YANMAR

TECHNICAL MANUAL

DIESEL TRACTOR

EF685

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SAFETY

WARNING

Never attempt to operate or service this machine until you have first read and understood all of the applicable Safety Instructions that are set forth in this Manual.

The failure to comply with all relevant Safety Instructions could result in bodily injury.

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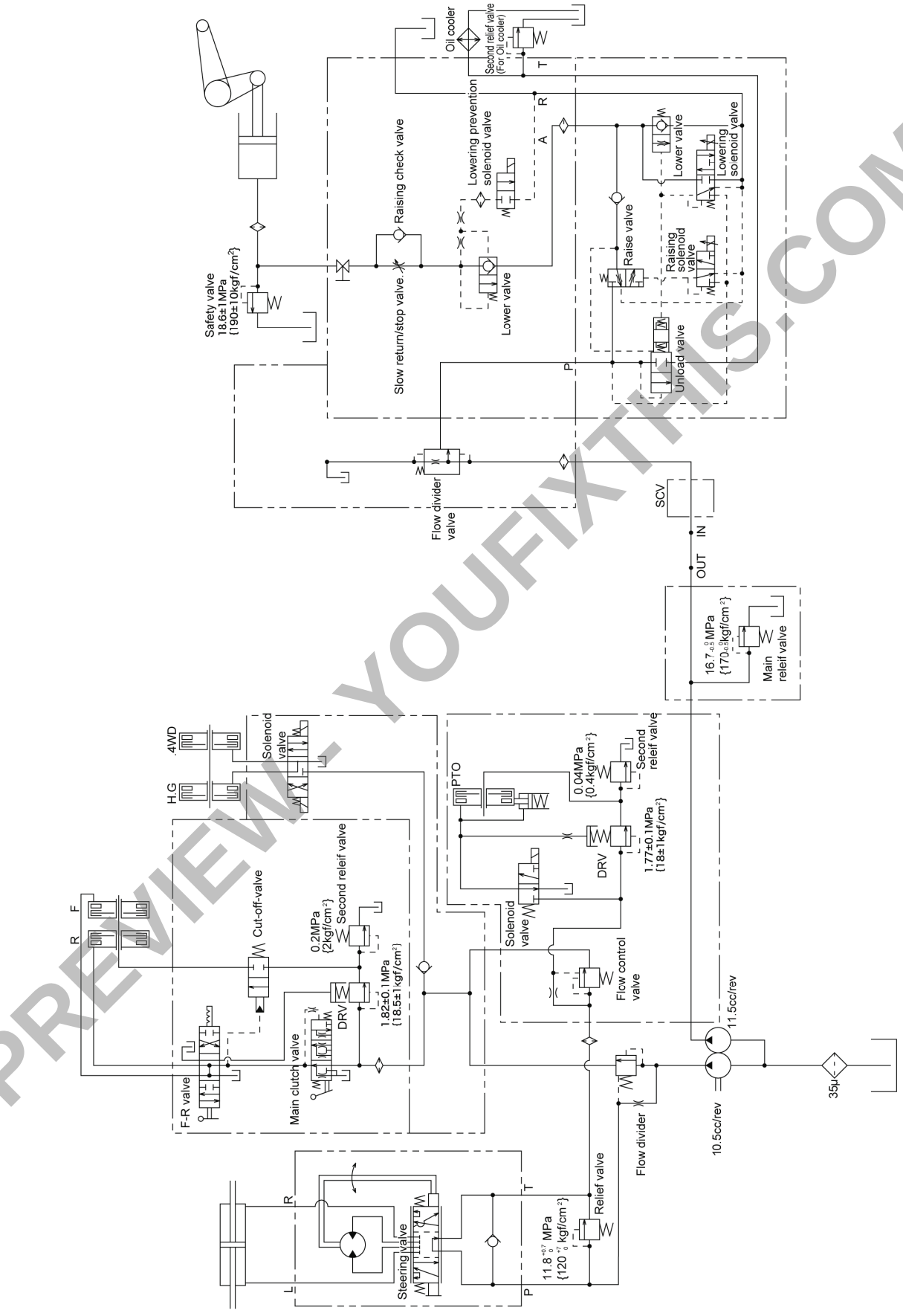
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Rough classification	No.	Part name	Name in part catalog No. in part catalog	Functions and other details
Engine section	1	Electronic governor relay-1	Relay CA-1A (Polar) 1E6910-82500	It supplies power to the electronic governor controller.
	2	Electronic governor fuse	Relay CA-1A (Polar) 1E6910-82500	Fuse for the electronic governor relay-1 and electronic governor relay-2 circuits.
	3	Slow blow fuse 60A	Slow blow fuse 60A 1A7000-52820	It protects the circuit between the battery and the fuse box.
	4	Fuel injection pump	- -	Pump to force feed fuel. Sends the rack positioning sensor signal and the speed sensor signal to the controller, and controls the fuel injection quantity and CSD valve.
	5	Battery	Battery 130E41L 198450-51510	Power to the tractor
	6	Headlamp	Headlamp L ASSY 1A7450-53200 Headlamp R ASSY 1A7450-53200	Headlamp
	7	Side lamp	Side lamp L CMP 1A7450-53250 Side lamp R CMP 1A7450-53260	These lamps illuminate a wide area in front of the tractor while working. (Note that they should not be used on a public road.)
	8	Horn	Horn 1C7100-08150	It produces a warning sound.
	9	Horn relay	CA relay (C type) 198461-52950	It is activated by pressing the horn switch. Then the horn will sound.
	10	Brake lamp relay	CA relay (C type) 198461-52950	It supplies power to the brake switch.
Fuse box	11	Fuse 15A (Trailer)	Fuse 15A 198535-52130	It protects the trailer coupler circuit.
	12	Fuse 5A (Reverse)	Fuse 5A 198535-52110	It protects the reverser, PTO relay and safety relay circuits.
	13	Fuse 20A (Brake lamp)	Fuse 20A 198535-52140	It protects the back lamp and stop lamp circuits.
	14	Fuse 15A (Headlamp)	Fuse 15A 198535-52130	It protects the headlamp and brake lamp circuits.
	15	Fuse 15A (Turn signal lamp)	Fuse 15A 198535-52130	It protects the turn signal lamp circuit.
	16	Fuse 10A (Combination meter)	Fuse 10A 198535-52120	It protects the combination meter circuit.
	17	Fuse 10A (Engine)	Fuse 5A 198535-52110	It protects the main relay circuit for the engine governor controller and the alternator circuit.
Front column section	18	Turn signal relay	Turn signal unit 1A7890-57200	It blinks the turn signal lamps.
	19	Side lamp relay	CA relay (C type) 198461-52950	It is activated by pressing the side lamp switch, and the side lamps come on.
	20	Turn signal circuit relay	CA relay (C type) 198461-52950	When the turn signal lamp relay is activated, this relay will supply power to the turn signal relay.
	21	Low beam relay	CA relay (C type) 198461-52950	When the combination switch for the headlamps is set to “Lo”, the circuit will be energized.
	22	Brake switch L	Switch 198223-52150	It detects whether the left brake pedal is ON or OFF.
	23	Brake switch R	Switch 198223-52150	It detects whether the right brake pedal is ON or OFF.
	24	Combination meter	Combination meter CMP 1A7660-56110	It turns on the engine mode, sensor trouble and thermostat lamps through the controller.
	25	Side lamp switch	Switch with switch (CMP) 198121-52110	It turns the side lamps ON and OFF.

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12.1 GENERAL HYDRAULIC CIRCUIT DIAGRAM



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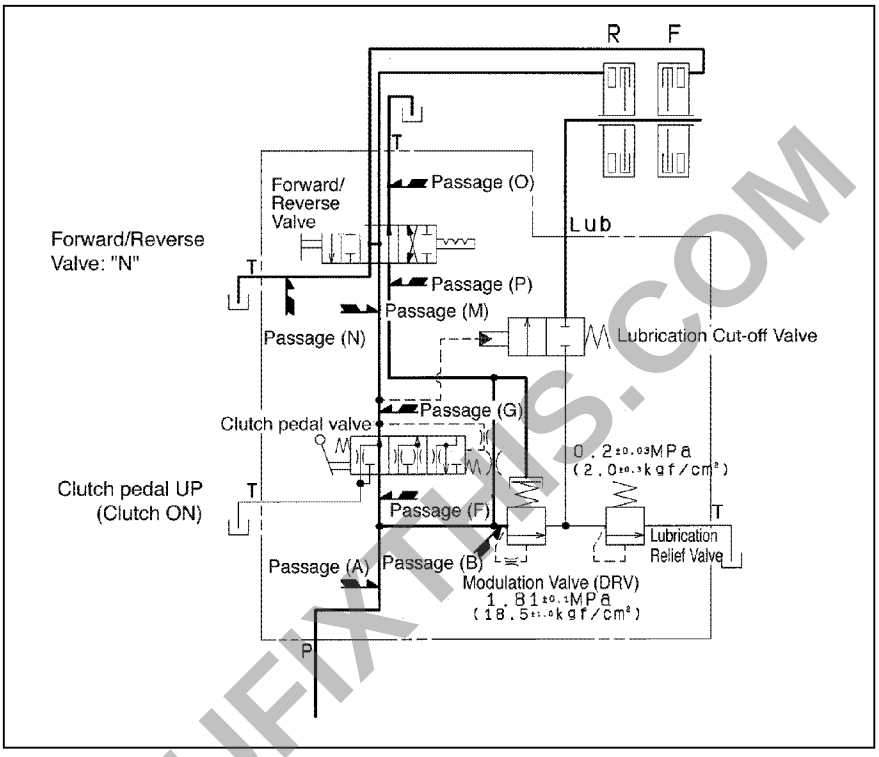
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FUNCTION:

Controls all functions of the hydraulic reverser

MAJOR COMPONENTS:

- Clutch Pedal Valve
- Lubrication Relief Valve
- Lubrication Cut-off Valve
- Modulation Valve (DRV)
- Forward/Reverse Valve



THEORY OF OPERATION:

When the clutch pedal is returned to the up position, charge oil flows to three places: passage (F) of clutch pedal valve (1), passage (B) of modulation relief valve (3), and through orifice (5) to modulation valve (2).

Oil entering passage (F) of clutch pedal valve flows from passage (G) of clutch pedal valve (1) to passage (M) of forward/reverse valve (6). With forward/reverse valve in neutral, (N and O).

Oil entering passage (B) of modulation relief valve is insufficient to overcome spring pressure, modulation relief valve (3) remains closed.

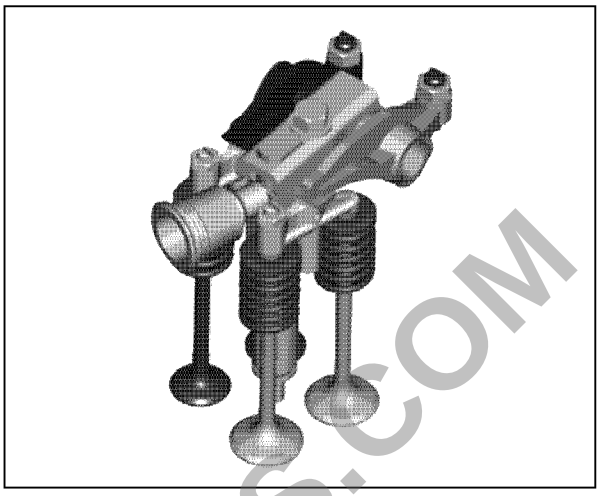
Oil flowing through orifice (5) enters forward/reverse valve at passage (P) and returns to sump through sum passage (N and O).

Low pressure oil at passage (G) is insufficient to overcome spring pressure of lube cut-off valve (7). Thus oil is trapped between relief valves and lube cut-off valve. Oil at passage (A) returns to sump through forward/reverse clutch pack.

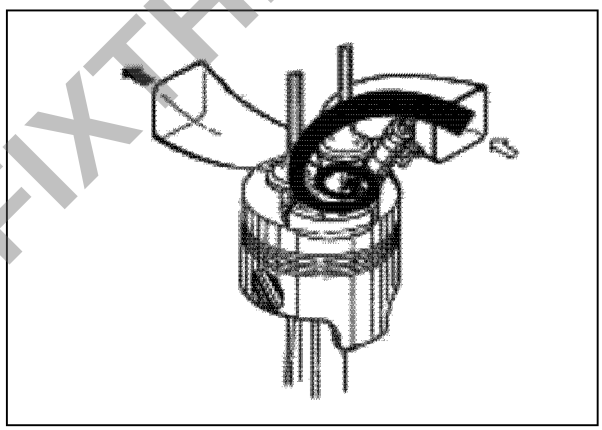
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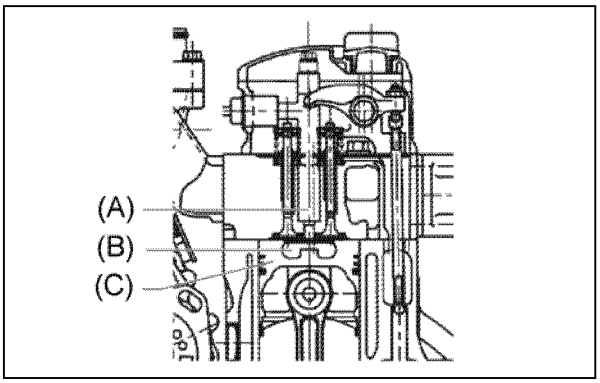
<Emission control technology>
3.
The TNV engine features 2 intake valves and 2 exhaust valves per cylinder. The fuel direct-injection valve is of vertical type and is center located and the combustion chamber is located at the center of the cylinder, thereby enabling a decrease in emission of PM and NOx.



<Fuel technology>
4. Intake and exhaust
- Swirl ratio optimized by redesigning the intake port
- Air-fuel mixture optimized by reviewing the compression ratio



Combustion chamber
- Air-fuel mixture optimized by using a new combustion chamber
- Uniform injection achieved by reviewing the nozzle mounting angle (locating it at the center of the combustion chamber)



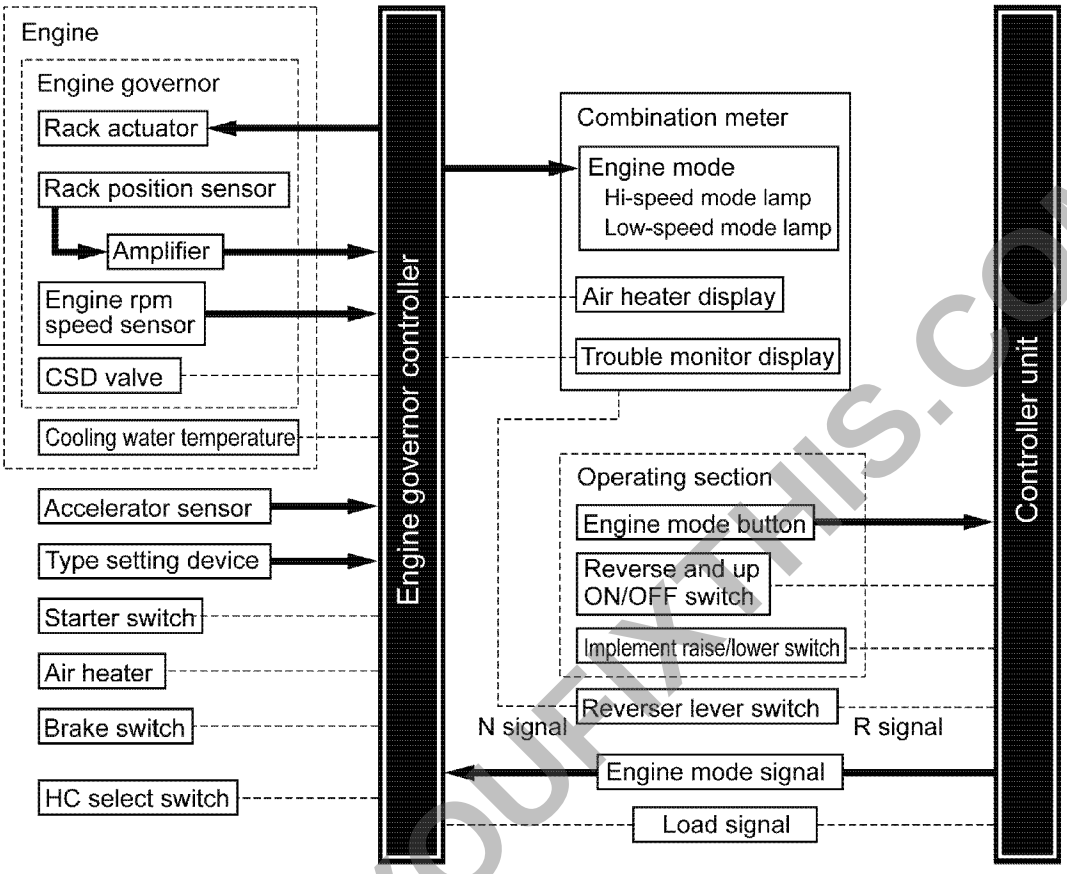
(A) Injection nozzle
(B) Combustion chamber
(C) Piston

Three new mechanisms of the MP4 pump

The mono-plunger type fuel pump uses a single plunger to distribute fuel uniformly to each cylinder, thereby eliminating the variation in fuel distribution between the cylinders. Fuel is atomized by high-pressure injection and the fuel timing at each engine speed and load condition is optimized by using a revolution timer and a load timer. This has achieved clean exhaust and high-efficient combustion performance.
The new TNV diesel engine ensures low fuel consumption and high eco-friendliness.

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(2) High-efficiency diesel engine output characteristic-switching control



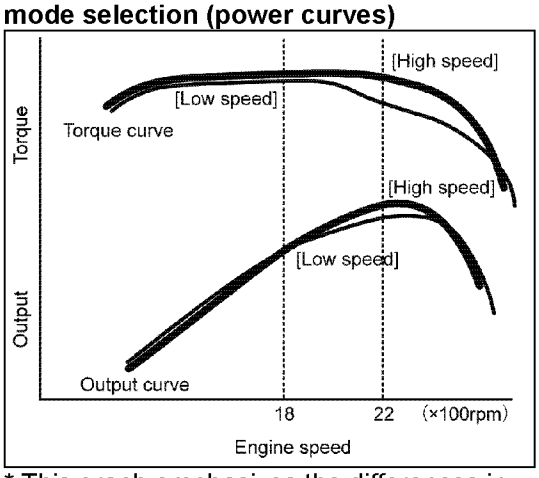
<Settings in the operating section>
The engine output characteristics can be changed by operating the engine mode button or the tillage mode button.

<Operation>
The output characteristics change according to the work you are doing.

<u>During low-speed operation:</u>
Engine mode 2 (low-speed mode)
(The maximum torque is produced in the low speed area.)

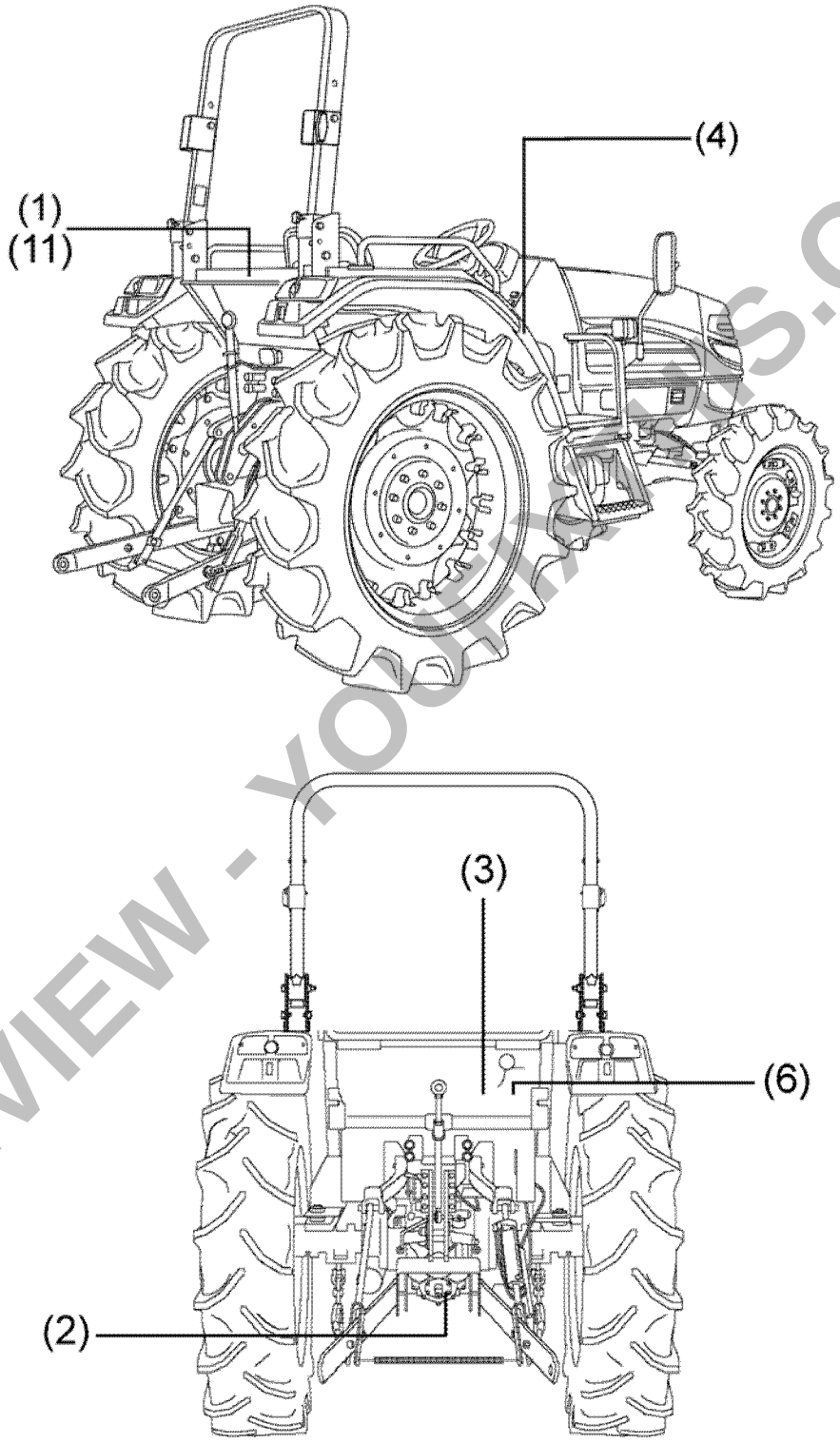
<u>During high-speed tilling operation:</u>
Engine mode 1 (hi-speed mode)
(The maximum torque is produced in the high speed area.)

Change in performance due to the engine mode selection (power curves)



* This graph emphasizes the differences in order to make it easy to understand the different modes.

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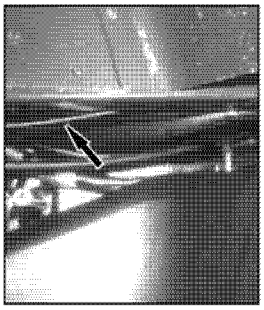
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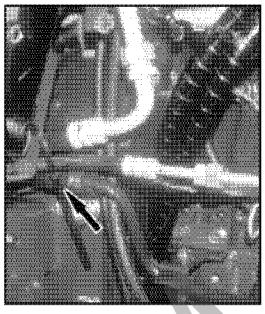
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3. Remove the rubber strip securing the air conditioner hose and the cabin.

4. Remove the two clamps that secure the harness coupler to the fuel gauge.

5. Check again to make sure all the couplers and links have been removed.





6. Pay attention not to stretch the air conditioner hose too tightly, and install it as close to the tractor as possible.

DANGER
After making sure the cabin is put on the ground in the stable condition, remove the lifting tools.



7. Reinstall the parts by reversing the procedure used to remove them.

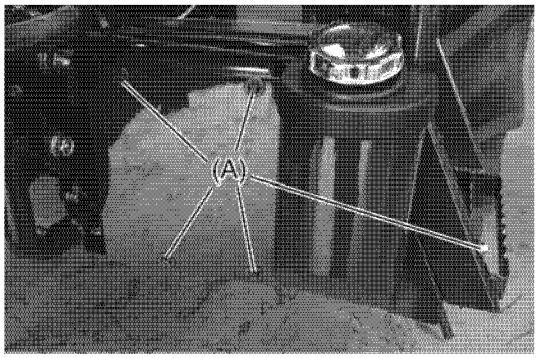
2.3 HOW TO TILT THE FUEL TANK

The fuel tank on the left side can be tilted (the fuel tank on the right side cannot be tilted).

1. Drain the fuel until it is less than ¼ full.

2. Remove the front cover on the left tank.
M8 bolt: Five bolts on the left

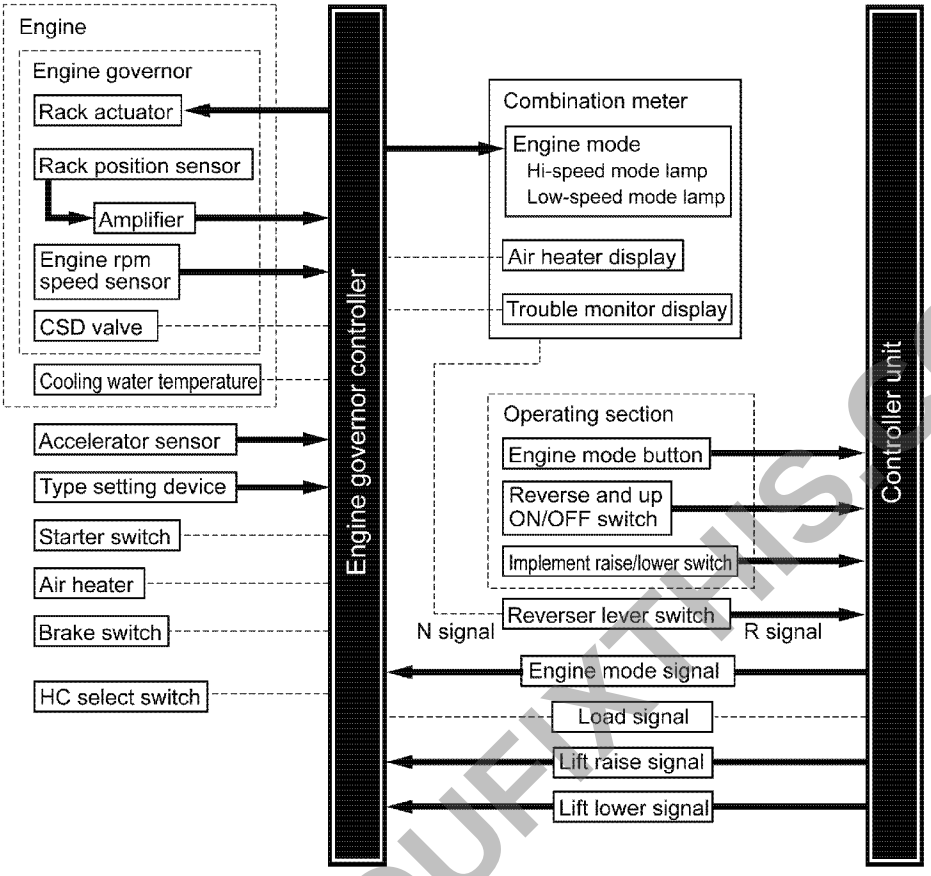
(A) M8 bolts



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(2) High-efficiency diesel engine speed control



(2) High-efficiency diesel engine speed control

<Settings in the operating section>
This control is set by the engine mode button. (“Hi-speed mode” ⇔ “Low-speed mode”)
However, when the engine speed is reduced while using the HC (Headland Control) function in Engine mode 1 (hi-speed mode), the reduced speed will be maintained, even if the engine mode is changed to Engine mode 2 (low-speed mode). When the speed set by the accelerator is below 1,500 rpm, the reduced speed condition is released and the speed will go up and down according to movements of the accelerator.

<Operation>
1) Maximum speed control mode
Changes the maximum speed for high-speed tilling operations.

2) HC (Headland Control)
When the engine speed is over 1,500 rpm and the implement raise/lower switch is put in the “Raising” position, the engine speed will be gradually reduced.
(To release this control) Put the implement raise/lower switch in the “Lowering” position or use the accelerator to set the speed to 1,500 rpm or less.

When the engine speed is over 1,500 rpm and the reverser lever is put in the “R” (reverse) position, the engine speed will be gradually reduced.
(To release this control) Put the implement raise/lower switch in the “Lowering” position or use the accelerator to set the speed to 1,500 rpm or less.
The rate at which the speed is reduced during HC (Headland Control) operations, mentioned in (2) above, is determined by the HC speed select switch. (OFF, Fast, and Slow)

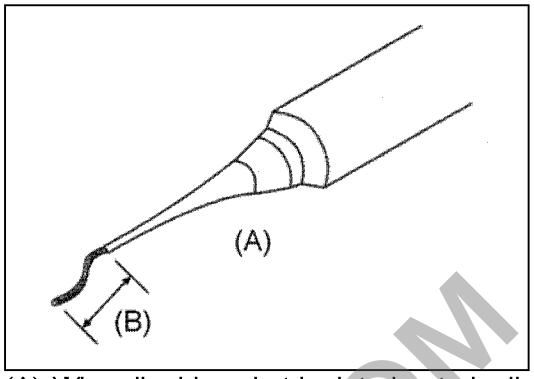
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<Deterioration of a liquid gasket>

1. When using the liquid gasket again after a tube is opened, the gasket in the nozzle part may have been hardened or deteriorated. Squeeze out the liquid gasket a little and then use it.
2. When the surface of squeezed out liquid gasket glitters, it means the filler (oil) is separated and the gasket is deteriorated.

* It sometimes is found the oil of liquid gasket is separated within the period of validity. It is not deteriorated.
* Normal gasket will be hardened in about 2 hours, but the deteriorated gasket would not be hardened.



(A) When liquid gasket is deteriorated, oil is separated from components.
(B) Squeeze out about 20 mm and check deterioration.

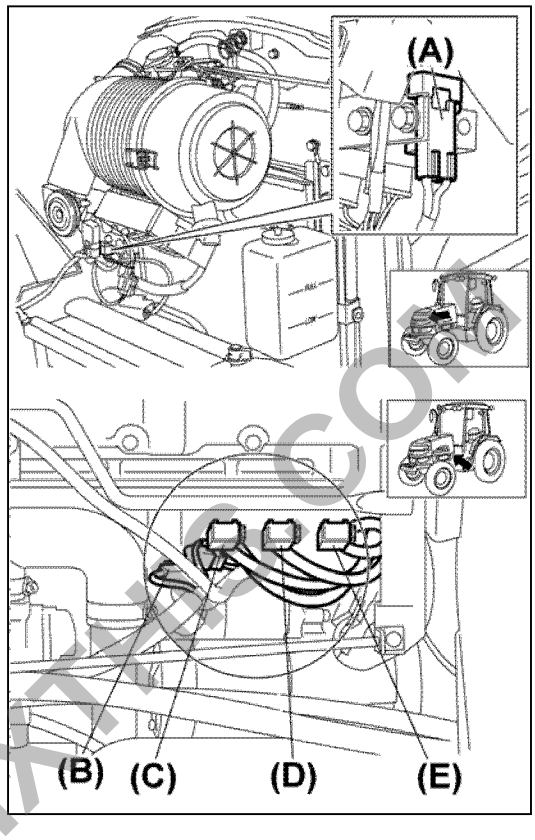
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(3) Check the slow blow fuses.

[Reference]
A slow blow fuse is a type of fuse. If excessive current flows into the wiring circuit (a circuit that is always energized), the fuse will blow and the current is shut off. If the fuse blows, have the fuse checked at the distributor, dealer, or agricultural store where you purchased the tractor.

(A) Electric governor fuse
(B) 60A (Main)
(C) 80A (Starter motor)
(D) 80A (External power supply)
(E) 80A (Charging)



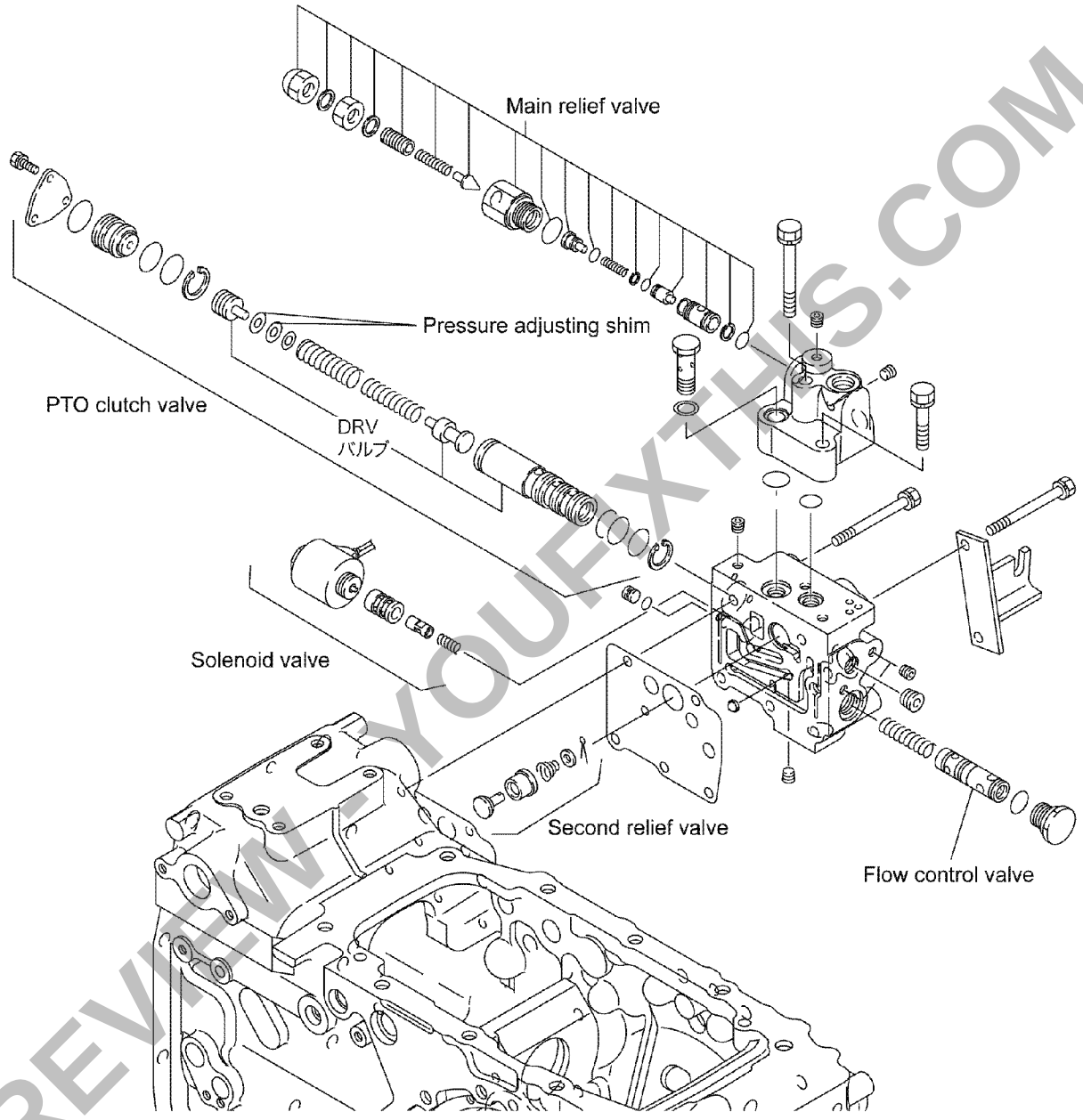
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9.1.6 Hydraulic Control Components

(1) Positions of the components

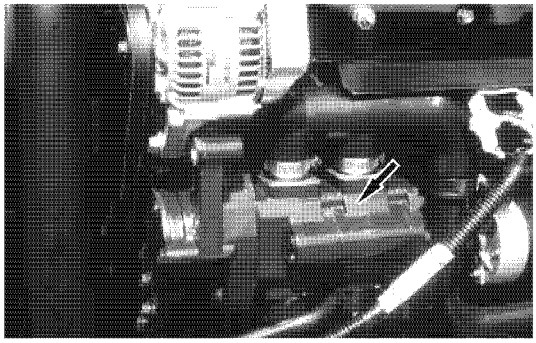
<Exploded view>



1. Hydraulic pump

The PTO oil pressure is produced by the gear pump. The oil pressure also serves as the power steering. A separate pump on the backside of the PTO hydraulic pump is used to provide oil pressure for the power steering and PTO.

Discharge rate: 10.5 cc/rev

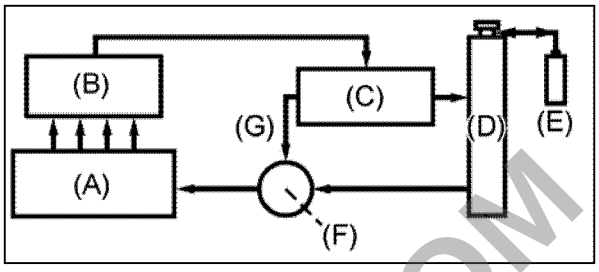


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3.1.5 Cooling Water System

(1) Flow of cooling water

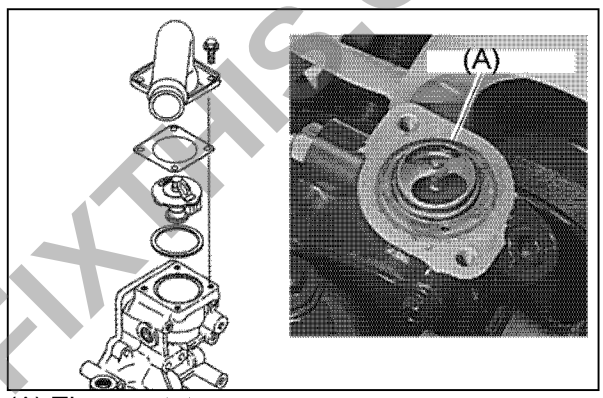
(A) Cylinder block
(B) Cylinder head
(C) Thermostat
(D) Radiator
(E) Sub-tank
(F) Cooling water pump
(G) Bypass



(2) Main components

<Thermostat>
Maintains a constant temperature for the cooling water, thereby preventing the engine from being excessively cooled. If the water temperature is low, the valve closes to circulate cooling water without sending it to the radiator. If the water temperature increases, the valve opens to send cooling water to the radiator.

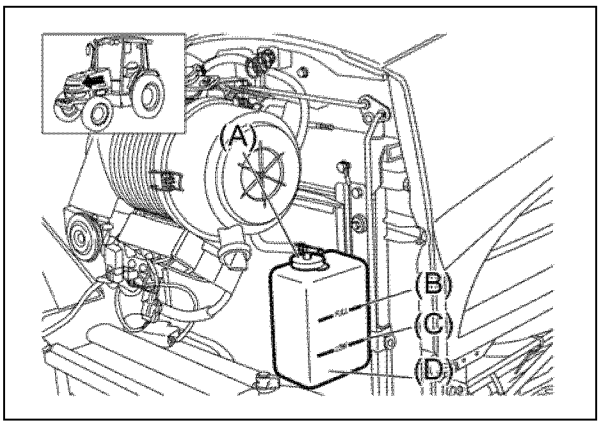
Thermostat	
Temperature at which the valve is opened	80-84°C
Temperature at which the valve is fully opened	95°C
Valve lift	10mm minimum



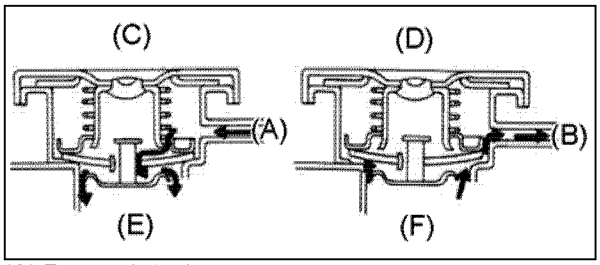
(A) Thermostat

<Radiator (with sub-tank)>
Sub-tank
The sub-tank is used to store evaporated cooling water, thereby preventing cooling water from being consumed.

(A) Fuel supply port
(B) Upper limit
(C) Lower limit
(D) Sub-tank



Radiator cap
When the internal pressure of the radiator rises because of an increase in water temperature, the valve opens to send water vapor to the sub-tank (to prevent the radiator from deforming or otherwise changing).
When the water temperature decreases, the valve closes, the internal pressure of the radiator becomes negative, and then the water in the sub-tank is sucked back to the radiator.



(A) From sub-tank
(B) To sub-tank
(C) When vapor pressure decreases
(D) When vapor pressure increase
(E) Water is sucked from the sub-tank back to the radiator.
(F) Steam is sent to the sub-tank.

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(3) Operation inspection procedure>

Checking when the AUTO button is "ON"

When the AUTO button is pressed and the lamp comes on, or the "Depth", and Engine mode 1 (hi-speed mode) display lamps on the instrument panel are lit, if the following operations can be performed, the tractor is normal.

With the depth dial in the "Shallow" position, when the end of the rear cover moves up and down, the rotary plow should move up and down.

Checking when the AUTO button is "OFF"

When the AUTO button is pressed and the "Depth" display lamp on the instrument panel are unlit, if the following operations can be performed, the tractor is normal.

Even when the end of the rear cover moves up and down, the rotary plow should not move up and down.

Checking regardless of the AUTO button "ON" or "OFF" condition

1. The rotary plow should move up and down when you operate the implement raise/lower switch or the implement up/down lever.

2. With the lifting position dial in the "Middle" position, when you operate the implement raise/lower switch or the implement up/down lever, the rotary plow should be raised only halfway.

3. Then, when you turn the lifting position dial, the height of the rotary plow should change.

4. When the engine is stopped and the key switch is "OFF", even when you operate the implement raise/lower switch or the implement up/down lever, the rotary plow should not descend.

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