the feathering notches, (A), on the valve plates (3 and 4).*



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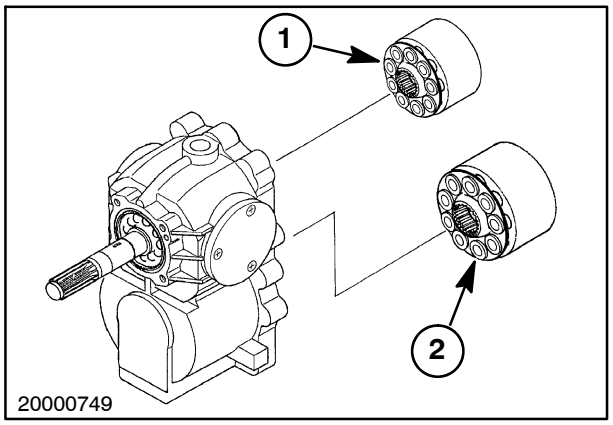
CYLINDER BLOCK ASSEMBLY

Removal

1. Remove the pump cylinder block assembly, 1, from the housing.
2. Remove the motor cylinder block assembly, 2, from the housing.

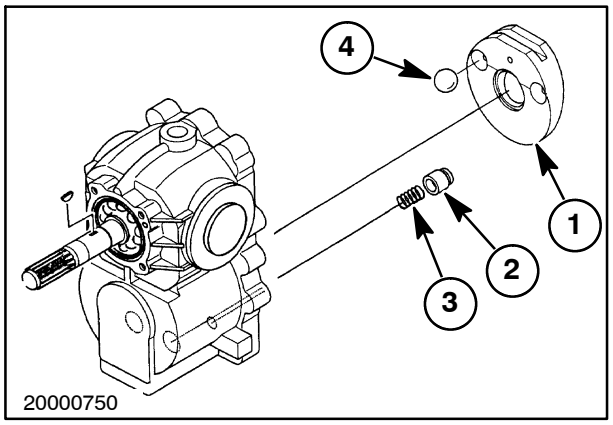


82

MOTOR SWASH PLATE

Removal

1. Remove the motor swash plate, 1, from the housing.
2. Remove the pistons, 2, spring, 3 and steel balls, 4.

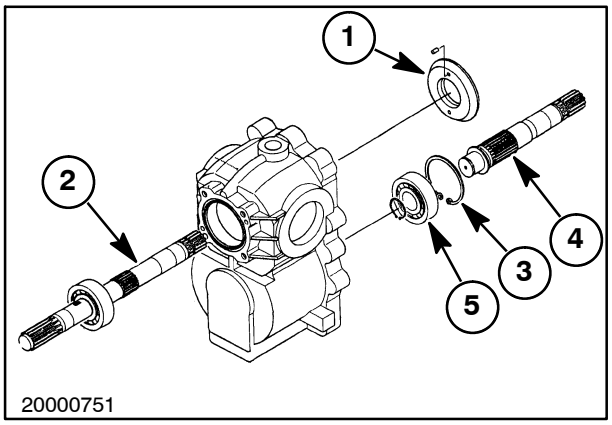


83

INPUT AND OUTPUT SHAFT

Removal

1. Remove the thrust plate, 1, from the housing.
2. Using a soft jaw hammer, drive out the input shaft, 2.
3. Remove the snap ring, 3, and output shaft, 4, with bearing, 5, from the housing.



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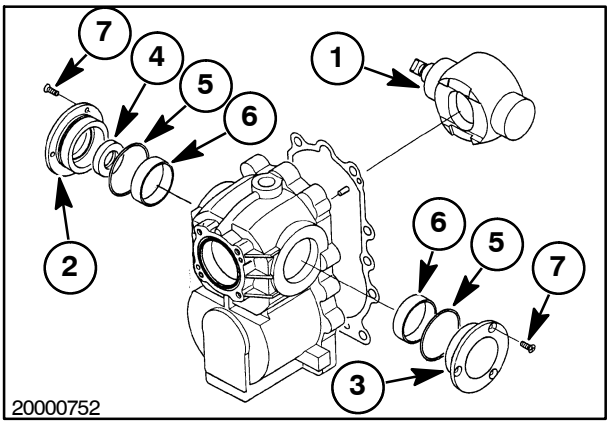
PUMP SWASH PLATE

Removal

1. Scribe reference marks on the swash plate covers, 2 and 3 and remove the covers from the housing.
2. Using a soft mallet, gently tap the axial end of the swash plate and remove the opposite side cover.
3. Gently tap the exposed trunnion end and remove the remaining cover.
4. Remove the variable swash plate, 1, from the housing.



85

1. Pump swash plate
2. Right-hand cover
3. Left-hand cover
4. Oil seal
5. O ring
6. Bushing
7. Screw

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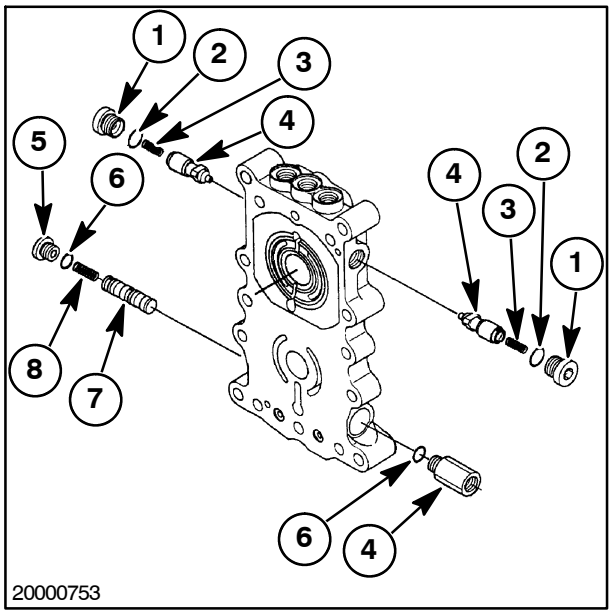
PORT BLOCK

Removal

1. Remove the plug, 1, O rings, 2, spring, 3, and high pressure relief valve and check valve, 4, as an assembly.
2. Remove the plugs, 4 and 5, O rings, 6, spool, 7, and spring, 8, for the two speed motor.



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Inspection

Inspect the hydrostatic components for the following conditions:

- Excessive wear or scored pistons and cylinder bores in the pump and motor block assemblies.
- Excessive wear or scored cylinder block and valve port plate mating surfaces.
- Excessive wear or scored charge pump rotor faces and lobes.
- Excessive wear or scored charge pump body and wear plate surfaces.
- Check the ball bearings for excessive wear and looseness or uneven rotation when rotated by hand.
- Inspect the variable swash plate bushings for excessive wear or scoring. Replace the cover and bushing as an assembly if required.

NOTE: *BEFORE ASSEMBLY, BE SURE:*

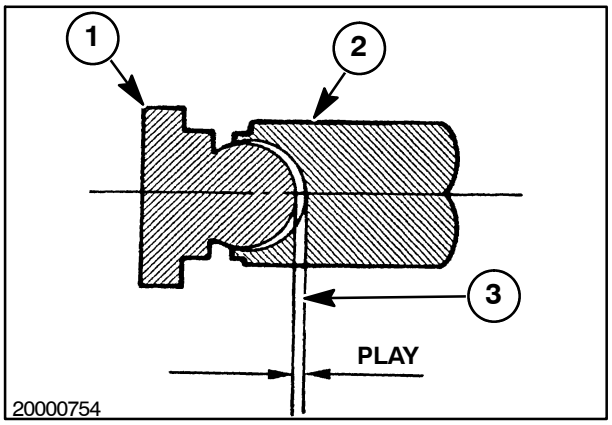
- *ALL COMPONENTS ARE THOROUGHLY CLEANED AND WELL LUBRICATED WITH AMBRA MULTI G 134.*
- *REPLACE O RINGS, OIL SEALS AND GASKETS WHEN REASSEMBLING.*
- *APPLY PETROLEUM JELLY TO O RINGS AND OIL SEAL LIPS.*

PISTON

Assembly

- Replace the piston assembly if the play at the caulked areas, 3, of the piston, 2, and shoe, 1, exceeds the service limit.

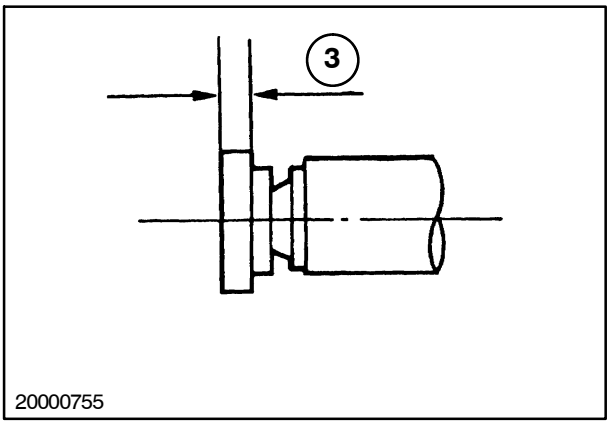
Standard Assembly Valve	Service Limit
0.03 mm (0.001 in.)	0.1 mm (0.004 in.)



87

- Replace the piston assembly if the shoe thickness, 3, is below the service limit.

Standard Assembly Valve	Service Limit
3.0 mm (0.118 in.)	2.9 mm (0.114 in.)



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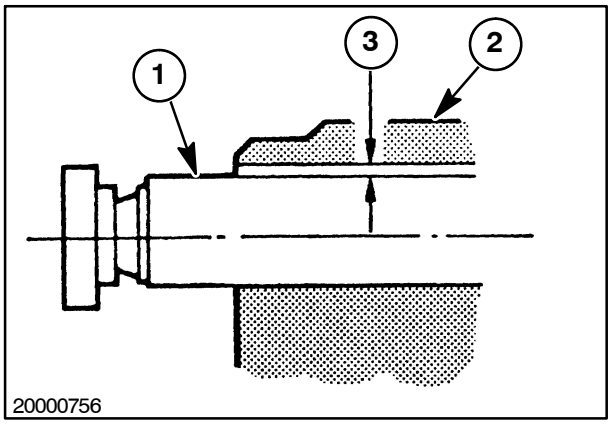
- Replace the piston assembly if the clearance, 3, between the piston, 1, and cylinder block, 2, exceeds the service limit.

Standard Assembly Valve	Service Limit
0.02 mm (0.0007 in.)	0.03 mm (0.001 in.)



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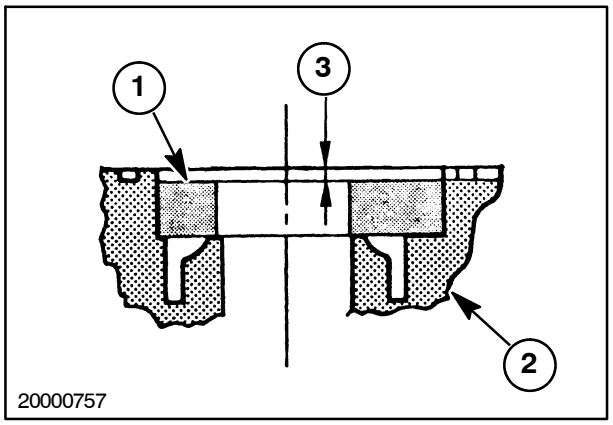
CHARGE PUMP

Assembly

- Measure the side clearance, 3, of the trochoid rotor and replace if the service limit is exceeded.

Standard Assembly Valve	Service Limit
0.02 - 0.03 mm (0.0007 - 0.001 in.)	0.035 mm (0.0014 in.)



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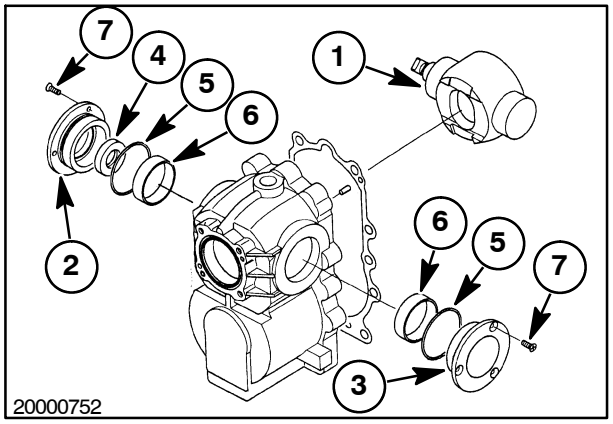
1. Trochoid rotor assembly
2. Charge pump case
3. Clearance

SWASH PLATE

Assembly

1. Install the pump swash plate, 1, into the housing.
2. Align the reference marks and install the covers, 2 and 3, into the housing.
3. Install the screws, 7, and tighten to 6.1 - 7.3 N·m (4.50 - 5.38 ft.-lbs.).



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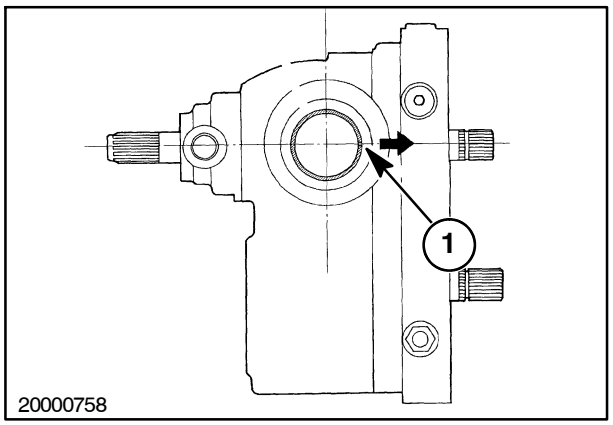
1. Pump swash plate
2. Right-hand cover
3. Left-hand cover
4. Oil seal
5. O ring
6. Bushing
7. Screw

Take care that the cover notch, 1, is toward the port block mounting screw when installing the covers.



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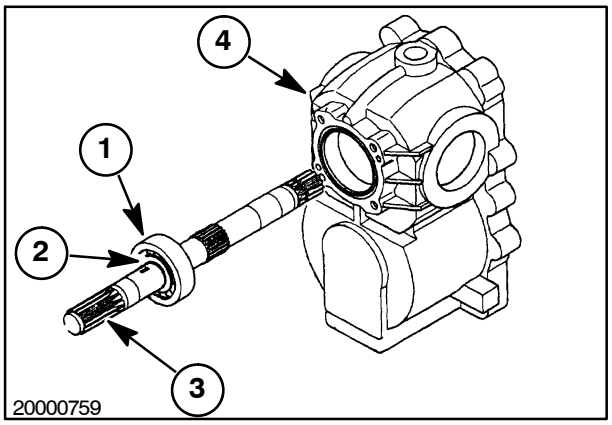
PUMP SHAFT (INPUT SHAFT)

Assembly

1. If removed, install the bearing, 1, and snap ring, 2 , to the pump shaft, 3.
2. Install the pump shaft into the housing, 4, from the front.



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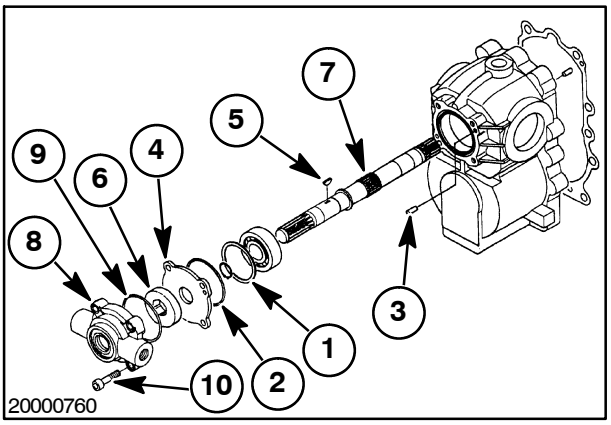
CHARGE PUMP

Assembly

1. Install the washer, 1, and O ring, 2, to the housing.
2. Install the pin, 3, and plate, 4, to the housing.
3. Install the key, 5, and trochoid rotor assembly, 6, onto the pump shaft, 7.
4. Install the charge pump case, 8, and O ring, 9, with socket head bolts, 10, and tighten to 17.0 - 18.4 N·m.



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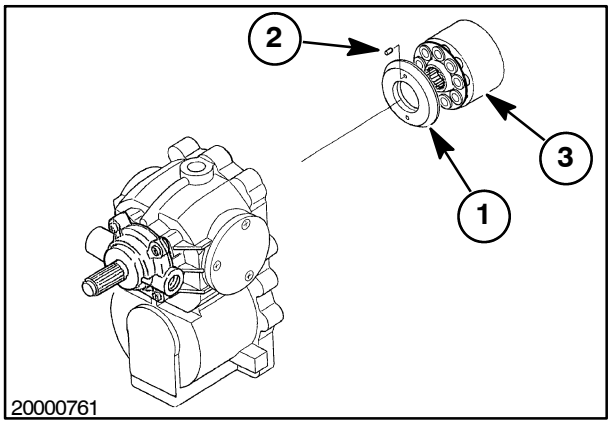
CYLINDER BLOCK

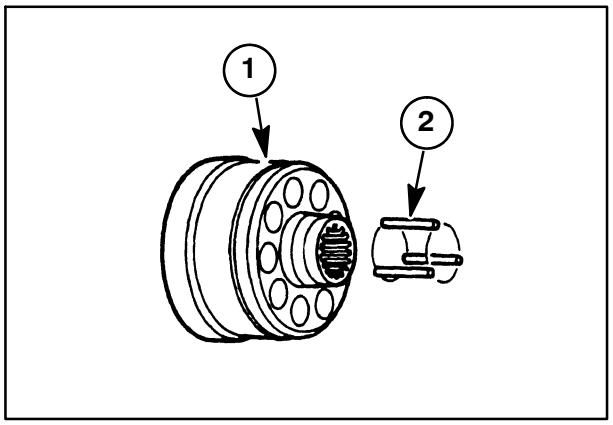
Assembly for Pump

1. Install the thrust plate, 1, into the swash plate while aligning pin, 2, and pin hole.
2. Install the cylinder block assembly, 3.



95

NOTE: *Take care not to lose the three pins, 2, from the pump cylinder block, 1. Ensure that they are installed into the piston block.*



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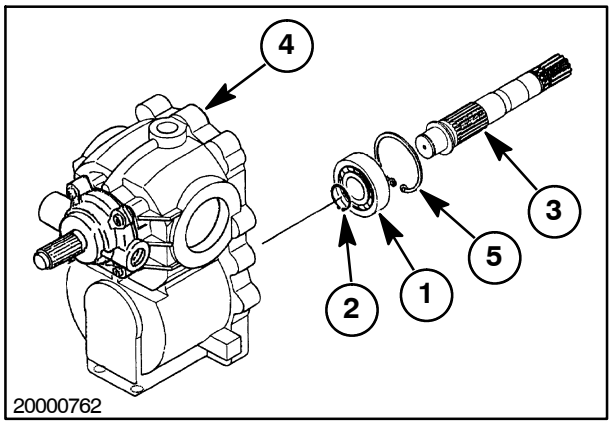
MOTOR SHAFT

Assembly

1. Install the ball bearing, 1, and snap ring, 2, onto the motor shaft, 3.
2. Install the motor shaft, 3, into the housing, 4, and secure by the snap ring, 5.



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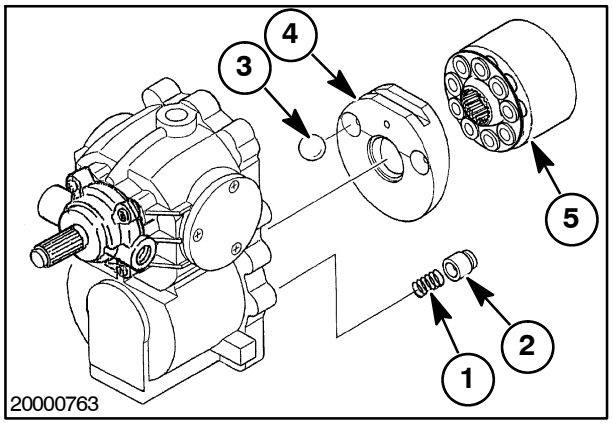
CYLINDER BLOCK

Assembly for Motor

1. Install the spring, 1, and pistons, 2, into the housing.
2. Install the steel balls, 3, into the housing.
3. Install the motor swash plate, 4, into the housing.
4. Install the cylinder block assembly, 5, into the housing.



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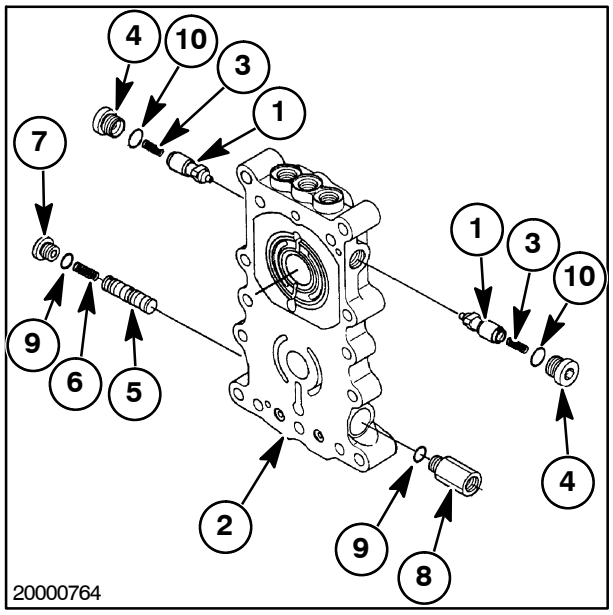
PORT BLOCK

Assembly

1. Install the check valve and high pressure relief valve, 1, as a set into the port block, 2.
2. Install the spring, 3, O rings, 10, and plug, 4, and tighten to 63.1 - 64.3 N·m (895 - 87 ft.-lbs.).
3. Install the spool, 5, spring, 6, O rings, 9, and plugs, 7, and adapter fitting, 8, and tighten to 51.0 N·m (69 ft.-lbs.).

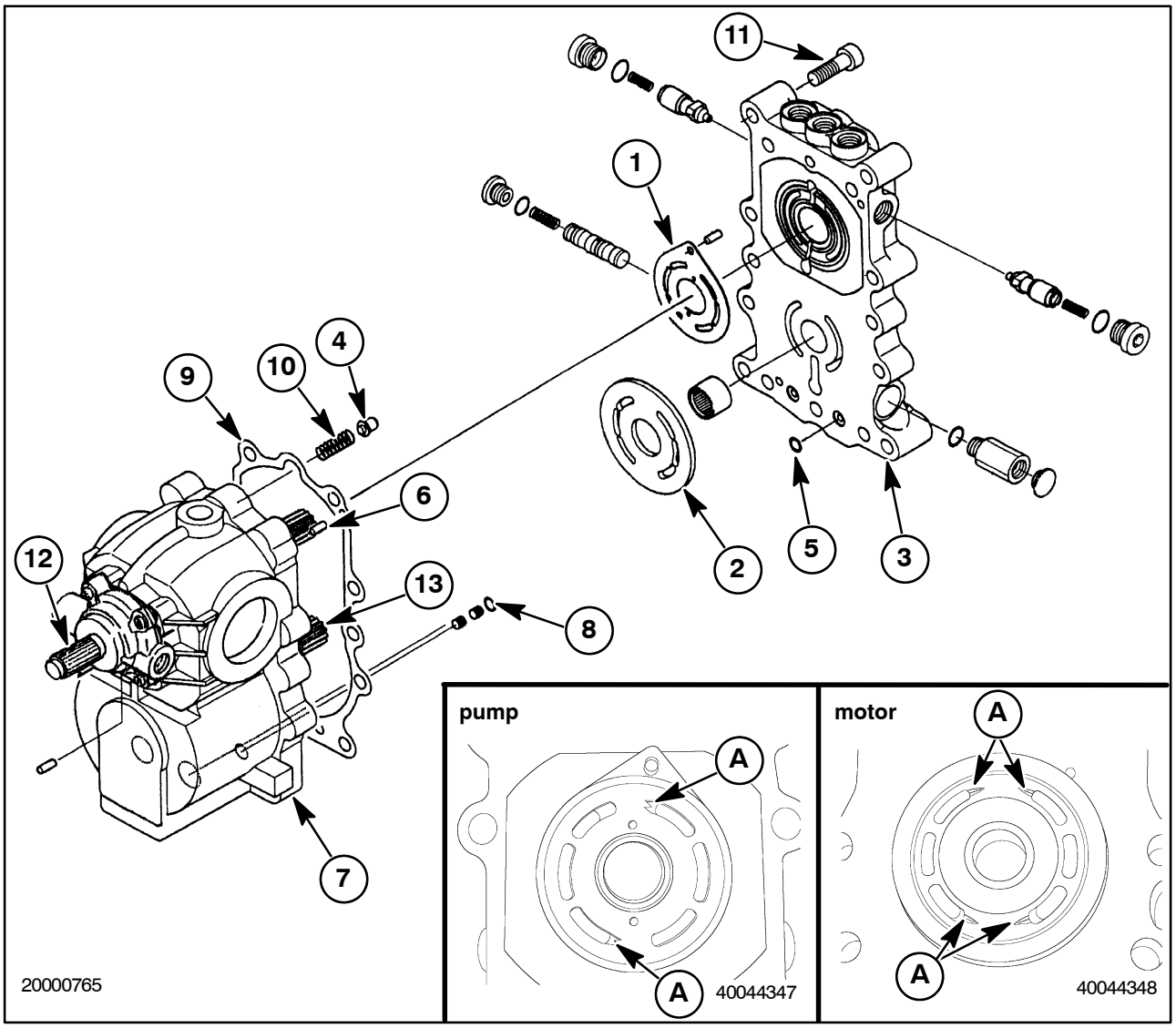
NOTE: *Use care at the position of plugs, 7 and 8, and direction of the springs, 3, and spool, 5.*

NOTE:*Spool should be a sliding fit with no binding in the bore. Polish if needed. Lubricate with hydraulic oil when installing.*



99

1. Check and high pressure relief valve assembly
2. Port block
3. Spring
4. Plug
5. Spool
6. Spring
7. Plug
8. Adapter fitting
9. O ring
10. O ring



100

1. Pump valve plate
2. Motor valve plate
3. Port block
4. Charge pressure relief valve
5. O ring
6. Pin
7. Housing
8. O ring
9. Metal gasket
10. Spring
11. Socket head bolt
12. Input shaft
13. Output shaft

Installation

1. Install the valve plates, 1 and 2, to the port block assembly, 3.

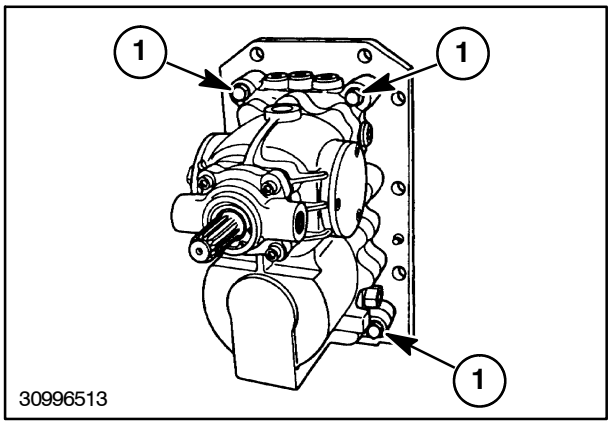
NOTE: *Ensure feathering notches, A, are facing outward from the port block.*

2. Install the charge pressure relief valve, 4, to the port block.
3. Install the O rings, 5, to the port block.
4. If removed, install the pins, 6, to the housing, 7.
5. Install the O rings, 8, to the housing, 7.
6. Install the metal gasket, 9, to the housing, 7.
7. Lubricate the contact surface of the cylinder blocks.
8. Install the spring, 10, for charge pressure relief valve to the housing, 7. Use petroleum jelly to install spring in position.
9. Install the port block assembly, 3, to the housing, 7, and tighten the socket bolts, 11, to 69.9 - 71.3 N·m (51.5 - 52.5 ft.-lbs.).
10. Using pliers to help grip shafts, input shaft, 12, and output shaft, 13, should rotate. If not, inspect.

HYDROSTATIC TRANSMISSION

Assembly

1. Install the two hex nuts and hex cap head screws, 1, and install the HST to the transmission case.
2. Install the clutch housing.
3. Reassemble the tractor between the engine and clutch housing.



101

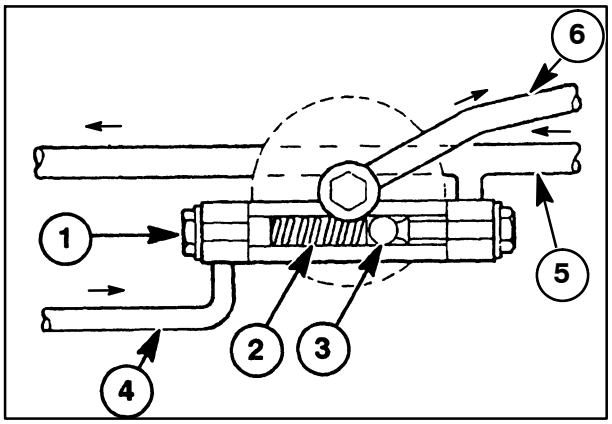
Op. 29 204

CHECK VALVE

A check valve in the pipe circuit protects the cooler from excess pressure due to high oil viscosity or a restriction in the cooler circuit.

NOTE: *Check valve opens when there is 17.5 PSI pressure differential between the inlet and outlet of the filter base.*

NOTE: *When the check valve opens, oil bypasses the oil cooler but still circulates through the filter. Oil flow directional arrows shown in figure.*



102

1. Banjo bolt
2. Spring
3. Ball
4. Cooler return manifold tube
5. Cooler supply tube
6. Transmission supply tube

Disassembly

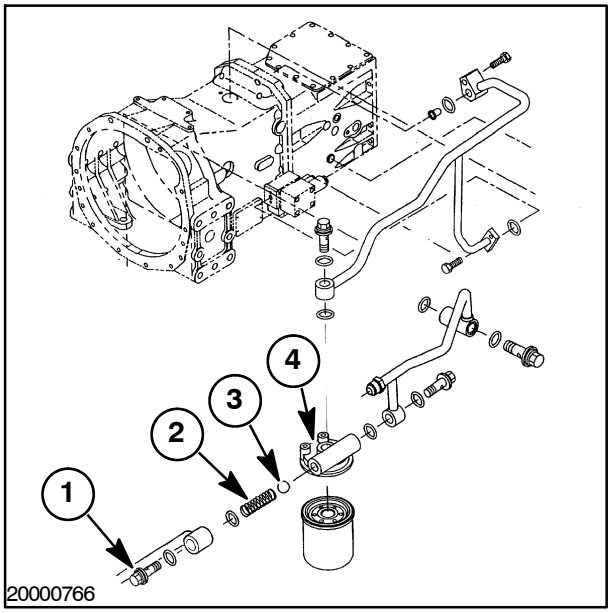
1. Remove the front banjo bolt, 1 (from cooler pipe tube).
2. Remove the spring, 2, and steel ball, 3, from the filter holder, 4.

Inspection

1. Inspect the spring and ball for excess wear or damage. Replace faulty components if required.
2. Inspect the ball seat in the filter holder. Replace the filter holder if required.

Assembly

Assemble the check valve components as shown in the prior figure.



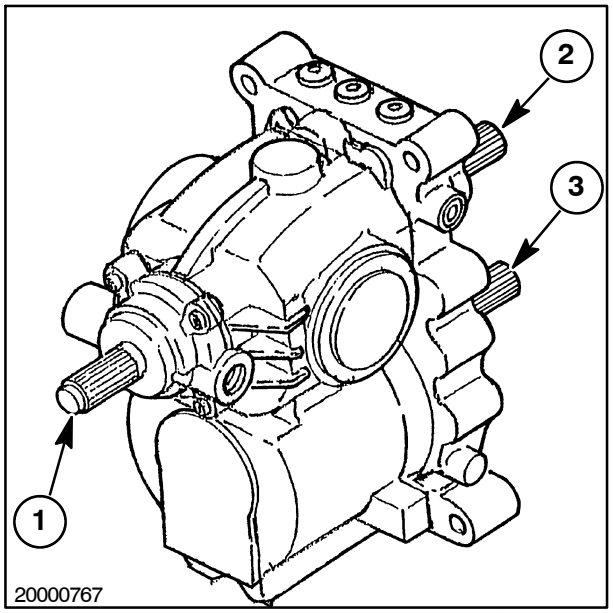
103

DESCRIPTION AND OPERATION - GEARBOX

Op. 29 300

GEARBOX

The hydrostatic transmission unit used on the tractors has two output shafts, 2 and 3, to the transmission gearbox. One output shaft, 3, provides power to the transmission gearbox and drives the rear axle drive pinion. The other output shaft, 2, provides power to the transmission gearbox for PTO drive.

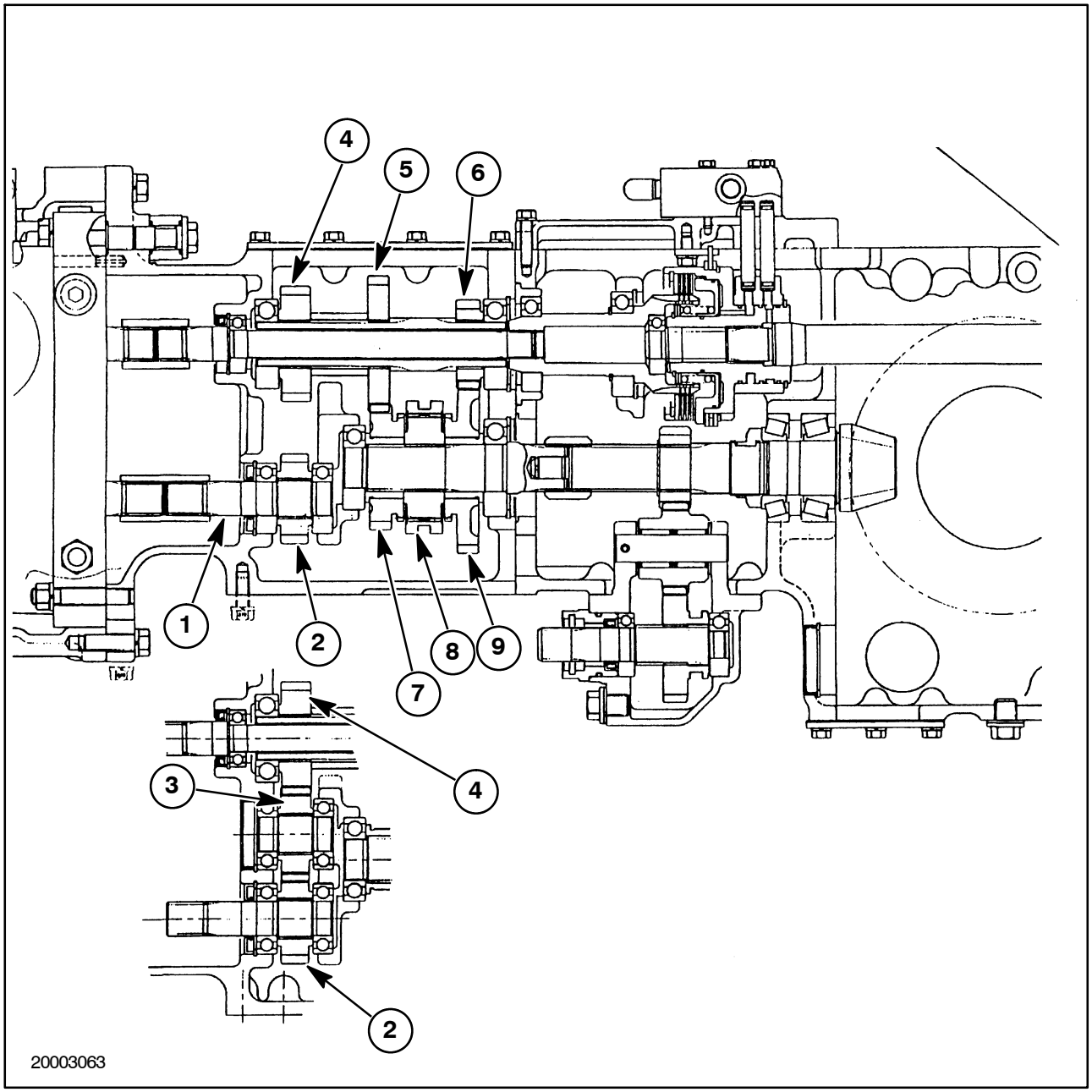


104

1. Input Shaft
2. Output Shaft for PTO
3. Output Shaft for rear axle drive pinion

GEARBOX IDENTIFICATION

The hydrostatic transmission gearbox is a two speed non-syncromesh type gearbox, that transfers power from the output shaft of the hydrostatic transmission to either the rear axle pinion gear or front wheel drive drop box gear.



105

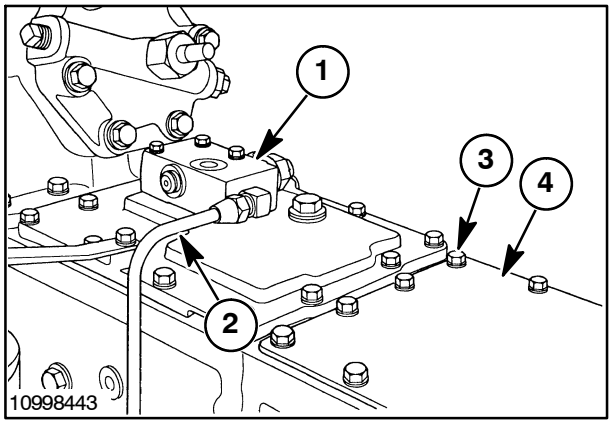
1. Input shaft
2. 20-tooth lower counter shaft gear
3. 21-tooth mid counter shaft gear
4. 26-tooth upper shaft front gear
5. 31-tooth fixed gear
6. 19-tooth fixed gear
7. 29-tooth high range gear
8. Range gear sliding coupler
9. 41-tooth low range gear

OVERHAUL – GEARBOX

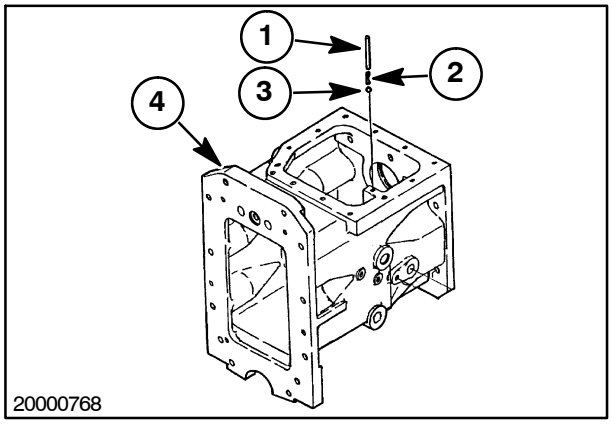
GEARBOX

Removal

1. Drain the transmission fluid into a suitable container.
2. Separate the tractor between the bell housing and the engine. See “Separating the Tractor”.
3. Remove the hydrostatic transmission. See “Hydrostatic Transmission Removal” discussed earlier in this section.
4. Remove the PTO solenoid valve, 1, and hydraulic line, 2.
5. Remove the hex head cap screws, 3, and remove the transmission cover and gasket, 4.
6. Remove pin, 1, spring, 2 and ball, 3, from the case, 4.



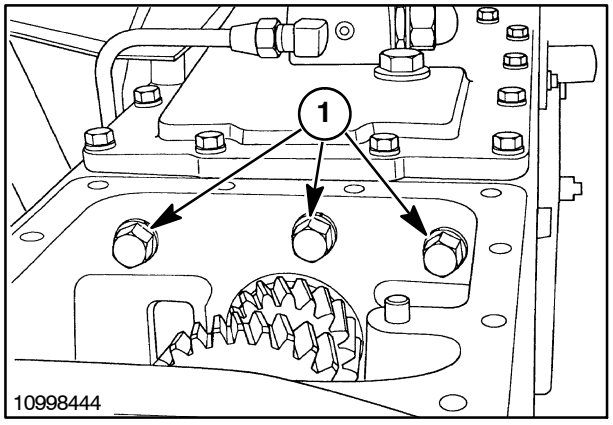
106



107

7. Remove the transmission to rear axle buckle-up bolts, 1, and separate the transmission from the rear axle.

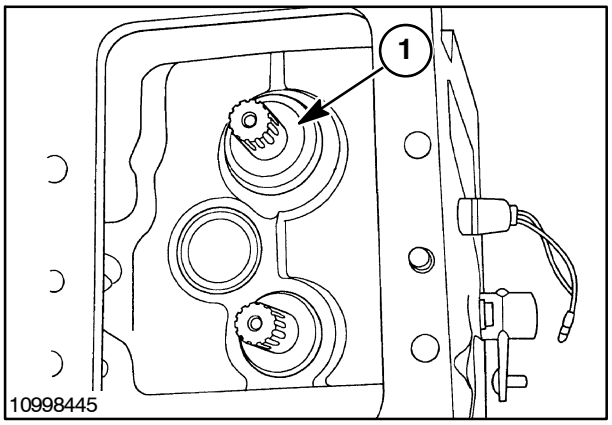
NOTE: *Three of the buckle-up bolts, 1, are located in the transmission case under the top cover.*



108

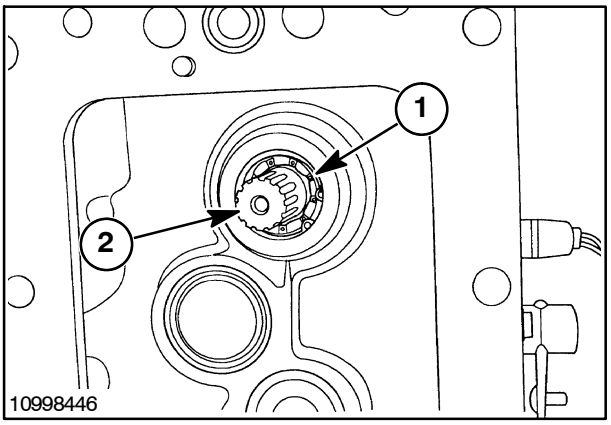
Disassembly

1. Remove and discard the PTO drive shaft seal, 1.



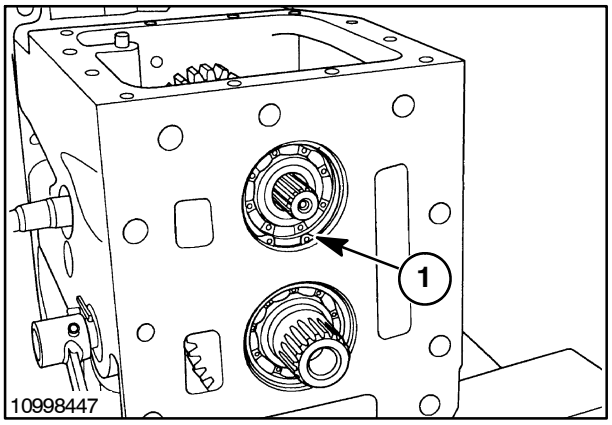
109

2. Remove the snap ring, 1, and remove the PTO drive shaft, 2, with bearing from the front of the casing.



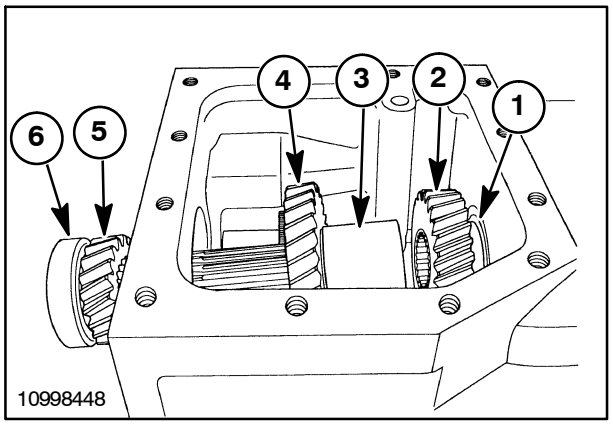
110

3. Remove the snap ring, 1, securing the counter shaft at the rear of the casing.



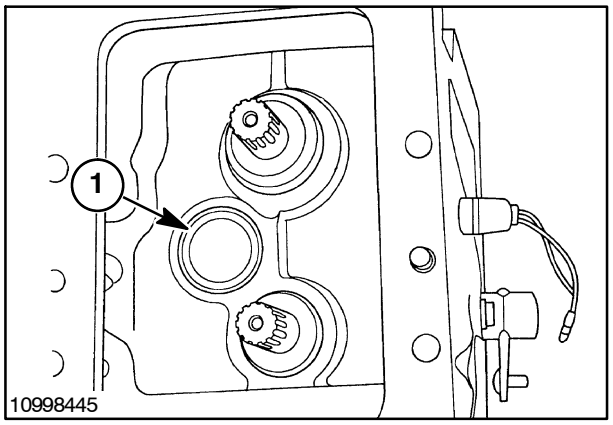
111

4. Remove the counter shaft from the rear of the casing removing the front bearing, 1, fixed gear (19T), 2, collar, 3, and high fixed gear (31T), 4, from the shaft. The low fixed gear (26T), 5, and rear bearing, 6, will remain on the shaft.



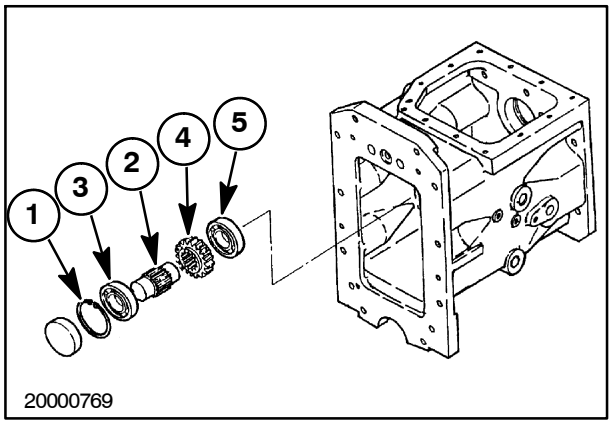
112

5. Remove and discard the counter shaft oil seal, 1, from the front of the case.



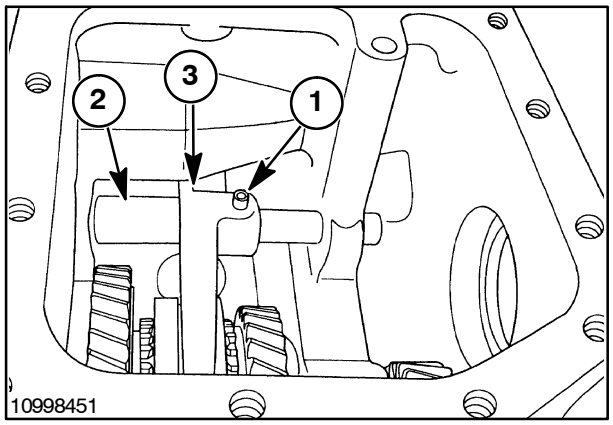
113

6. Remove snap ring, 1.
7. Remove the counter shaft, 2, through the front of the case with front bearing, 3.
8. Remove the fixed gear (21T), 4, and rear bearing, 5, from the case.



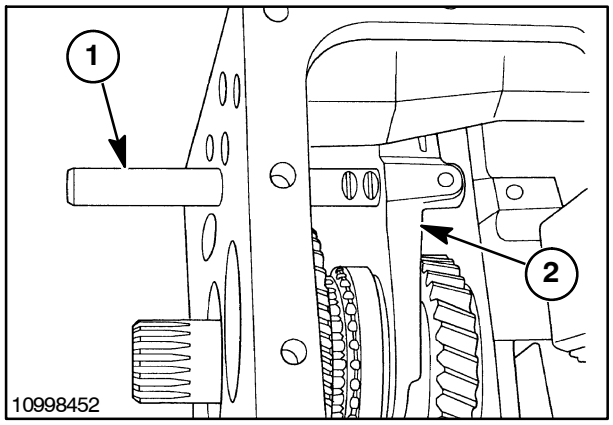
114

9. Drive the spring pin, 1, through the shift rod, 2, and fork, 3.



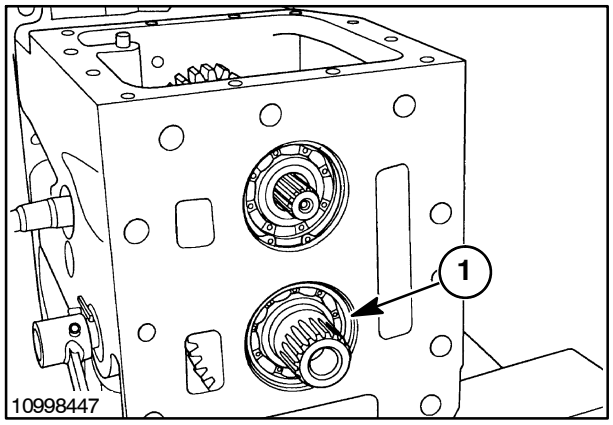
115

10. Remove the shift rod, 1, from the rear of the case.
11. Remove the shift fork, 2.



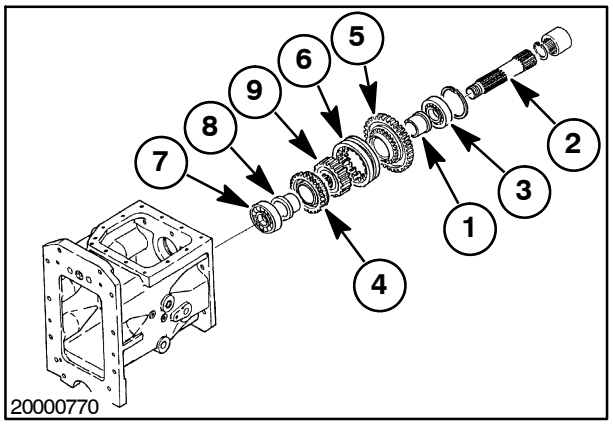
116

12. Remove the snap ring, 1, securing the main shaft assembly.



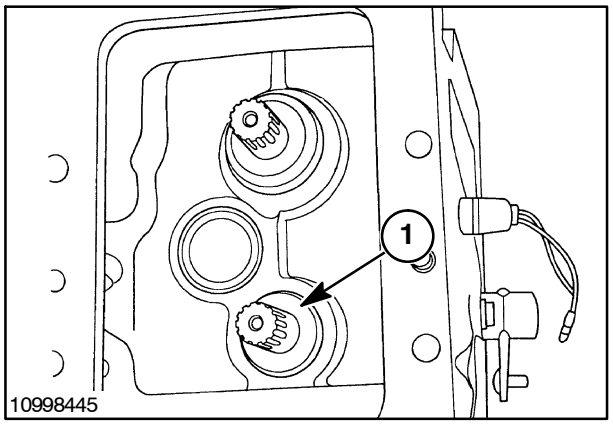
117

13. Withdraw the main shaft, 2, with rear bearing, 3, through the rear of the case.
14. Remove the main coupling, 1, low counter gear (41T), 5, hub, 9, slide gear, 6, high counter gear (29T), 4, main coupling, 8, and front bearing, 7, from the case.



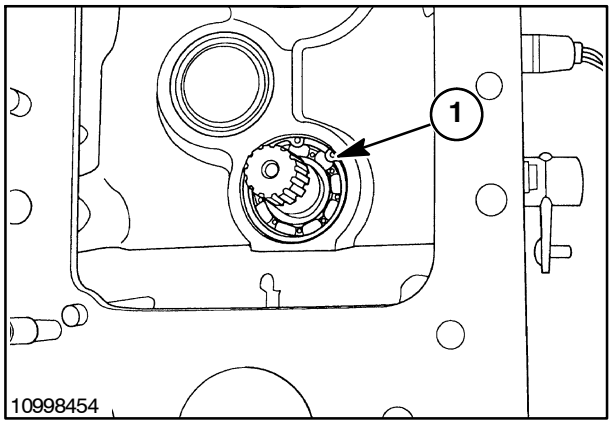
118

15. Remove and discard the drive shaft oil seal, 1, from the front of the case.



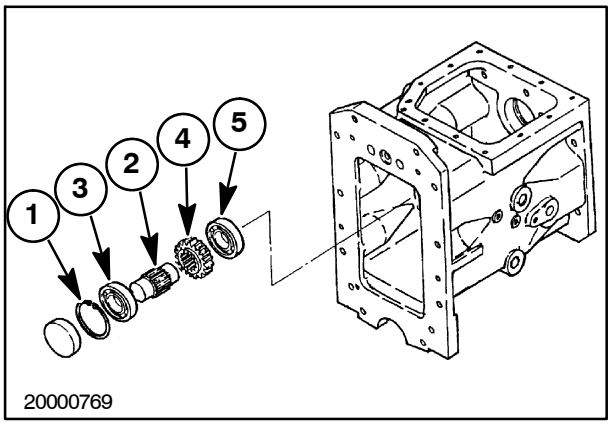
119

16. Remove the snap ring, 1.



120

17. Remove the drive shaft, 1, with front bearing, 2, from the front of the case.
18. Remove the fixed gear (20T), 3, and rear bearing, 4, from the case.



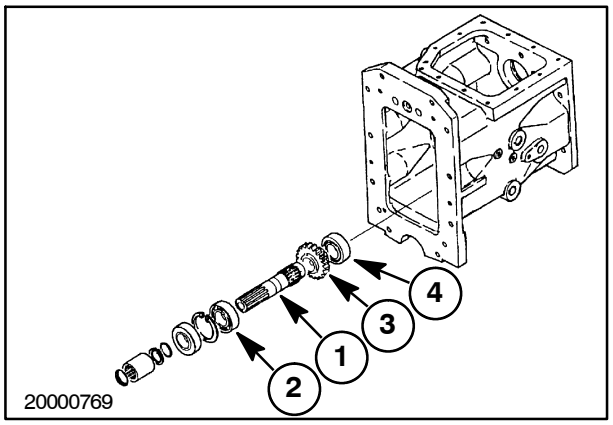
121

Inspection

1. Wash all components with a suitable cleaning solvent and air dry.
2. Inspect all bearings for excess wear, score marks, discoloration from overheating, or other damage. Rotate the bearings by hand and check for roughness while slowly rotating the inner and outer races.
3. Lubricate all bearings with clean hydraulic fluid, Ambra Multi G 134 or equivalent, before installation.
4. Inspect the transmission case for, pitting, cracks, worn bearing bores, or other damage.
5. Check the detent springs for wear, chip, or weak spring tension.
6. Inspect the detent balls for excess wear or damage.
7. Inspect the shift rail detent grooves for, pitting, excess wear, or other damage.
8. Inspect all gears for excess wear, chipped teeth, or other damage. Check the gear backlash by inserting the mating assemblies into the casing and using a feeler gauge. Gear backlash should be between 0.4 - 0.6 mm (0.002″ - 0.006″) with a maximum wear limit of 0.6 mm (0.236″).
9. Inspect the shift forks for excess wear, bending, or other damage.

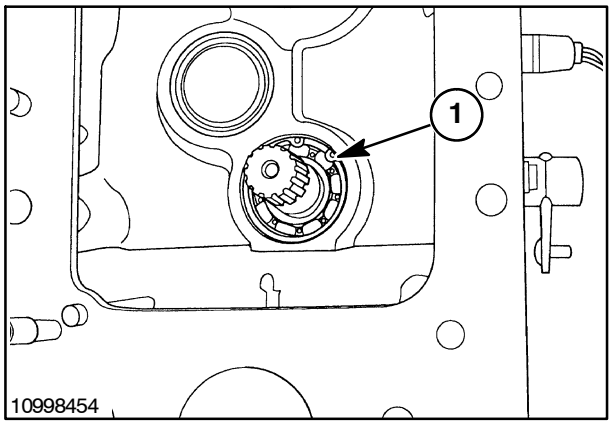
Assembly

1. Install the drive shaft rear bearing, 4, in the bore of the casing and install the fixed gear (20T), 3, in position.
2. Insert the drive shaft, 1, with front bearing, 2, through the front of the case through the fixed gear until it bottoms out in the rear bearing.



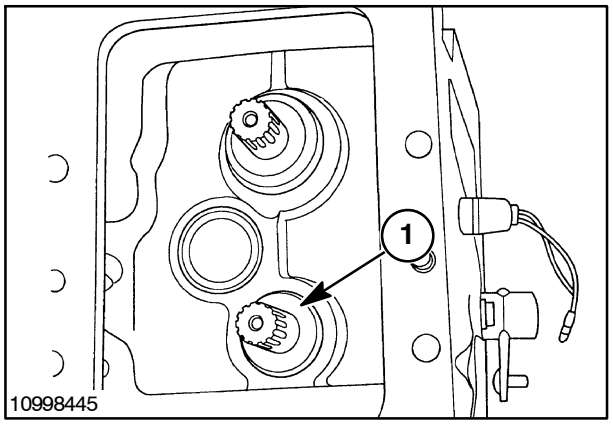
122

3. Install snap ring, 1, to secure the drive shaft assembly in position.



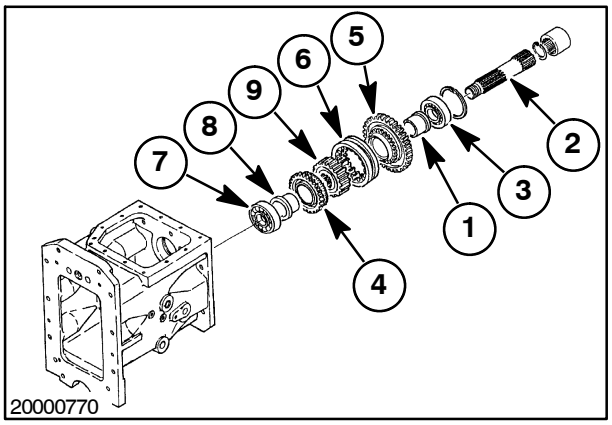
123

4. Install the new drive shaft oil seal, 1.



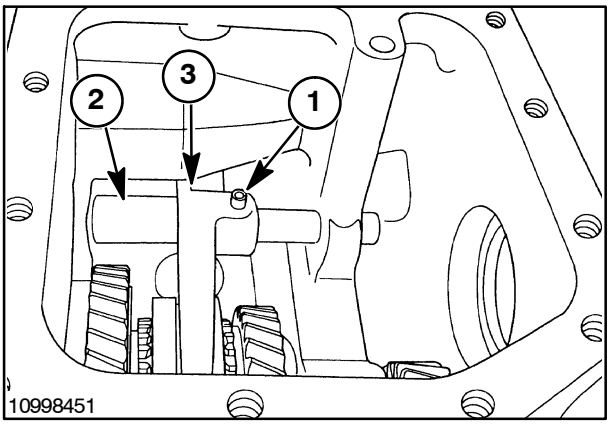
124

5. Install the main shaft front bearing, 7, in its bore in the casing.
6. Assemble the main coupling, 8, high counter gear (29T), 4, slide gear, 6, hub, 9, low counter gear (41T), 5, and main coupling, 1, and place in position in the case.
7. Install the main shaft with rear bearing, 1, through the rear of the case through the gear assembly until it bottoms out in the front bearing.



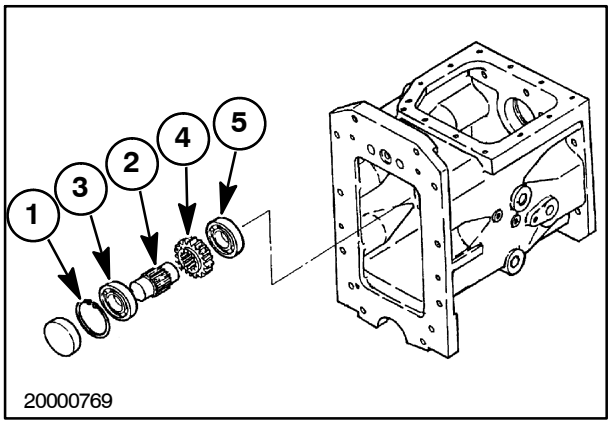
125

8. Install the shift fork, 3, in position and insert the shift rod, 2, through the fork and case. Secure in position with spring pin, 1.



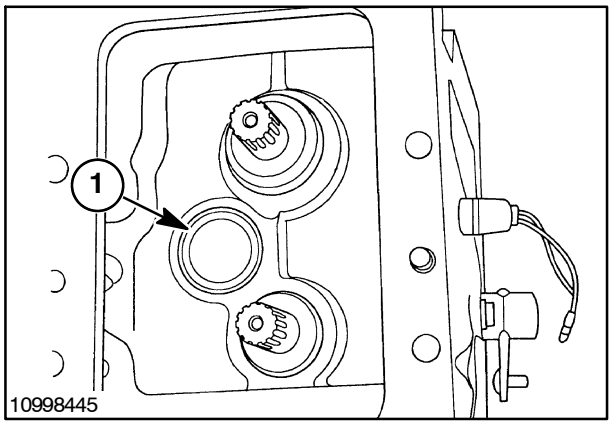
126

9. Install the counter shaft rear bearing, 5, in its bore in the case.
10. Install the fixed gear (21T), 4, in position in the case, then install the counter shaft, 2, with front bearing, 3, through the front of the case through the fixed gear until it bottoms out in the rear bearing.
11. Install the snap ring, 1, to secure the counter shaft assembly.



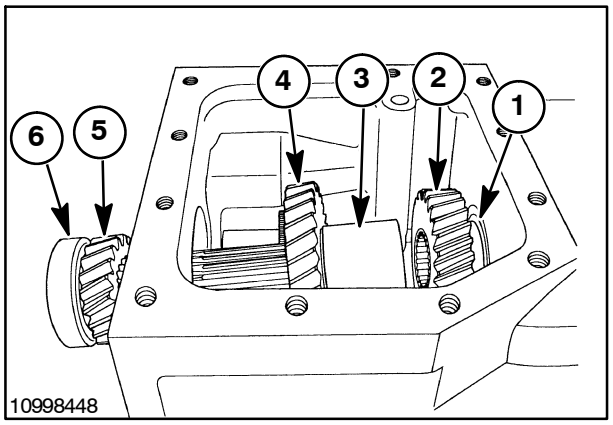
127

12. Install the new counter shaft oil seal, 1.



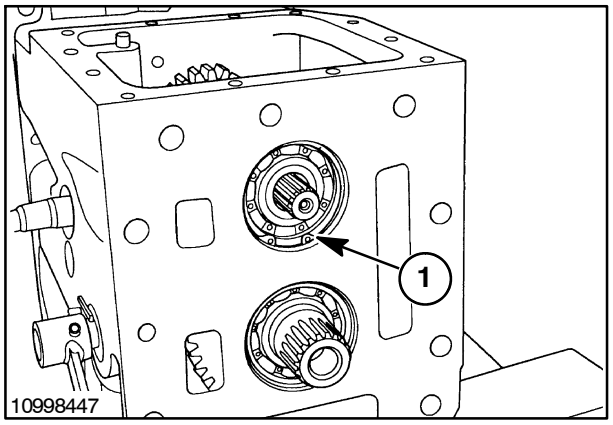
128

13. Install the front bearing, 1, in its bore in the case.
14. Install the high fixed gear, (31T), 4, collar, 3, fixed gear (26T), 2, in position in the case.
15. Install the counter shaft with low fixed gear (19T), 5, and rear bearing, 6, from the rear of the case through the gear assembly until it bottoms out in the front bearing.



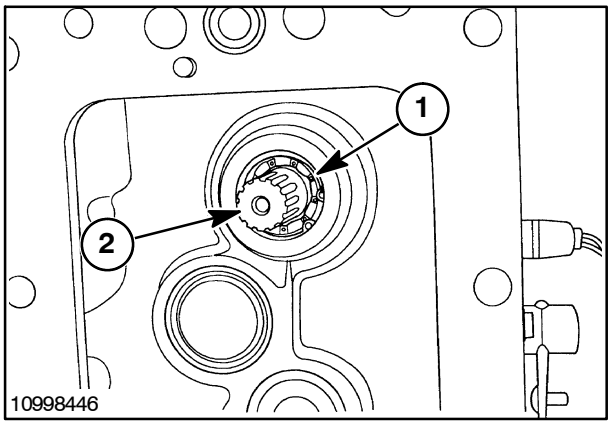
129

16. Install the snap ring, 1, in its groove in the rear of the case.



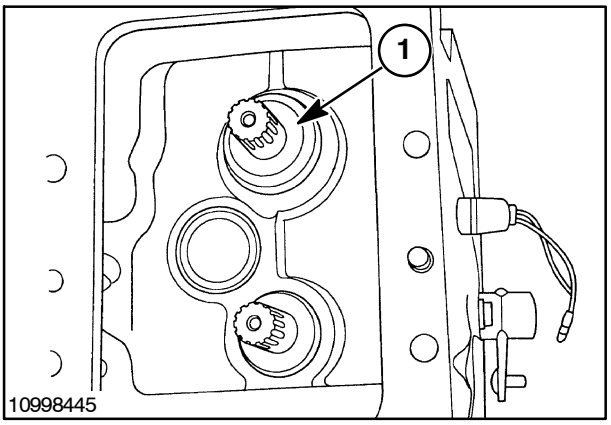
130

17. Install the PTO drive shaft, 2, with bearing through the front of the counter shaft and secure with snap ring, 1.



131

18. Install the new PTO drive shaft seal, 1.

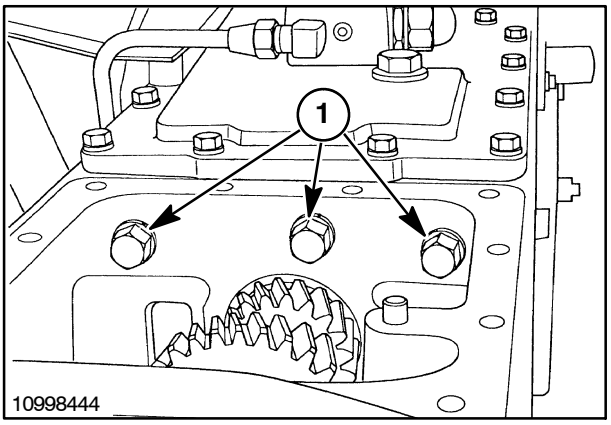


132

Installation

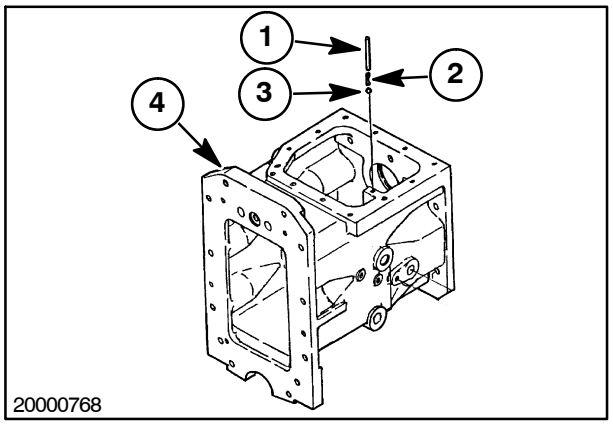
1. Apply a light coat of Loctite sealer, gasket eliminator #518, to the mating surfaces of the rear axle and transmission housing. Align the transmission housing with the rear axle and install the buckle-up bolts. Tighten to 81 N·m (60 ft.-lbs.).

NOTE: *Three of the buckle-up bolts, 1, are located in the transmission case under the top cover.*



133

2. Install the detent ball, 3, spring, 2, and pin, 1, into the case, 4.



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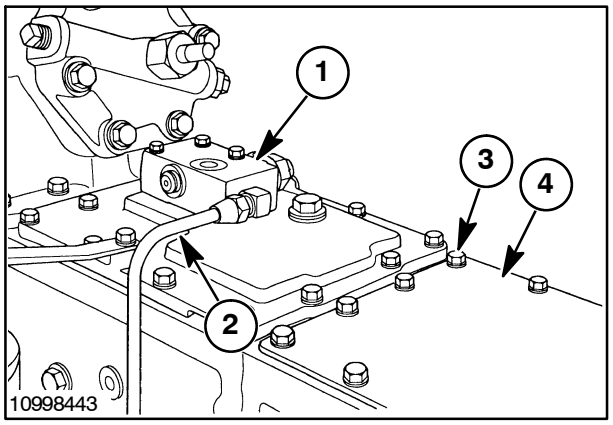
3. Using a new gasket, install the transmission cover, 4. Secure the cover with hex head cap screws, 3.
4. Install the PTO solenoid valve, 1, and hydraulic line, 2.
5. Install the hydrostatic transmission. See “Hydrostatic Transmission Installation” discussed earlier in this section.

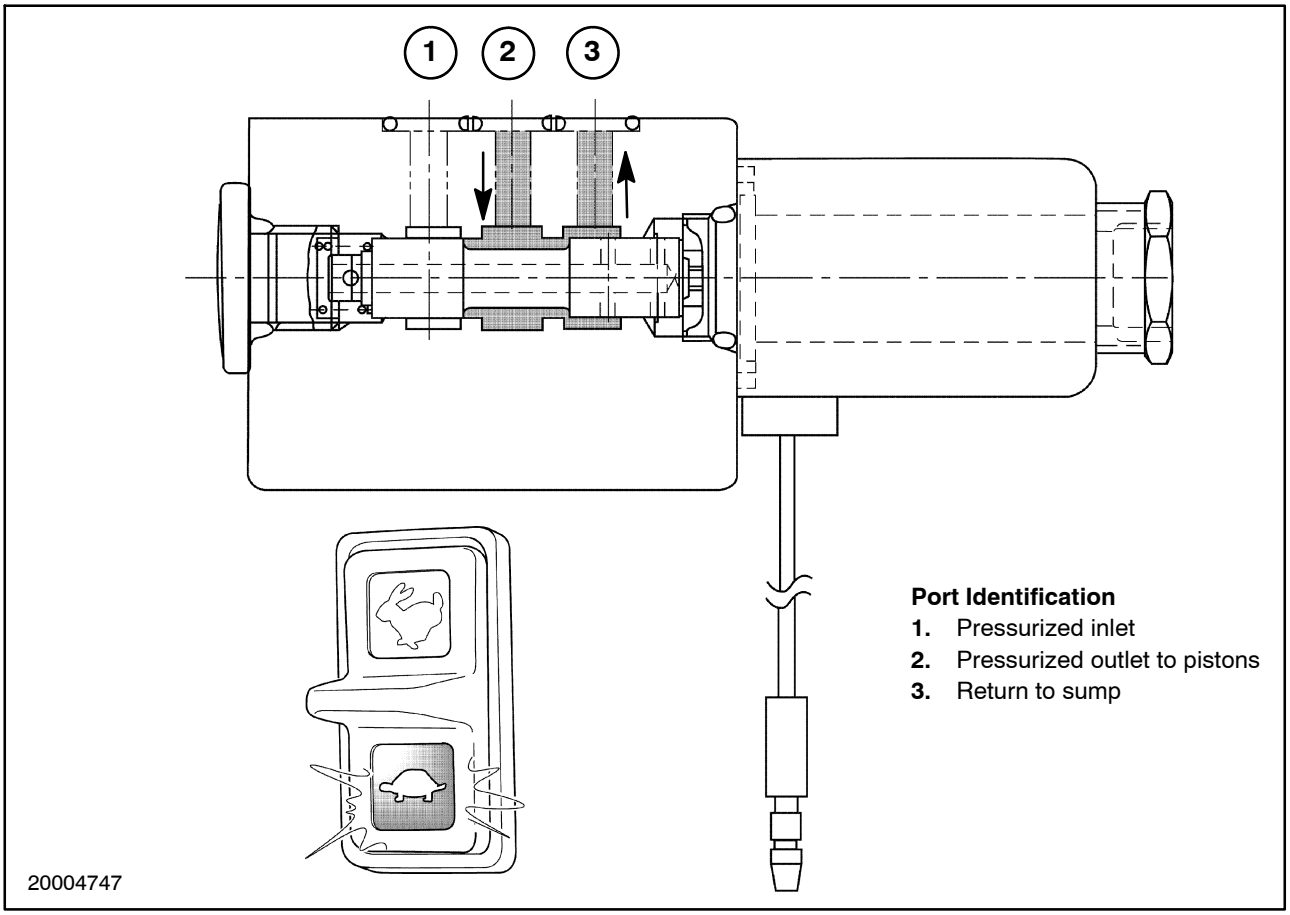


135

Op. 29 214

HI/LO SOLENOID VALVE

The solenoid valve controls the motor swash plate angle by controlling the flow of charge pump pressurized oil. When the solenoid valve is deactivated, by the Hi/LO switch being in the “Turtle” position, no charge pump oil is allowed to flow through the valve to the angling pistons. In the (LOW/TURTLE) mode the swash plate angle is at 15°.

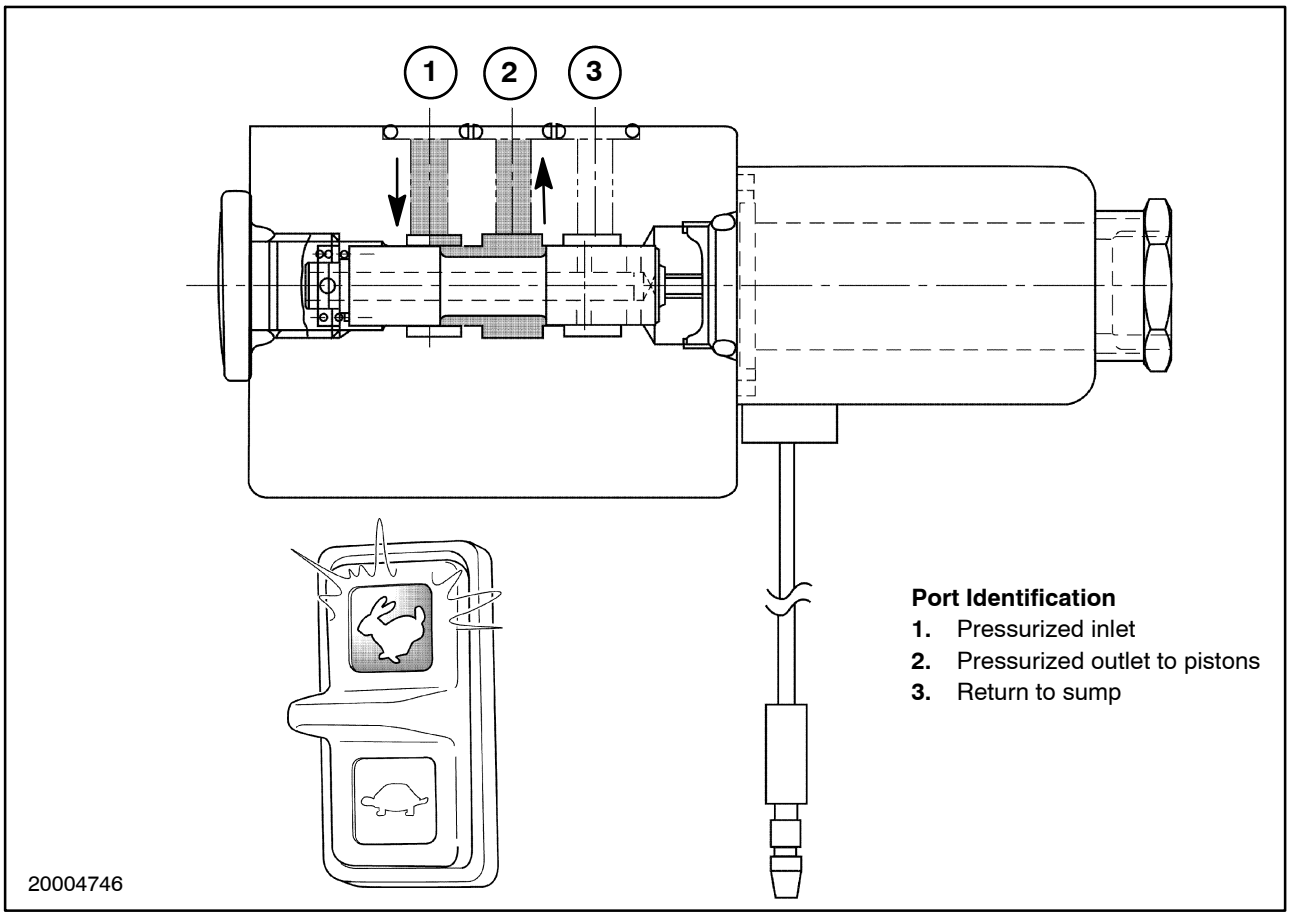


Port Identification

1. Pressurized inlet
2. Pressurized outlet to pistons
3. Return to sump

136

When the solenoid is activated, by placing the HI/LO switch in the “Rabbit” position, the spool is shifted allowing charge pump pressurized oil to flow to the angling pistons that are located under the motor swash plate. When the pistons are pressurized, the motor swash plate angle moves from 15° to 9° for (HI/RABBIT) mode operation.



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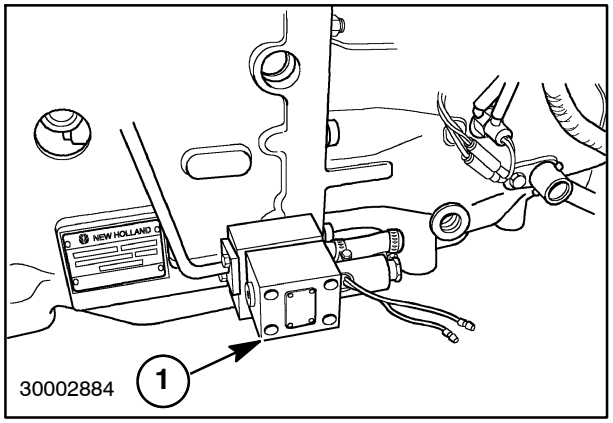
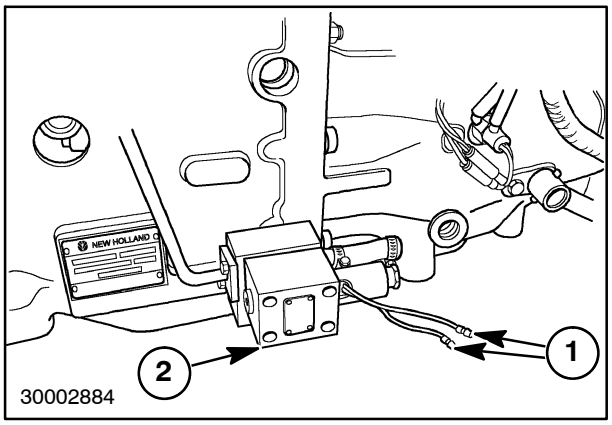
The solenoid valve assembly, 1, is located on the left side of the transmission case.



138

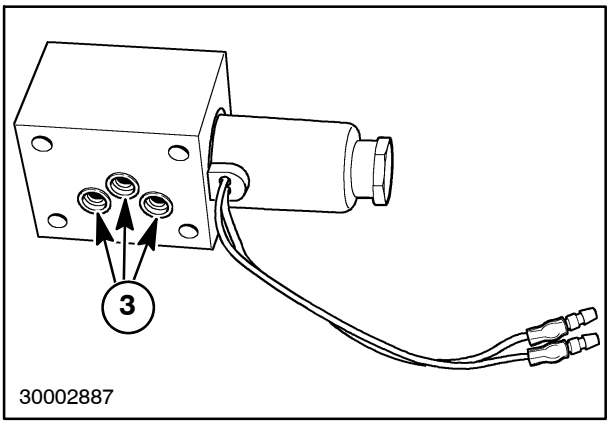
Removal

1. Disconnect wires, 1.
2. Using a 5 mm allen wrench, remove the four socket head mounting bolts, 2.



139

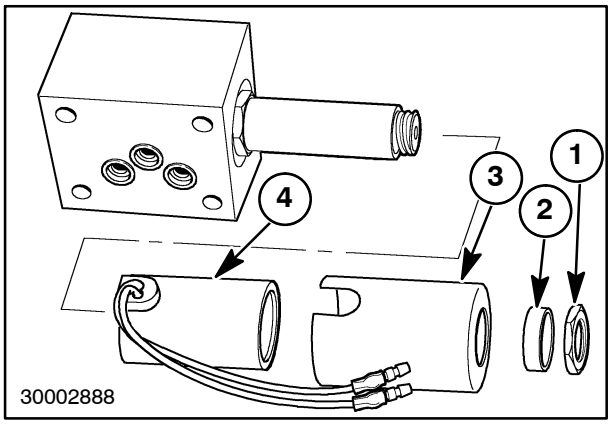
3. When removing the valve assembly, be careful not to displace the three O rings, 3, that are located between the solenoid valve body and the adapter block.



140

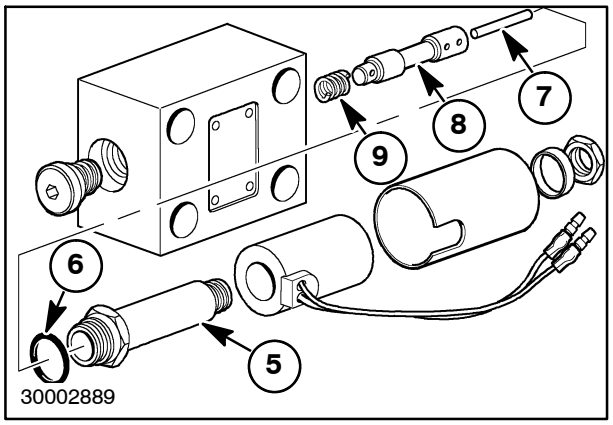
Disassembly

1. Remove solenoid retaining nut, 1, spacer, 2, solenoid cover, 3, and solenoid, 4, from valve stem.



141

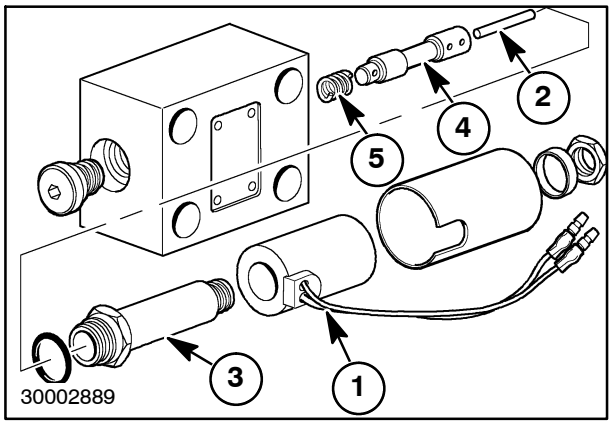
2. Remove valve stem, 5, O ring, 6, plunger, 7, spool, 8, and spring, 9, from valve body.



142

Inspection

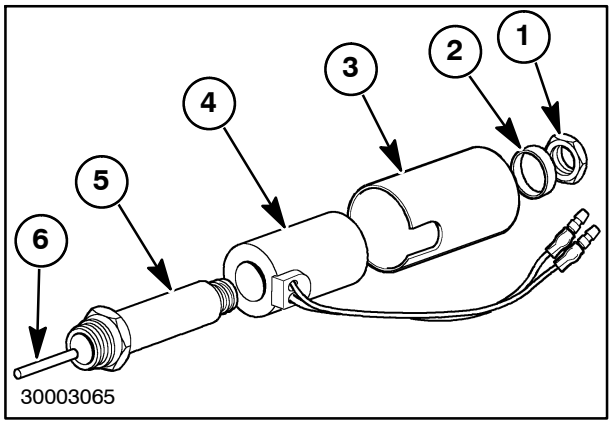
1. Check solenoid, 1, for damaged wires.
2. Plunger, 2, should slide freely in and out of valve stem, 3.
3. Spool, 4, should be a smooth sliding fit inside of valve body bore, if spool is binding check for contamination in bore or for rough spots on spool. Spool can be polished with fine emery paper if needed.
4. Check spring, 5, for any damage or distortion.



143

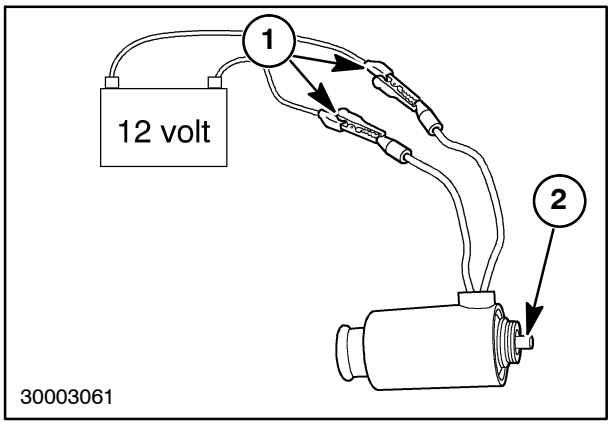
Testing

1. Assemble nut, 1, spacer, 2 solenoid cover, 3, solenoid, 4, valve stem, 5, and plunger, 6.



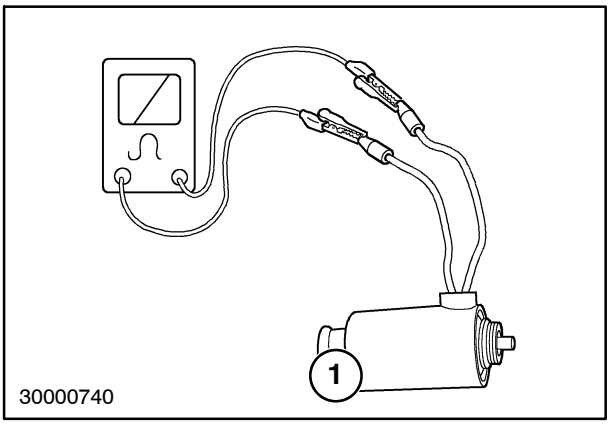
144

2. Apply 12 volt power source to the solenoid leads, 1.
3. When 12 volts are supplied to solenoid leads, plunger, 2, should protrude from valve stem. Valve stem should become magnetized when solenoid is supplied with electrical current.



145

4. Check ohm reading across leads of solenoid. Reading should be 7.5 to 10.5 ohms.
5. If plunger does not protrude when voltage is applied or resistance reading is not within specification, replace solenoid.

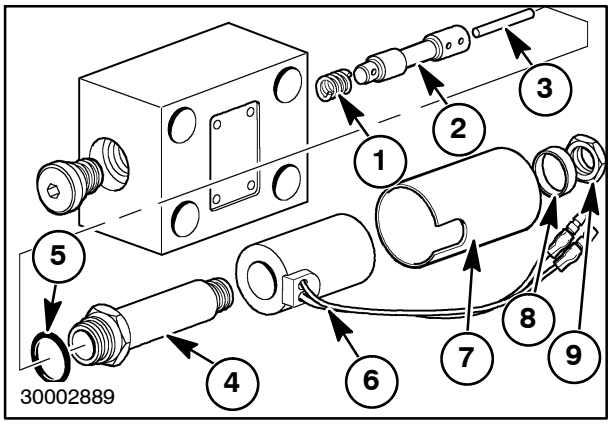


146

Assembly

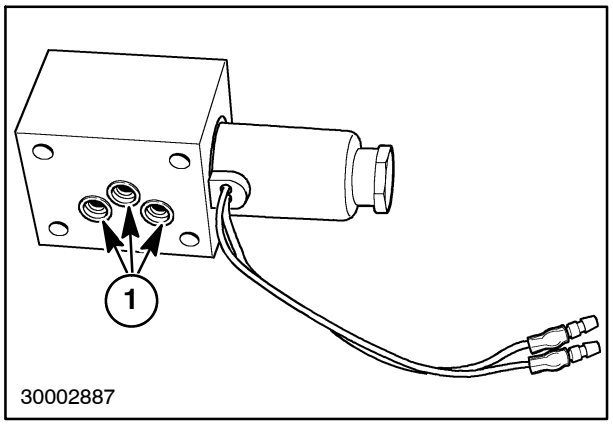
NOTE: *Clean and lubricate spool before installing into valve body.*

1. Install spring, 1, spool, 2, plunger,.3, valve stem, 4, with o ring, 5, solenoid, 6, cover, 7, spacer, 8 and nut, 9.



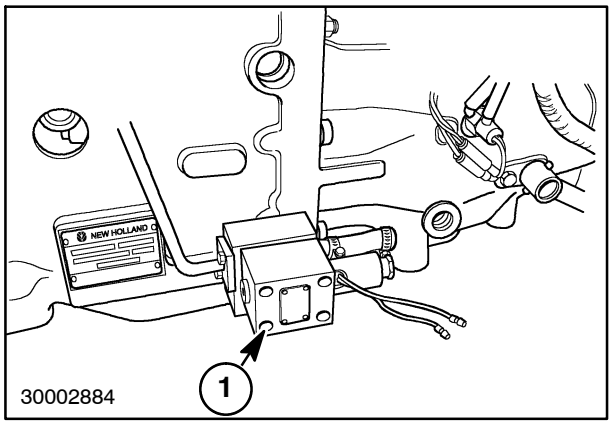
147

2. Install the three o rings, 1 onto backside of valve body.



148

3. Install valve body onto adapter block with the four socket head bolts. Torque to 5.6 Nm 50 in.-lbs.



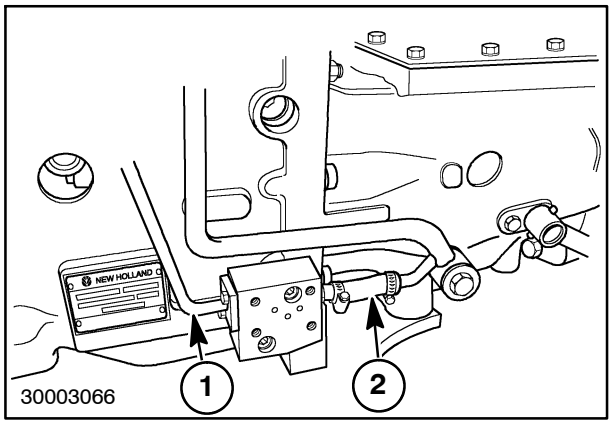
149

ADAPTER BLOCK

Removal

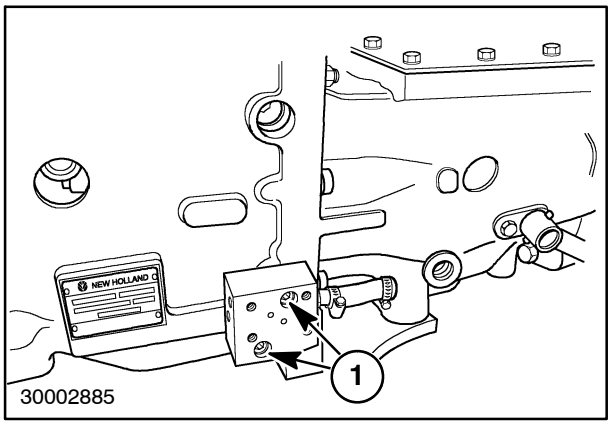
NOTE: *Solenoid valve must be removed before adapter block can be removed from transmission case.*

1. Remove metal line, 1, and hose, 2, from adapter block.



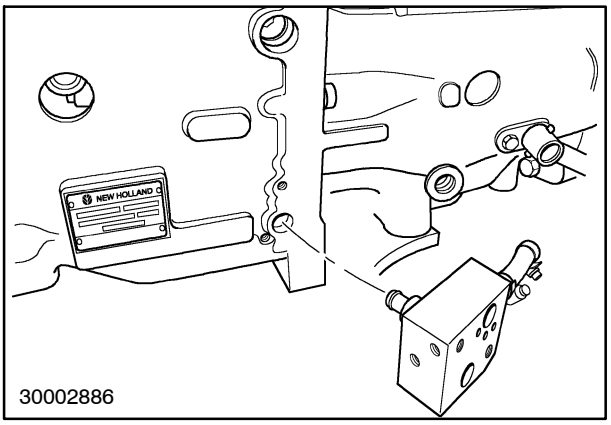
150

2. Using a 6 mm allen wrench remove the two socket head bolts mounting bolts, 1.



151

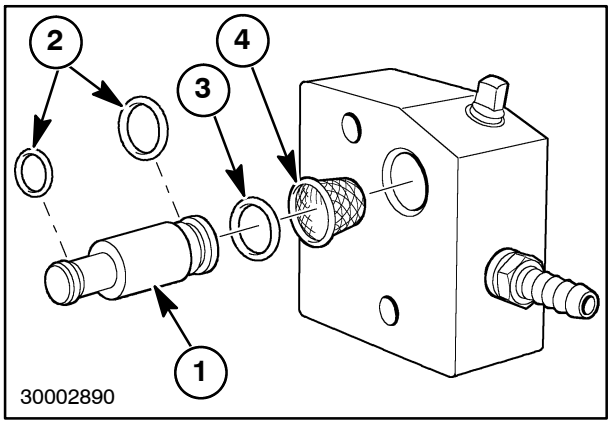
3. Pull adapter block assembly away from internal hydrostatic transmission.



152

Disassembly

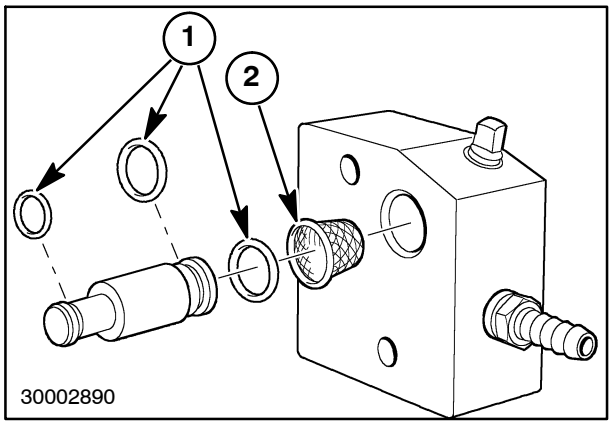
1. Remove adapter fitting, 1, and O rings, 2, from block.
2. Remove O ring, 3, and screen, 4, from block port.



153

Inspection

1. Inspect all O rings, 1, for damage and replace as needed.
2. Clean screen,, 2, with solvent and compressed air.



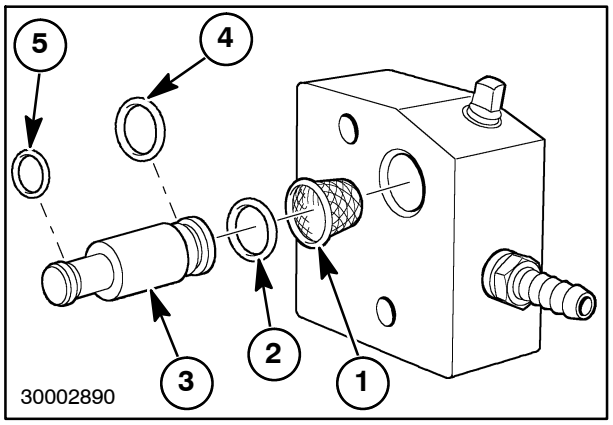
154

Assembly

1. Install screen, 1, and O ring, 2 into bore of block.

NOTE: *O ring, 2, is sandwiched between screen, 1, and adapter fitting, 3.*

2. Install adapter fitting, 3, with O rings, 4, and, 5 into block.



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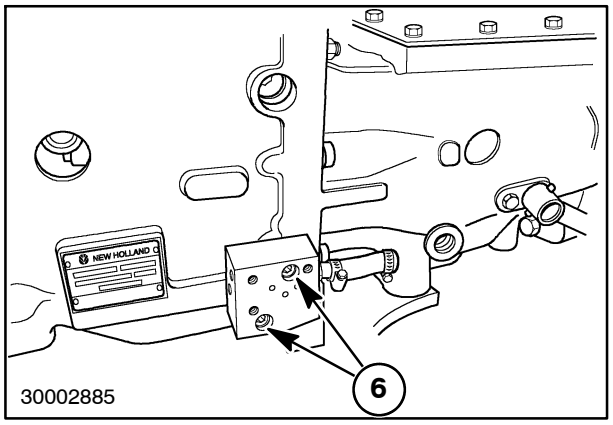
3. Install adapter block assembly into Hydrostatic transmission port, secure with two socket head bolts, 6, tighten bolts to 27 Nm 20 ft.-lbs.



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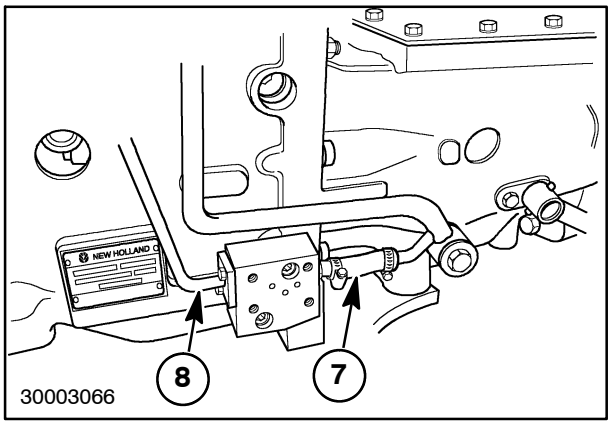
4. Install hose, 7, and metal line, 8.



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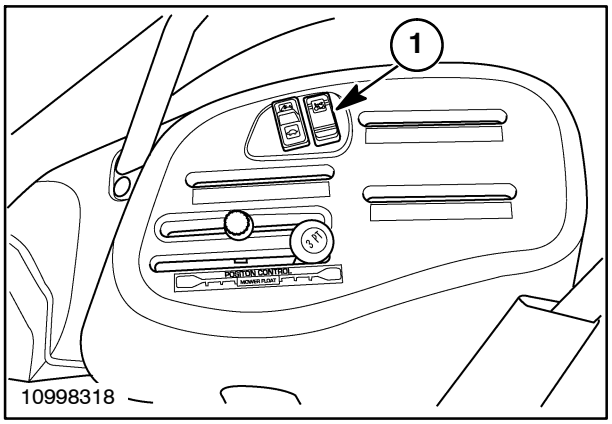
CRUISE CONTROL

An electronic cruise control system is standard equipment on models TC35DA, TC40DA and TC45DA. The cruise control system utilizes an electromagnet, to lock the hydrostatic transmission linkage in any position and maintain a constant selected forward or reverse speed.

The cruise control is activated by a three-position momentary rocker switch, 1, that is located on the right-hand side pod. When cruise control system is activated the tractor symbol on the switch will be illuminated green, indicating the system is “ON”.



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After starting the tractor and reaching the desired operating speed, engage the cruise control by :

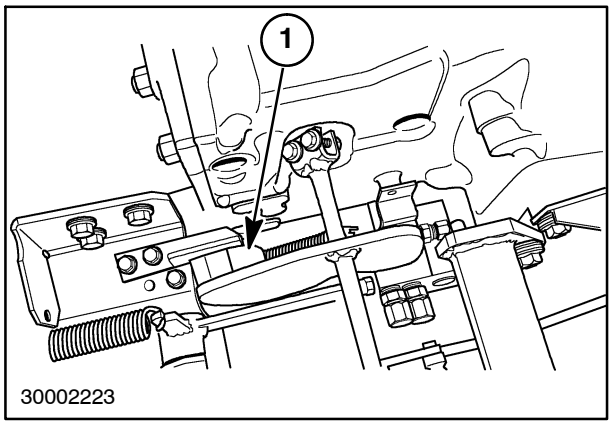
- Place the ignition switch in the “ACC/RUN” position.
- Having the parking brake or both brake pedals are in the released position.
- Depressing the top side of the cruise control switch.

This activates the electromagnet, 1, which holds the hydrostatic pedal in place.

The cruise control can be disengaged by:

- Depressing both brake pedals.
  (Depressing both pedals activates cruise release brake switch).
- Placing the cruise control switch in the “OFF” position.

When either one of the above actions take place, the electric current to the magnet is interrupted, and the hydrostatic pedal returns to neutral.



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NOTE: *The cruise control can be overridden by pushing on the hydrostatic pedals with enough force to force the linkage past the electromagnet. If the cruise is over ridden, once the force on the pedal is removed the cruise will be set at the new speed position.*

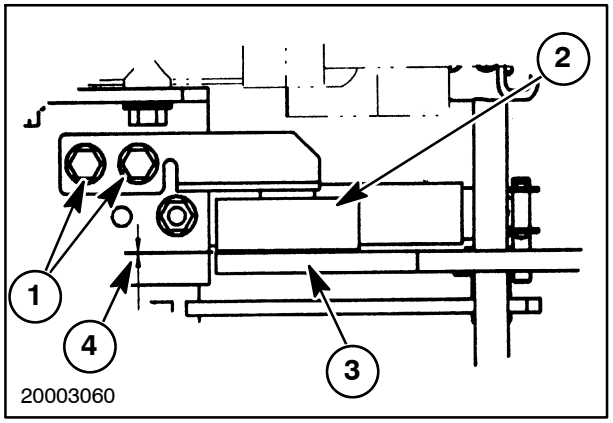
NOTE: *When the ignition key is turned to the “OFF” position, the cruise control will default to the “OFF” position.*

ELECTROMAGNET AIR GAP

Adjustment

With the tractor turned off and the cruise control deactivated, loosen bolts, 1, on magnet mounting plate. Move mounting plate inboard or outboard to obtain an air gap, 4, of 0.5 – 1.5 mm (0.020 – 0.060 in.) between magnet, 2, and pivot plate, 3. Retighten mounting bolts, 1.

NOTE: *Troubleshooting cruise control system is covered in section 55 electrical.*



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