WSM

WORKSHOP MANUAL
TRACTOR

MECHANISM

Kubota

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KiSC issued 06, 2006 A

MECHANISM

CONTENTS

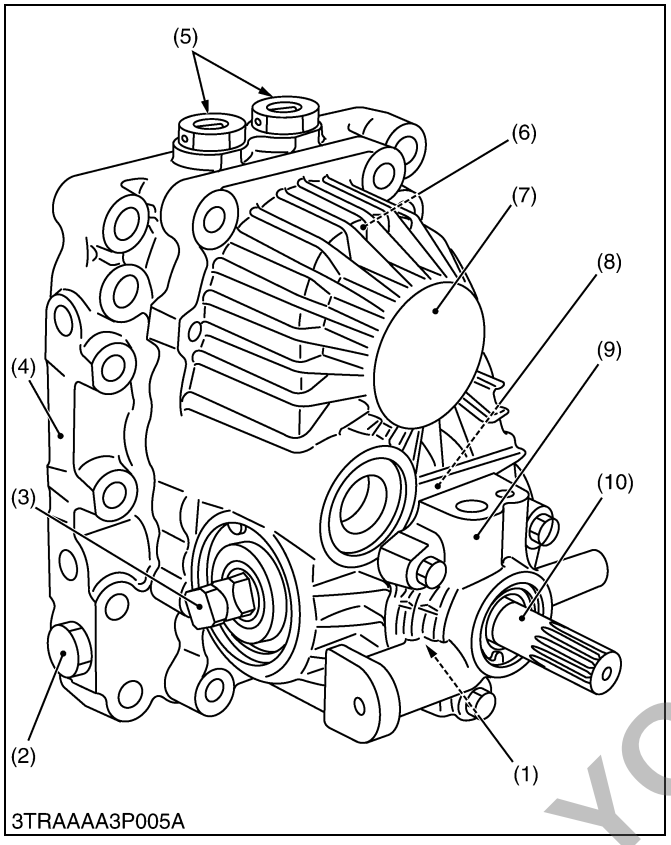
1. DRY TYPE, SINGLE PLATE CLUTCH 2-M1
2. DRY TYPE, DUAL STAGE CLUTCH 2-M2
3. HYDRAULIC MULTIPLE DISC CLUTCH 2-M4
   [1] TYPE 1 (For Travelling) 2-M4
   [2] TYPE 2 (For PTO) 2-M5

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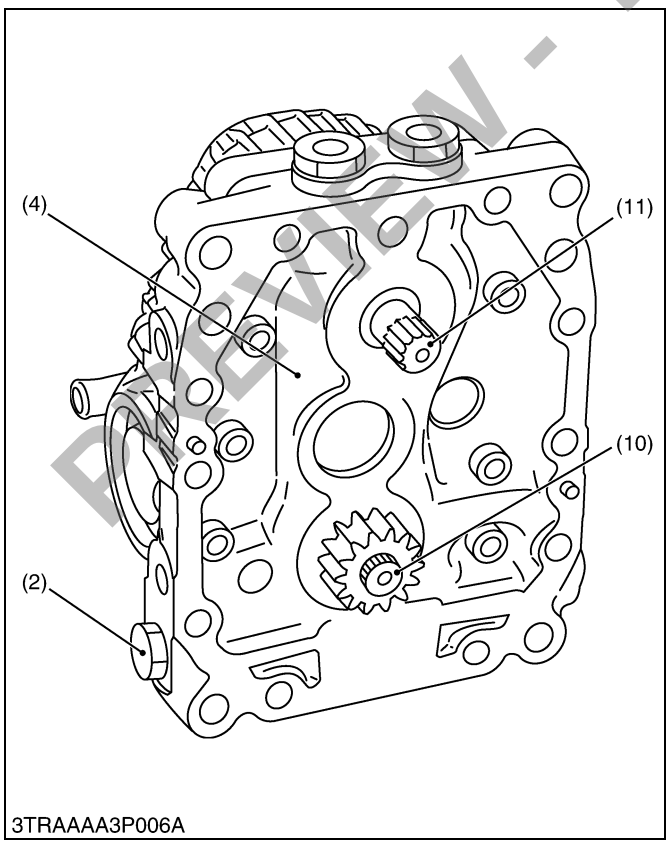
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5. HYDROSTATIC TRANSMISSION (TYPE 1) (Code No. 6C150-11603)

[1] STRUCTURE



3TRAAAA3P005A



3TRAAAA3P006A

Hydrostatic transmission is composed of variable displacement piston pump, fixed displacement piston motor, charge pump and valve system.

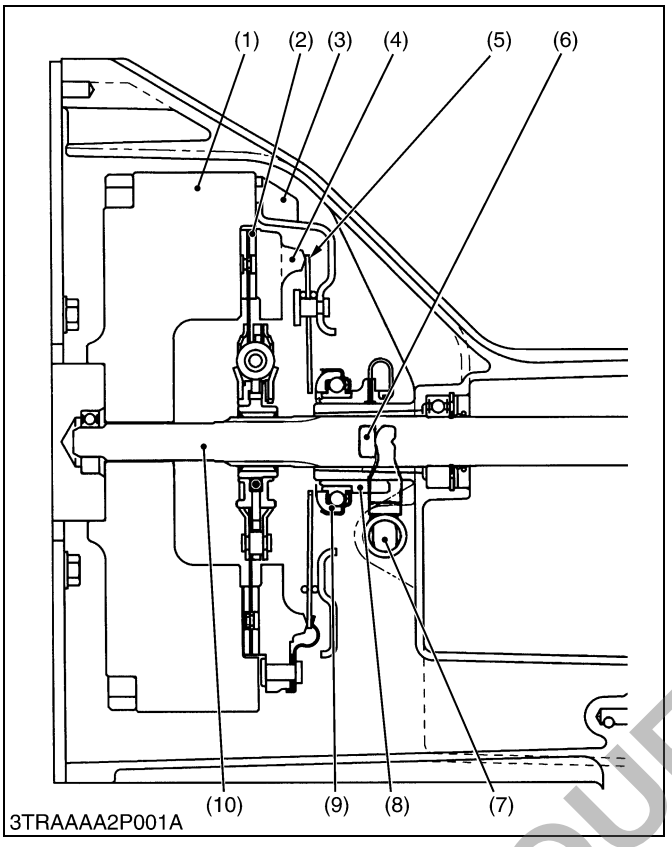
(1) Charge Relief Valve
(2) Check and High Pressure Relief Valve
(3) Trunnion Shaft
(4) Center Section
(5) Neutral Valve
(6) Fixed Displacement Piston Motor
(7) Housing
(8) Variable Displacement Piston Pump
(9) Charge Pump
(10) Input Shaft (Pump Shaft)
(11) Output Shaft

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1. DRY TYPE, SINGLE PLATE CLUTCH



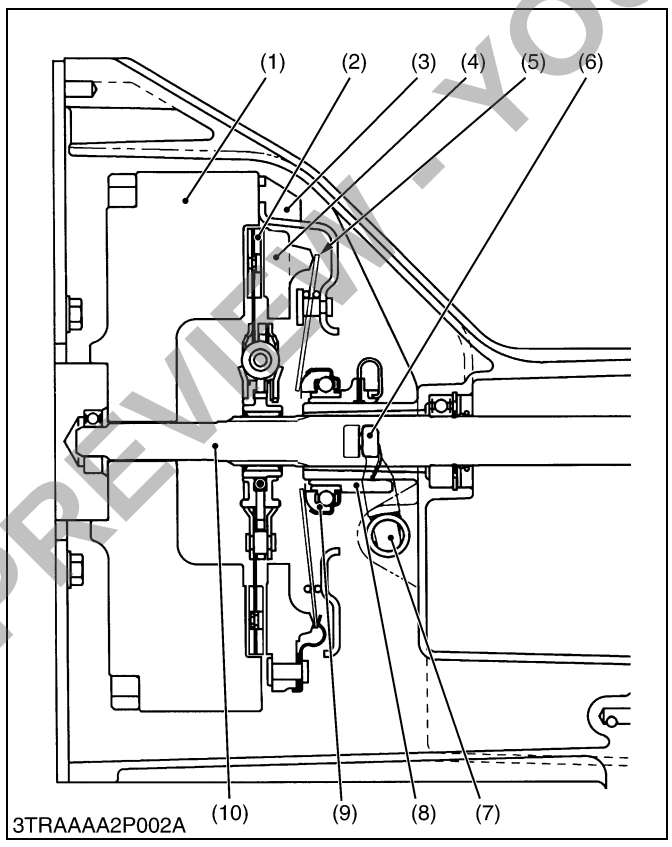
■ **Clutch "Engaged"**

When the clutch pedal is not depressed, the clutch release bearing (9) and the fingers of diaphragm spring (5) are not connected to each other.

Accordingly, the pressure plate (4) is tightly pressed against the flywheel (1) by the diaphragm spring (5). As a result, rotation of the flywheel (1) is transmitted to the transmission through the clutch shaft (10) due to the frictional force among the flywheel (1), clutch disc (2) and pressure plate (4).

(1) Flywheel
(2) Clutch Disc
(3) Clutch Cover
(4) Pressure Plate
(5) Diaphragm Spring
(6) Release Fork
(7) Clutch Rod
(8) Release Hub
(9) Release Bearing
(10) Clutch Shaft

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■ **Clutch "Disengaged"**

When the clutch pedal is depressed, the clutch pedal rod is pulled to move the clutch rod (7). Then, the release fork (6) pushes the release hub (8) and release bearing (9) toward the flywheel. Simultaneously, the release bearing (9) pushes the diaphragm spring (5).

As the pressure plate (4) is pulled by the diaphragm spring (5), the frictional force among the flywheel (1), clutch disc (2) and pressure plate (4) disappears.

Therefore, rotation of the flywheel (1) is not transmitted to the clutch disc (2), and then the rotation of the clutch shaft (10) stops.

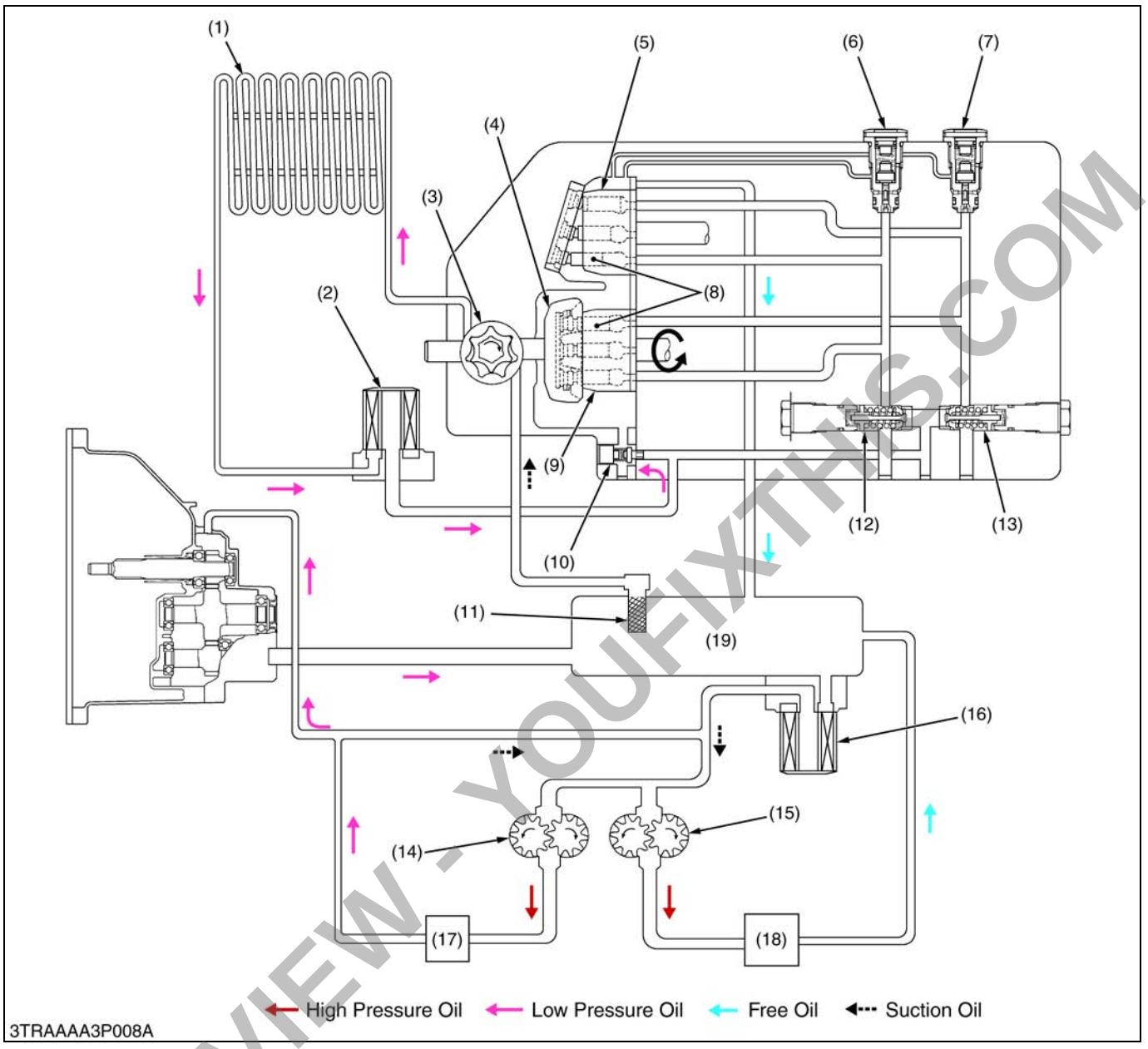
(1) Flywheel
(2) Clutch Disc
(3) Clutch Cover
(4) Pressure Plate
(5) Diaphragm Spring
(6) Release Fork
(7) Clutch Rod
(8) Release Hub
(9) Release Bearing
(10) Clutch Shaft

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[2] OIL FLOW AND VALVES



(1) Oil Cooler
(2) Oil Filter (for HST)
(3) Charge Pump
(4) Swashplate
(5) Motor Cylinder Block
(6) Neutral Valve (Forward)
(7) Neutral Valve (Reverse)
(8) Piston
(9) Pump Cylinder Block
(10) Charge Relief Valve
(11) Oil Strainer
(12) Check and High Pressure Relief Valve (Forward)
(13) Check and High Pressure Relief Valve (Reverse)
(14) Hydraulic Pump (for Power Steering)
(15) Hydraulic Pump (for Main Circuit)
(16) Oil Filter
(17) Power Steering Controller
(18) Hydraulic Control Valve
(19) Transmission Case

The pump and motor are joined in a closed hydraulic loop and most of oil circulates within the main oil circuit. A little oil lubricates and oozes out from the clearance between the moving parts of the case. Then oil in the main oil circuit of the HST needs to be supplied a want.

So all of oil fed from charge pump flow to hydrostatic transmission for charging and cooling.

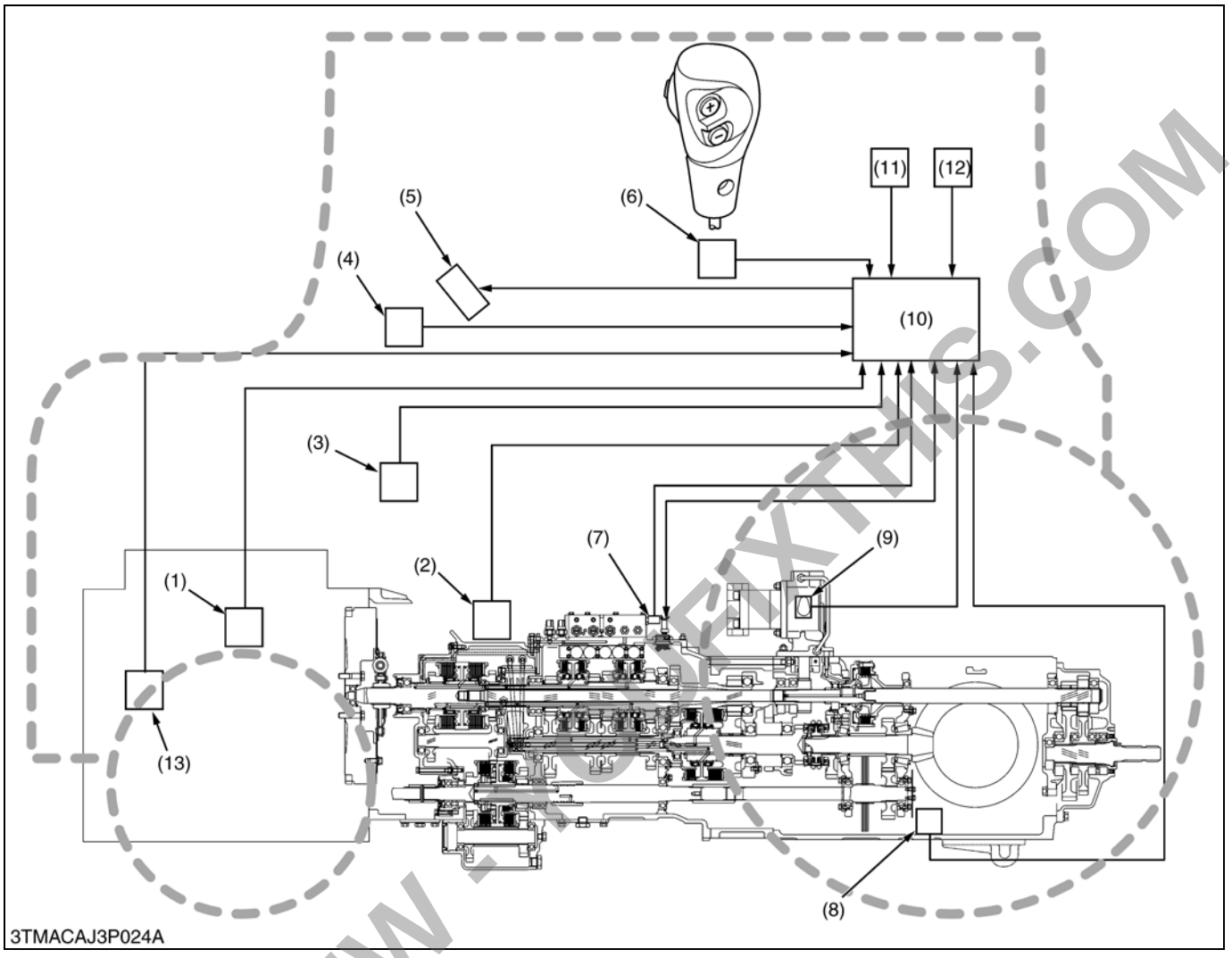
The charge oil aids smooth operation of pistons for pump and motor. The charge oil passes through the oil cooler and oil filter cartridge to charge relief valve port. The rest of oil passes through the charge relief valve into the HST housing. And overflow oil from HST housing return to the transmission case.

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[2] ELECTRIC CONTROL SYSTEM

(1) Control System

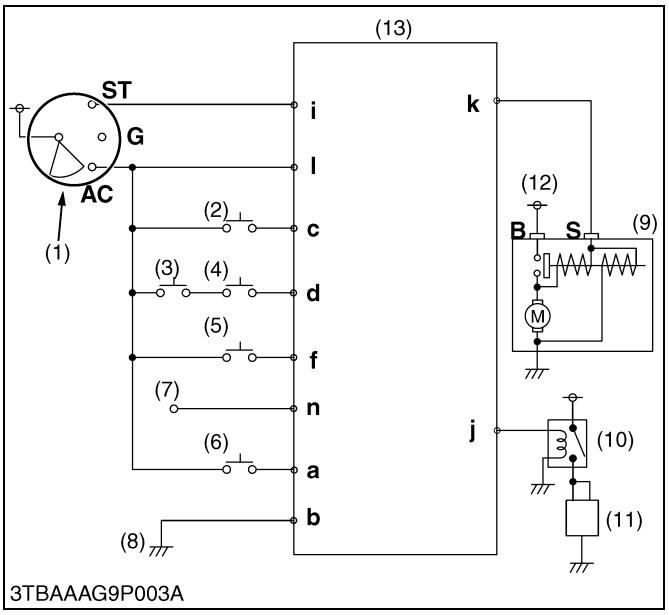


(1) Throttle Sensor
(2) Shuttle Rotation Sensor
(3) Clutch Pedal Sensor
(4) Shuttle Switch
(5) Meter Panel
(6) Power Shift/Range Shift Lever Sensor
(7) Oil Temperature Sensor
(8) Travelling Speed Sensor
(9) Engine Rotation Sensor
(10) Power Shift Control Unit
(11) Auto Mode Switch
(12) Auto Mode Sensitivity Adjustment Dial
(13) Turning Angle Switch

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(3) Type 3 (OPC Controller ; Code No. 6C190-55510)



3TBAAAG9P003A

B2630 and B3030 are configured with an **"Operator Presence Control (OPC)"** system to control engine starting and engine automatically stopping.

This OPC system mainly consists of controller and engine starting / stopping control switches such as HST pedal switch, independent PTO lever switch, seat switch, seat tilt switch and PTO lever switch.

Main parts regarding OPC system are laid out as shown in the electrical circuit.

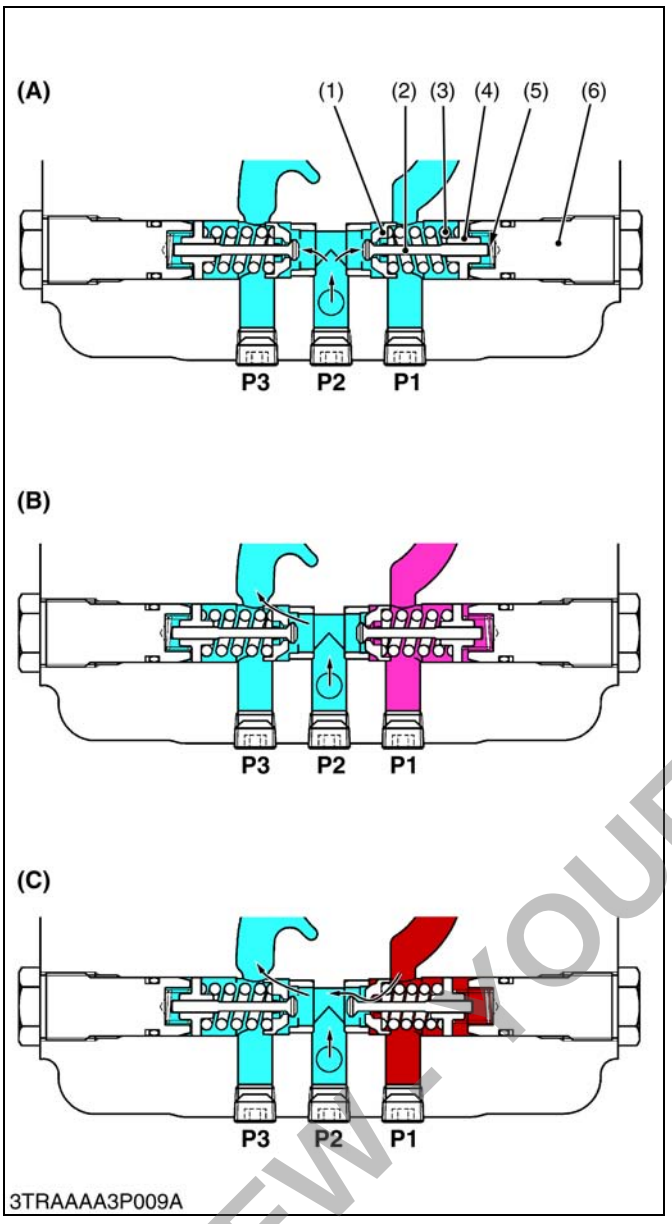
(1) Main Switch
(2) Independent PTO Lever Switch
(3) Seat Tilt Switch
(4) PTO Lever Switch
(5) Seat Switch
(6) HST Pedal Switch
(7) Regulator L Terminal
(8) Body Earth
(9) Starter Motor
(10) Key Stop Solenoid Relay
(11) Key Stop Solenoid
(12) Battery
(13) OPC Controller

a to l :Controller Terminal
ST :Main Switch ST Terminal
G : Main Switch G Terminal
AC :Main Switch AC Terminal
B : Starter Motor B Terminal
S : Starter Motor S Terminal

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■ Check and High Pressure Relief Valve

The check and high-pressure relief valve consists of pressure poppet (2), check valve seat (1), relief valve spring (3), spring guide (4) and check valve spring (5).

The valve is used to prevent an overload that would happen at a quick start, sudden stop or even during usual running. This valve doubles as a check valve.

The check and high-pressure relief valves are laid out facing each other as shown in the figure.

In neutral, both valves are open and charging oil enters into the main oil circuit through the valves. **(A)**

At normal operation, the check valve in the high-pressure side is closed and it pushes and opens the another one. An excessive charge flow goes through the charge relief valve into HST housing. **(B)**

The check and high-pressure relief valve along the high-pressure line serves as a high-pressure relief valve. If the pressure exceeds a high-pressure limit level, the pressure poppet opens itself against the relief valve spring (3) force and opens the valve seat that is located between the check valve seat (1) and the pressure poppet (2). Now the flow goes from **P1** to **P2** and **P3**. **(C)**

If the **P1** pressure drops, the relief valve spring forces the valve seat closed against the pressure. The high-pressure oil at **P1** does not flow to **P2** any longer.

As discussed above, the check and high-pressure relief valve protects engines, pumps, motors, gears and even the machine itself from overload.

Oil temperature	Valve operating pressure
50 °C (122 °F)	30.9 to 31.9 MPa 315 to 325 kgf/cm^2 4480 to 4622 psi

(1) Check Valve Seat
(2) Pressure Poppet
(3) Relief Valve Spring
(4) Spring Guide
(5) Check Valve Spring
(6) Valve Plug

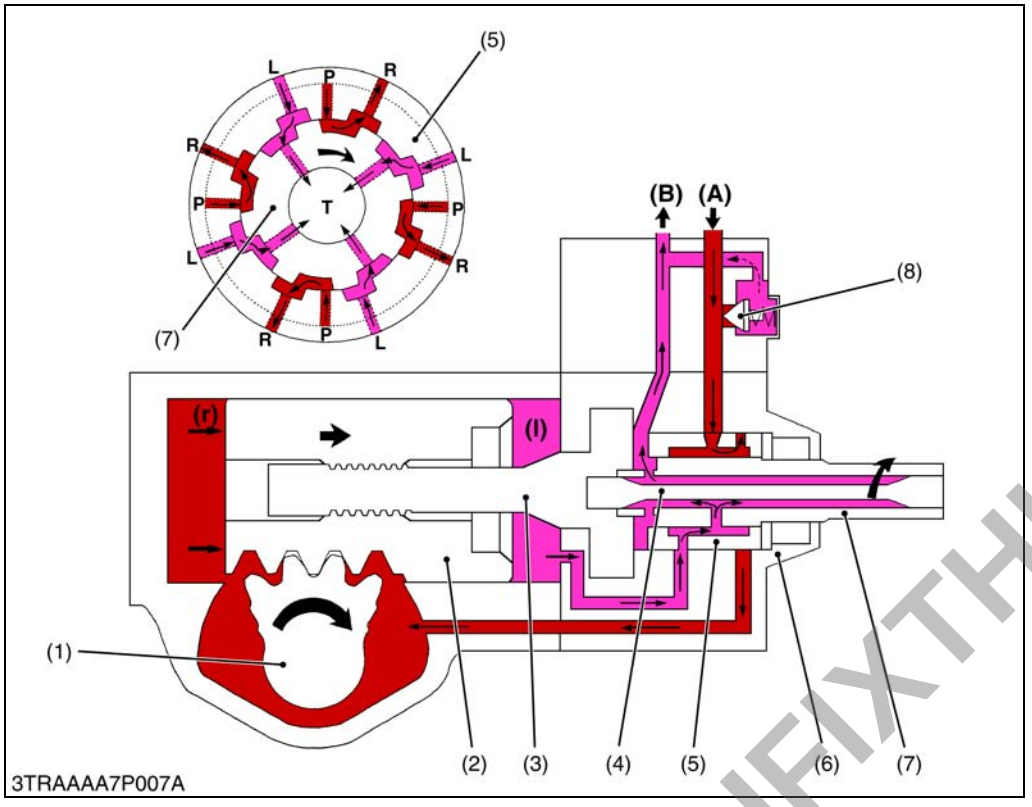
(A) In Neutral (Stop)
(B) When Check Valve Activating (Normal Operation)
(C) When High Pressure Relief Valve Activating

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■ Right Turning



(1) Sector Gear Shaft
(2) Rack (Piston)
(3) Worm Shaft
(4) Torsion Bar
(5) Sleeve
(6) Valve Housing
(7) Stub Shaft (Spool)
(8) Relief Valve

(A) From Pump
(B) Return to Suction Line

(l) Chamber "l"
(r) Chamber "r"

P : Pump Port
T : Return Port
L : Cylinder L Port
R : Cylinder R Port

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Operation mechanism for left turning is the same as that for right turning, except for directions of oil flow from and to the cylinder ports.

■ Manual Operation

(When Engine Stops or Hydraulic Circuit Troubles)

Even when the engine stops or hydraulic circuit malfunctions thus leading to hydraulic operation stop, manual operation is possible. However, naturally, steering wheel requires a larger operating power.

If the steering wheel is turned when hydraulic circuit ceases to operate, the worm shaft (3) which is connected with stub shaft (7) moves slightly by steering force, then the worm shaft (3) and rack (piston) (2) have same relationship with the manual steering gear.

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1. TABLE1

[1] HYDRAULIC RELATED PARTS

		HST Assy	Steering Controller-1	Steering Controller-2	Flow Priority Valve	Regulator Valve	Bi-speed Valve	PTO Clutch Valve	3P Hydraulic system			
									Relief Valve	Manual Control Valve	Position Control Valve-1	Position Control Valve-2
B	B1410 B1610 B7400	6C150-11603								6C080-36200 ↑ 6C120-36200		
	B1710	↑	6C070-41104								6C070-36202	
	B7500	↑	6C140-41213							6C120-36200	↑	
	B2110	↑	6C070-41104								↑	
	B2410	↑	↑								↑	
	B2710	↑	↑								↑	
	B2910	↑	↑								↑	
L	Sta-30	TA470-39000	TA470-37000		T0430-36700		T0411-99310				T0430-37500	
	Sta-35	↑	↑		↑		↑				↑	
	L2600		6C070-41104		35270-16710						31351-39604	31391-39002
	L2500		↑		↑						↑	↑
	L3000		↑		↑						↑	↑
	L4300		TA040-37002			T1060-19050		TA040-69300			↑	
	L3010(L2900)	TA240-58004	↑			TA040-66010		↑			↑	
	L3410(L3300)	↑	↑			↑		↑			↑	
	L3300CAB	↑	↑			↑		↑			↑	
	L3710(L3600)	↑	↑			↑		↑			↑	
	L3710CAB	↑	↑			↑		↑			↑	
	L4310(L4200)	↑	↑			↑		↑			↑	
	L4310CAB	↑	↑			↑		↑			↑	
	L4610	↑	TA150-37000			TA040-66050		↑			↑	
	L4610CAB	↑	↑					↑			↑	
M	M4900		3A111-63070					3A111-27400	3A121-82360		38240-39143	
	M4900CAB		↑					↑	↑		↑	
	M5700		↑	3A011-63072				↑	↑		↑	
	M5700CAB		↑					↑	↑		↑	
	M6800		↑					↑	↑		↑	
	M6800CAB		↑					↑	↑		↑	
	M8200		↑	3A011-63072			YW273-00100	↑	3F740-82360		3A151-82300	38240-39143
	M8200CAB		↑					↑	↑		↑	↑
	M9000		↑					↑	↑		↑	
	M9000CAB		↑					↑	↑		↑	
	M-110		3F240-63071	3F250-63072			3F250-23110	3F240-27402	↑			
	M-120		↑	↑			↑	↑	↑			

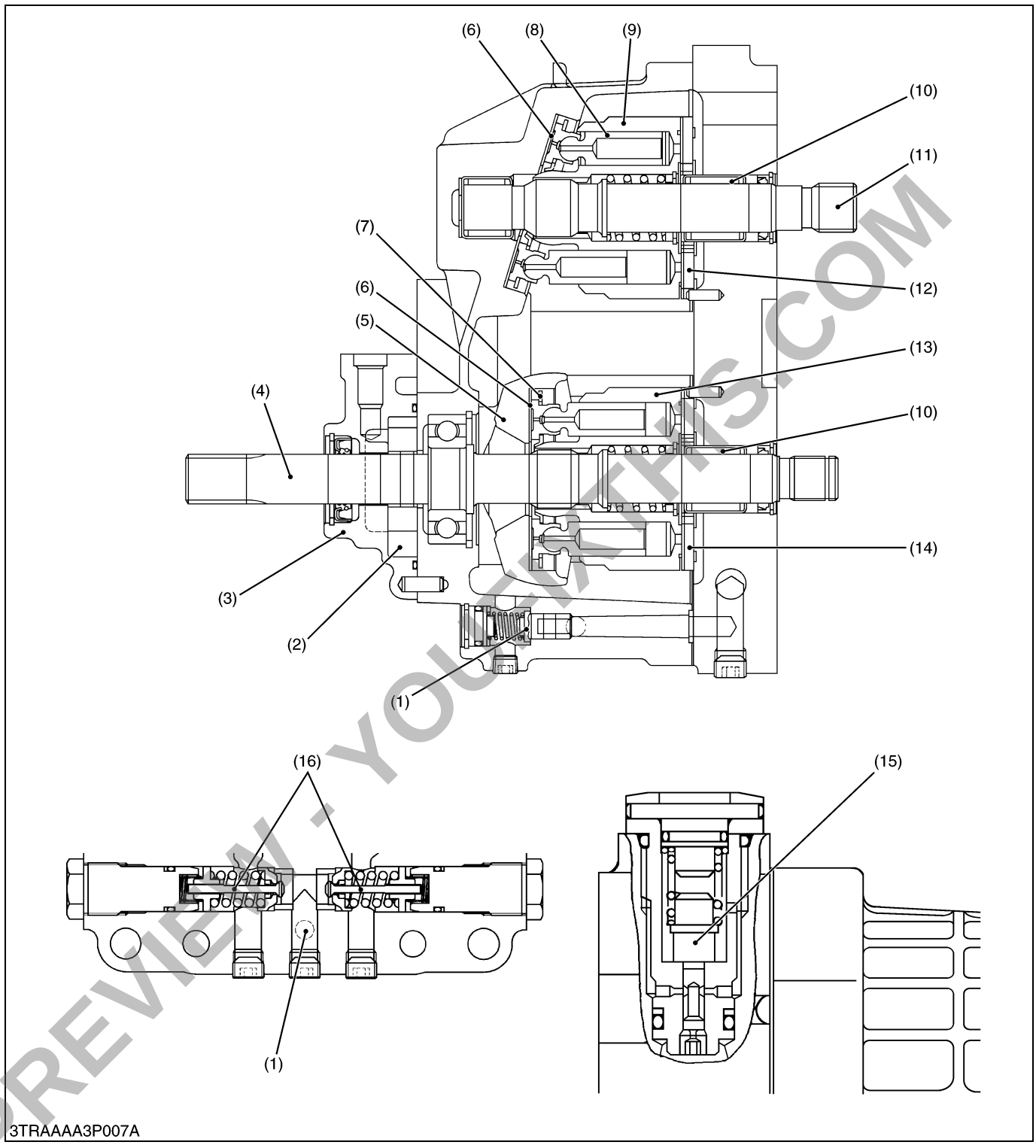
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1 ENGINE

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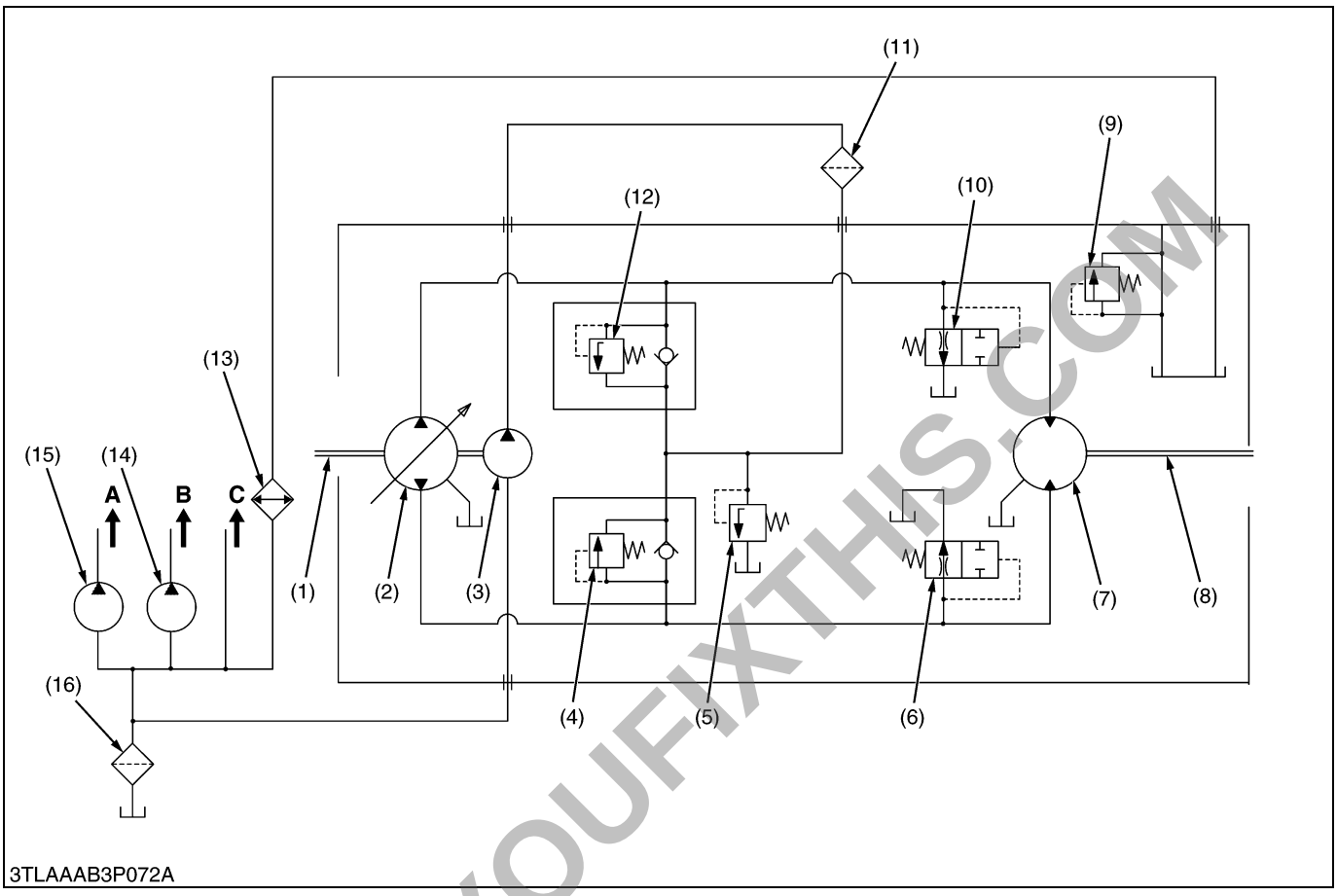


(1) Charge Relief Valve
(2) Charge Pump
(3) Charge Pump Case
(4) Pump Shaft
(5) Variable Swashplate
(6) Thrust Collar
(7) Retainer Plate
(8) Piston
(9) Cylinder Block (Motor)
(10) Needle Bearing
(11) Motor Shaft
(12) Valve Plate (Motor)
(13) Cylinder Block (Pump)
(14) Valve Plate (Pump)
(15) Neutral Valve
(16) Check and High Pressure Relief Valve

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[2] OIL FLOW



(1) Input Shaft
(2) Variable Displacement Pomp
(3) Charge Pomp
(4) Check and High Pressure Relief Valve
(5) Charge Relief Valve
(6) Neutral Valve
(7) Fixed Displacement Motor
(8) Output Shaft (Motor)
(9) Case Relief Valve
(10) Neutral Valve
(11) Oil Filter
(12) Check and High Pressure Relief Valve
(13) Oil Cooler
(14) Pump
(15) Pump
(16) Oil Filter

A : To Hydraulic Block
B : To Power Steering
C : From Steering Controller

The pump(2) and Motor(7) are joined in a closed hydraulic loop and most of oil circulates within the main oil circuit. When the variable swash-plate is at right angle to the pump piston, the oil is not send to the motor(7). When the variable swash-plate is tilted to forward or reverse, oil forced out of pump(2) at high pressure and send to the motor.

But the neutral valve(6), (10) in the main oil circuit lines are open and pass the oil to the case when in neutral, and oil pressure in their lines becomes low. And when the oil pressure in the high pressure line increase to a specified pressure, the neutral valve(6), (10) closes. Then the output shaft(8) rotates with the motor and oil is forced out of motor at low pressure and return to the pump(2). On the other hand, oil is send to the main circuit with the charge pump(3) through the filter(11) and check valve and excessive oil passes to the case through the charge relief valve(5). The case relief valve(9) controls pressure in the HST case.

The high pressure relief valve(4), (12) between the two lines in the main oil circuit monitors the oil pressure in each line, it opens and close the oil into another line.

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(4) Auxiliary Control

■ **Master Clutch Protection Control**

To avoid damage on a clutch caused by a long-lasting half-clutch state by clutch pedal operation, this system disengages the clutch automatically and notifies it to a driver.

To return to a normal control state, step on the clutch pedal, place the shuttle lever at neutral, or press the clutch button on the power shift lever.

■ **Machine Speed Check Control**

Operating the shuttle lever at a speed higher than 11 km/h (7.6 m/h) results in disengaging the master clutch and sounding an warning buzzer.

Returning the shuttle lever to its original position engages the clutch again and stops the buzzer.

■ **Protection against Hard Start**

If the shuttle lever is at the forward or backward run position and the clutch pedal is not stepped on, placing the power shift lever at **L** or **H** position without pressing the shift button results in sounding a buzzer to warn an operator. By the safety control, the tractor does not start.

■ **Fail-safe Control**

If a sensor or a solenoid valve becomes faulty, a related control is stopped to avoid abnormal operations. At the same time, the shifting display blinks or lights on and a buzzer sounds.

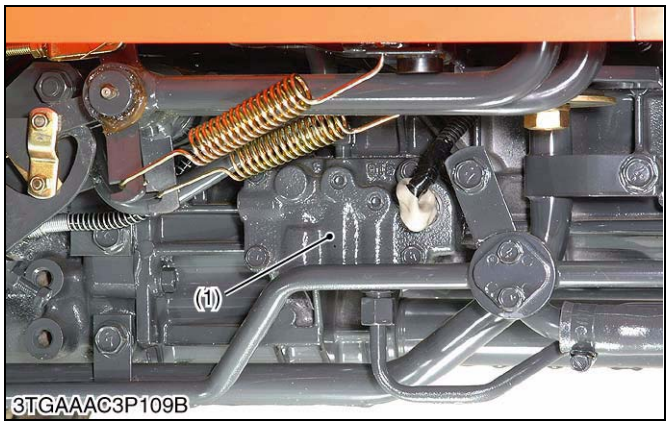
Returning the power shift lever to the neutral position releases the failsafe function temporarily.

Depending on a condition of a failure, the tractor can still move at a certain speed.

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(2) Bi-speed Valve (Code No. YW255-00102)



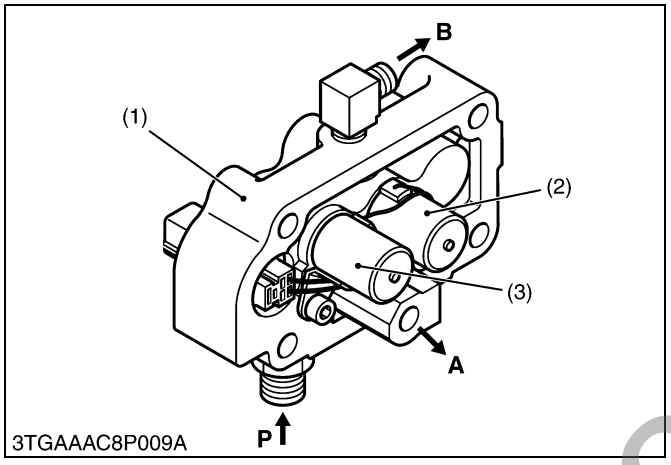
The bi-speed valve (1) is installed on a right side of the clutch housing into which the bi-speed clutch is built.

The solenoid valve (2) and (3) are built into the bi-speed valve (1), and they operate respectively according to the electrical signal from the PTO switch and the bi-speed controller.

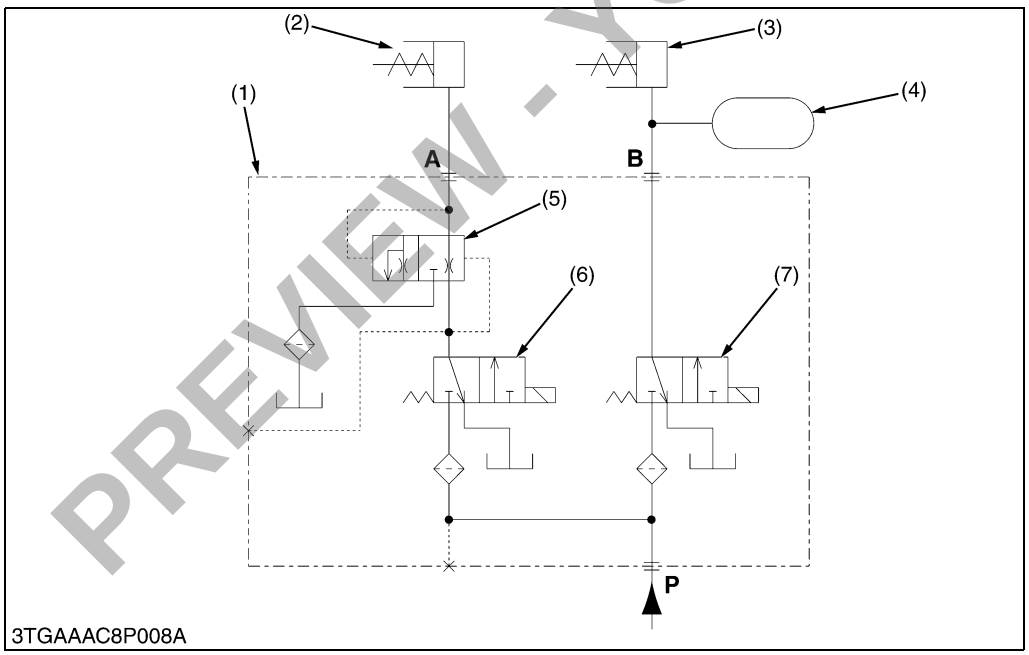
(1) Bi-speed Valve
(2) Solenoid Valve (PTO)
(3) Solenoid Valve (Bi-speed)

A : A Port (To Bi-speed Hydraulic Clutch)
B : B Port (To PTO Hydraulic Clutch)
P : P Port (Frpm Regulator valve)

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1) Hydraulic Circuit



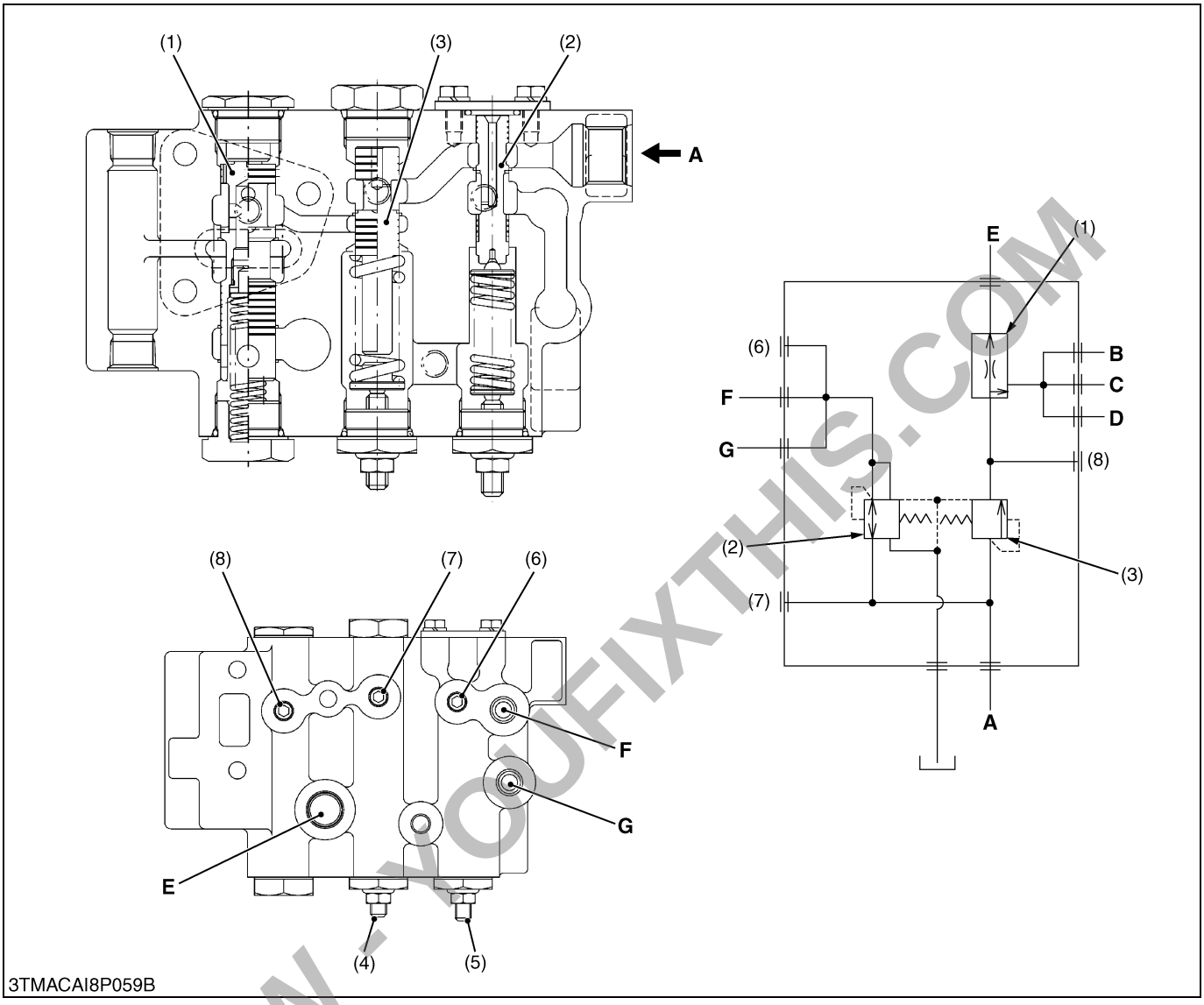
(1) Bi-speed Valve
(2) Bi-speed Hydraulic Clutch
(3) PTO Hydraulic Clutch
(4) Accumulator
(5) Orifice Valve
(6) Solenoid Valve (Bi-speed)
(7) Solenoid Valve (PTO)

A : A Port (To Bi-speed Hydraulic Clutch)
B : B Port (To PTO Hydraulic Clutch)
P : P Port (From Regulator Valve)

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(1) Flow Priority Valve
(2) Pressure Reducing Valve
(3) Regulating Valve
(4) Adjusting Screw
(5) Adjusting Screw
(6) Check Port 1
(7) Check Port 2
(8) Check Port 3

A : From Hydraulic Pump
B : To Main Shift Clutch Pack for Lubrication
C : From Power Steering Controller
D : To PTO Clutch Pack for Lubrication
E : To Power Steering Controller
F : To PTO Clutch Valve
G : To Power Shift Valve

Section view of the regulator valve and its hydraulic circuit are shown in the figure above.

The regulator valve is composed of the flow priority valve, regulating valve and pressure reducing valve. Oil from the hydraulic pump for the power steering system flows through the pressure reducing valve (2) to the power shift circuit / PTO circuit / 4WD, bi-speed circuit and differential lock circuit. When oil filled into the circuit the pressure reducing valve (2) is closed to maintain the pressure in power shift system circuit to 2.16 MPa (22 kgf/cm^2, 313 psi). The oil from the power steering pump passes through the regulating valve (3) and flow priority valve (1) and then it flow to the power steering circuit.

The regulating valve (3) is provided to maintain 2.94 MPa (30 kgf/cm^2, 427 psi) at inlet pressure of the pressure reducing valve (2) except when the power steering is operated.

Thereby getting 2.16MPa (22 kgf/cm^2, 313 psi) of the power shift circuit / PTO circuit / 4WD, bi-speed circuit and differential lock circuit.

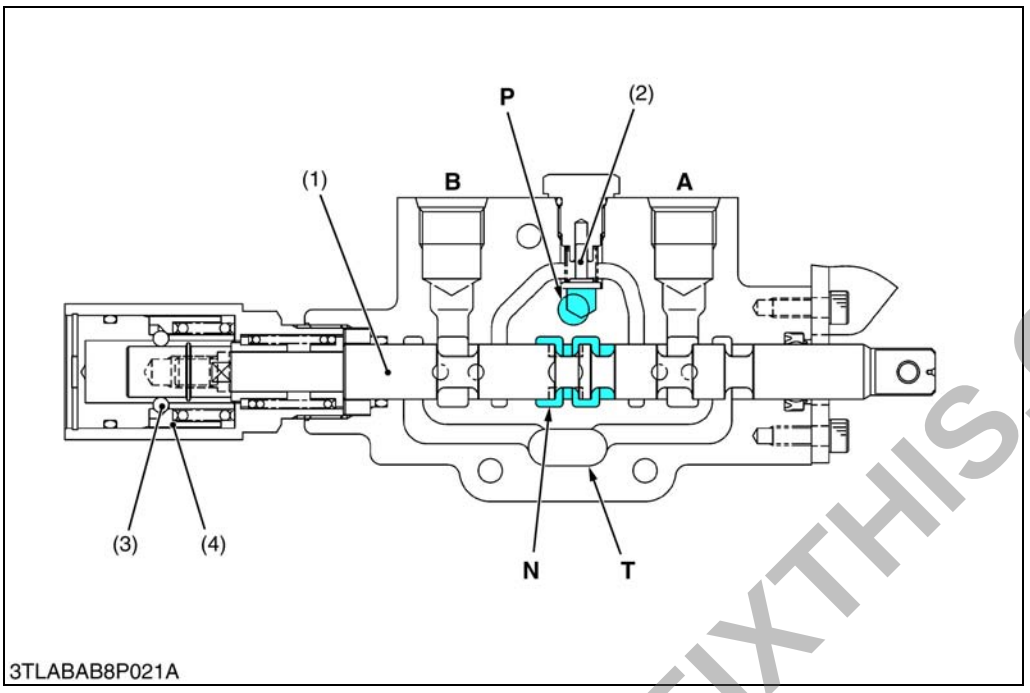
The flow priority valve is a flow divider that dives the flow from single hydraulic source (hydraulic pump). This valve feeds fixedly controlled flow to the **E** port side with priority and remainder to the **B** and **D** port side.

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(5) Type 5 (Floating with Detent-2, Code No. YW077-00103, YW312-00101)

■ Neutral



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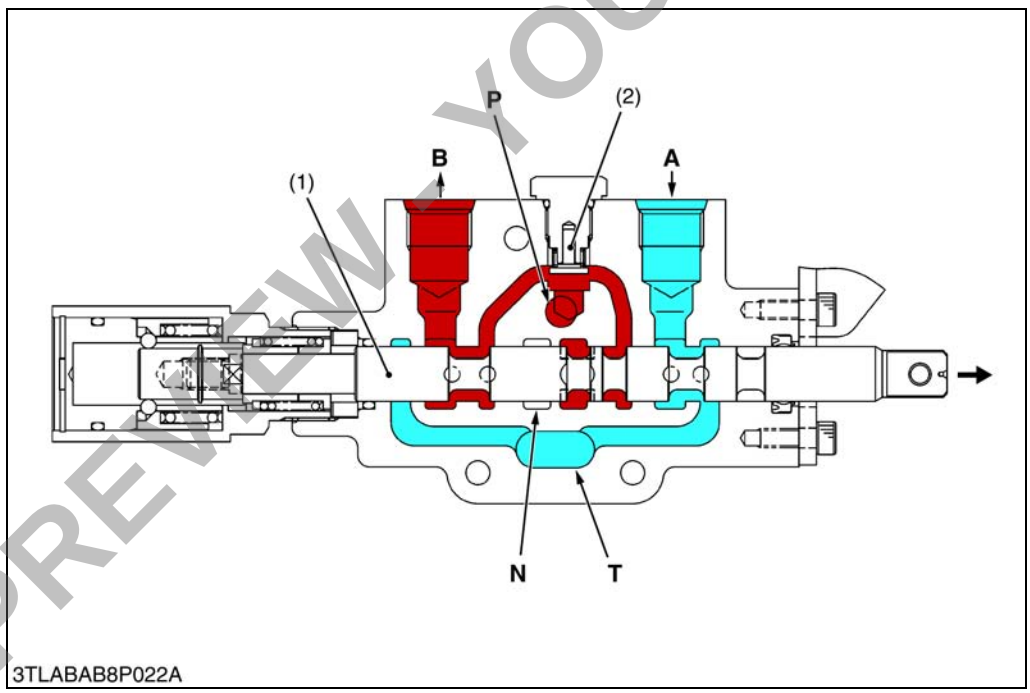
(1) Spool
(2) Check Valve
(3) Detent Ball
(4) Detent Sleeve

A : A Port (Implement Cylinder)
B : B Port (Implement Cylinder)
P : Pump Port
N : Neutral Port
T : Tank Port

W1015904

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to the position control valve via **N** port.

■ Lift



3TLABAB8P022A

(1) Spool
(2) Check Valve

A : A Port (Implement Cylinder)
B : B Port (Implement Cylinder)
P : Pump Port
N : Neutral Port
T : Tank Port

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When the spool (1) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (2) and flows to the implement cylinder via **B** port.

Return oil from the implement cylinder flows from the **A** port to the transmission case through **T** port.

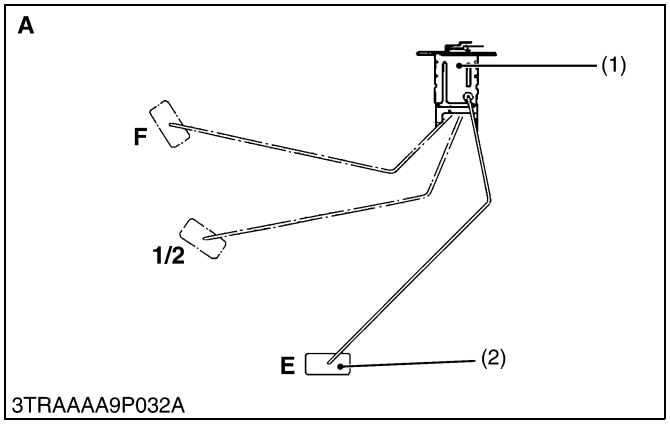
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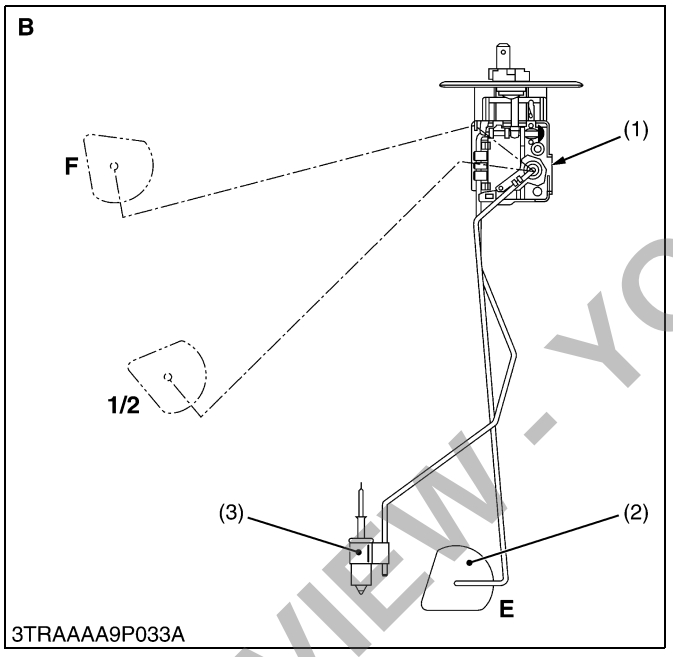
4. GAUGES

The fuel quantity and coolant temperature are indicated by the ammeters. The ammeters indicate each amperage flowing through the fuel level sensor for the fuel quantity detection and through the coolant temperature sensor for the coolant temperature detection.

[1] FUEL QUANTITY



3TRAAAA9P032A



3TRAAAA9P033A

■ Fuel Level Sensor

The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

As the float (2) lowers, the resistance of the variable resistor (1) varies. The relation between the amount of fuel and the resistance is as follows.

Fuel Level Sensor 1

F	1/2	E
1 to 5 Ω	Approx. 32.5 Ω	103 to 117 Ω

Fuel Level Sensor 2 (with Thermistor)

F	1/2	E
1 to 5 Ω	Approx. 32.5 Ω	108 to 112 Ω (or 103 to 117 Ω)

(1) Variable Resistor
(2) Float
(3) Thermistor

A : Fuel Level Sensor 1
B : Fuel Level Sensor 2 (with Thermistor)

W10165250

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