DK 75, DK 80, & DK 90 Tractors

WORKSHOP MANUAL

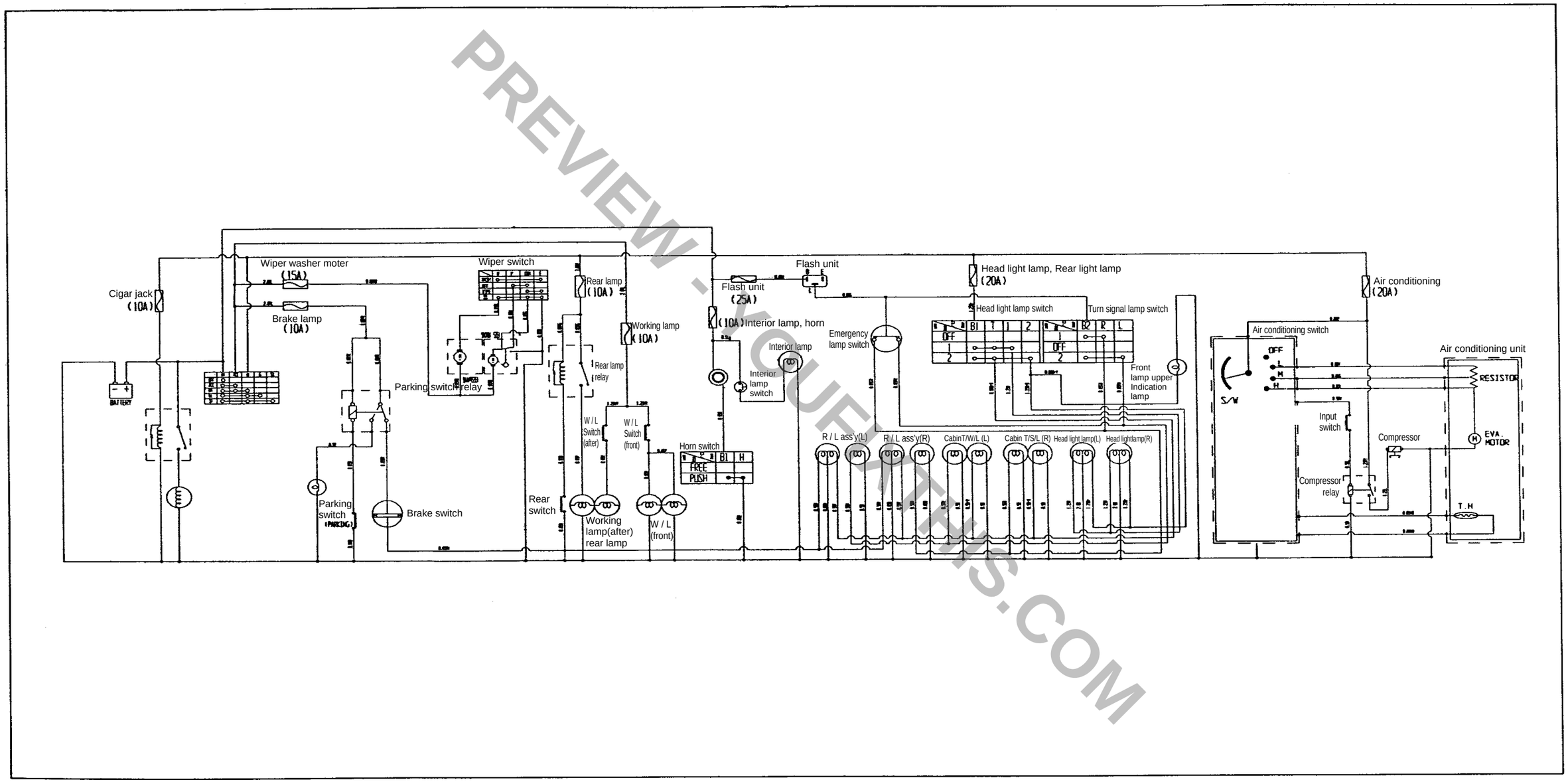
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[2] Fuse diagram circuit

(1) Cabin, open cab type



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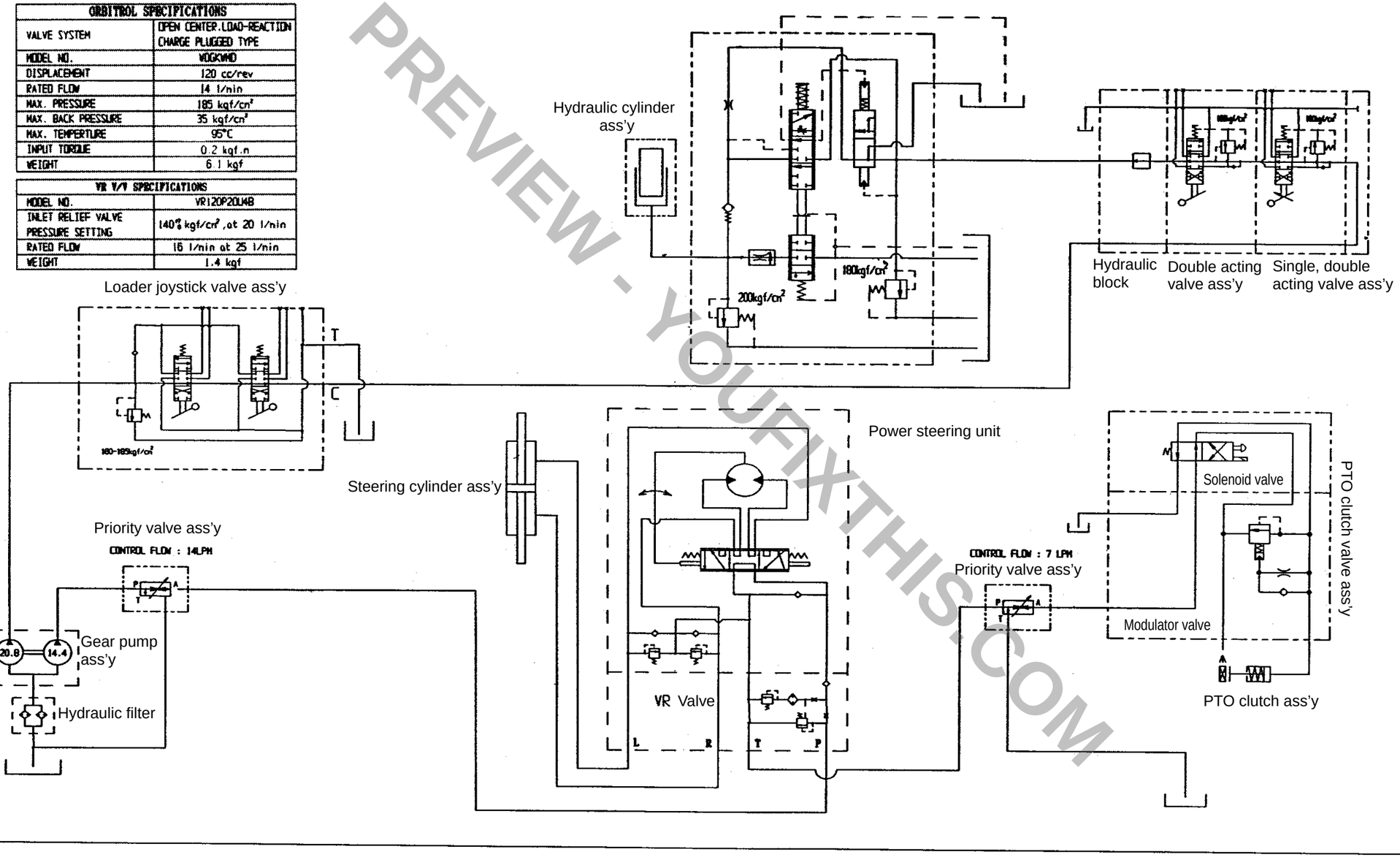
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DK60, DK65 HYD. CIRCUIT

*OPEN CENTER LOAD REACTION TYPE

ORBITROL SPECIFICATIONS	
VALVE SYSTEM	OPEN CENTER.LOAD-REACTION CHARGE PLUGGED TYPE
MODEL NO.	WOGKWMD
DISPLACEMENT	120 cc/rev
RATED FLOW	14 l/min
MAX. PRESSURE	185 kgf/cm²
MAX. BACK PRESSURE	35 kgf/cm²
MAX. TEMPERTURE	95°C
INPUT TORQUE	0.2 kgf.n
WEIGHT	6.1 kgf

VR V/V SPECIFICATIONS	
MODEL NO.	VR120P20U4B
INLET RELIEF VALVE PRESSURE SETTING	140% kgf/cm², at 20 l/min
RATED FLOW	16 l/min at 25 l/min
WEIGHT	1.4 kgf



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2-5. Piston and connecting rod assemblies

(1) General description (1004.4, 1004.4T)

⁎The pistons used in Phaser and 1000 Series engines have either a "Quadram" (A) or a "Fastram" (B) combustion chamber in the top of the piston. These combustion chambers are designed to give an efficient mix of fuel and air. The latest engines have pistons, with a "Fastram" combustion chamber and are available with different height grades.

⁎The pistons have two compression rings and an oil control ring. The groove for the top ring has a hard metal insert to reduce wear of the groove. Axial location of the fully floating gudgeon pin is by circlips.

⁎Expansion controlled pistons have a steel insert in the piston skirt.

⁎Turbocharged engines which are rated higher than 2300 rev/min have an anodised area on the top face of the piston.

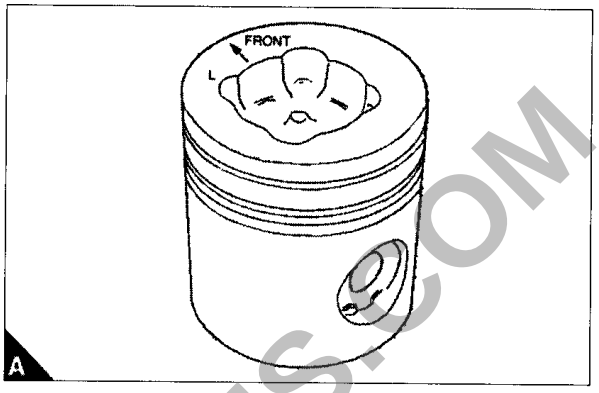
⁎Turbocharged engines have cooling jets fitted in the cylinder block to spray lubricating oil onto the inner surface of the pistons.

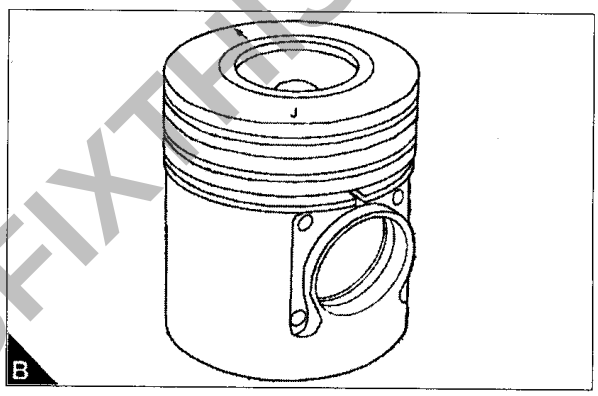
⁎The connecting rods are machined from "H" section forgings of molybdenum steel. The connecting rods of turbocharged engines have wedge shaped small ends. Generally, the location of the bearing caps to the connecting rods is made by serrations (C1) and the cap is retained by two nuts and bolts (C).

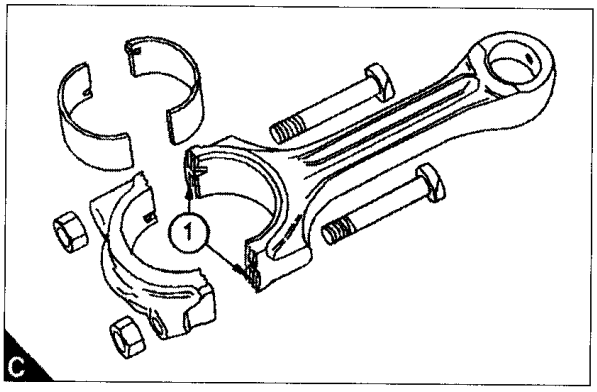
⁎On some turbocharged engines, used in vehicle applications, the location of the bearing cap to the connecting rod is made by dowels (D1) fitted in the bearing cap (D). The faces of these connecting rods and caps are flat and the caps are retained by two setscrews.

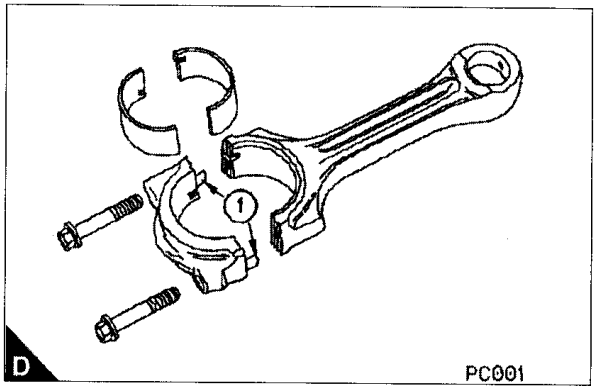
Note

- Always use the engine identification number to order new parts.









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① Standard torques for setscrews and nuts

Thread size	Torque		
	Nm	lbf ft	Kgf m
M6 x 1.00	9	7	0.9
M8 x 1.25	22	16	2.2
M10 x 1.50	44	33	4.5
M12 x 1.75	78	58	8.0
M14 x 2.00	124	91	12.6
M16 x 2.00	190	140	19.3

② Standard torques for studs (metal end)

Thread size	Torque		
	Nm	lbf ft	Kgf m
M6 x 1.00	5	4	0.5
M8 x 1.25	11	9	1.1
M10 x 1.50	18	14	1.8
M12 x 1.75	25	19	2.5

③ Standard torques for pipe unions, plugs, and adaptors

Thread size	Torque		
	Nm	lbf ft	Kgf m
1/8 PTF	9	7	0.9
1/4 PTF	17	13	1.7
3/8 PTF	30	23	3.0
3/4 PTF	45	35	4.5

④ Special torque for setscrews and nuts

The torque tensions below apply to components lubricated lightly with clean engine oil before they are fitted.

Description	Thread size	Torque		
		Nm	lbf ft	kgf m
Cylinder head assembly				
Setscrews, cylinder head(1004.4, 1004.4T)	1/2 UNF	See operation 2-4		
Setscrews, cylinder head(1004.42)	M10, 1/2 UNF	See operation 2-4		

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(2) Rocker cover

To remove and to fit 2-4.2A

Engines are supplied with either an aluminium rocker cover (A) or with rocker covers made of a composite material. The aluminium cover on some engines, has a dust seal which is fitted between the rocker cover and the induction manifold. The dust seal of the composite rocker cover is fitted ermanently to the side of the rocker cover with adhesive.

To remove

① Disconnect the breather pipe.

② Remove the cap nuts (A2) together with the steel washers and the shim washers from the top of the rocker cover.

③ Lift off the rocker cover and the joint. For aluminium covers, remove the rocker cover dust seal (A1).

Caution

- When the rocker cover is fitted, the cap nuts are tightened onto the nuts of the rocker brackets. During removal of the cap nuts, it is possible to loosen the nuts of the rocker brackets.
  The nuts of the rocker brackets should be tightened to the correct torque every time the cover is removed.

To fit

① Check the seal of the oil filler cap (A1), the sealing washers (A5), the steel washer (A3) and, if fitted, the shim washer (A4) for the cap nuts (A2).

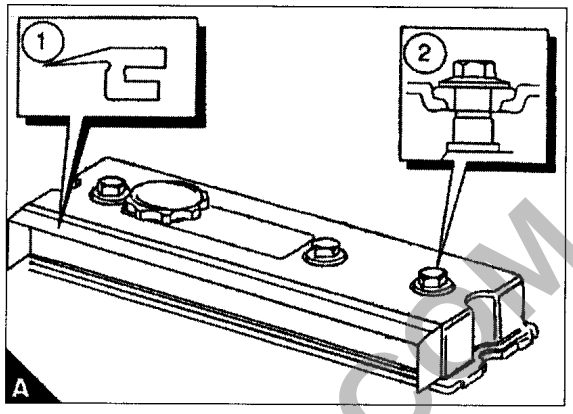
② Check the condition of the rocker cover joint (A6) and of the dust seal (A7). If necessary, the joint and the seal can be removed and renewed.

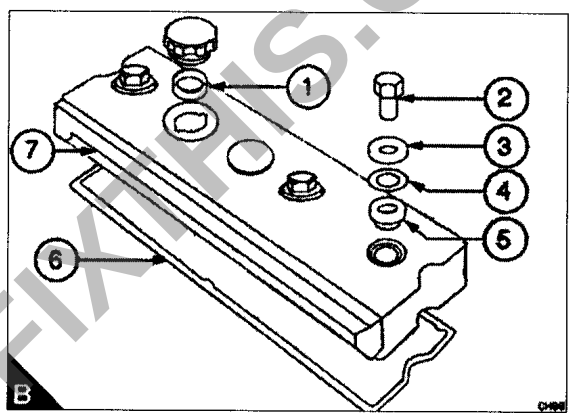
③ Clean the joint face of the cylinder head and it the rocker cover together with the dust seal.

④ Fit the sealing washers, the steel washers, the shims (if fitted) and the cap nuts.

Caution

- Damage to the sealing washer can occur if the cap nut is not tightened centrally through the sealing washer and the rocker cover. If the sealing washer is damaged it must be renewed.





⑤ Tighten the cap nuts to 20 Nm (15 lbf ft) 2.1 kgf m.

Notes

- The latest engines have an extra shim washer (A4) fitted between the cap nut sealing washer and the steel washer for the cap nut. If shim washers are fitted to aluminium rocker covers, tighten the cap nuts to 30 Nm (22 lbf ft) 3.0 kgf m. If shim washers are fitted to composite rocker covers, tighten the cap nuts to 20 Nm (15 lbf ft) 2.1 kgfm.
- Some earlier 1000 Series engines have a rocker cover joint that has a ribbed bottom face. When this joint is fitted, ensure that the flat face of the joint is towards rocker the cover.

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3-5. Trouble-shooting and action

1) Clutch

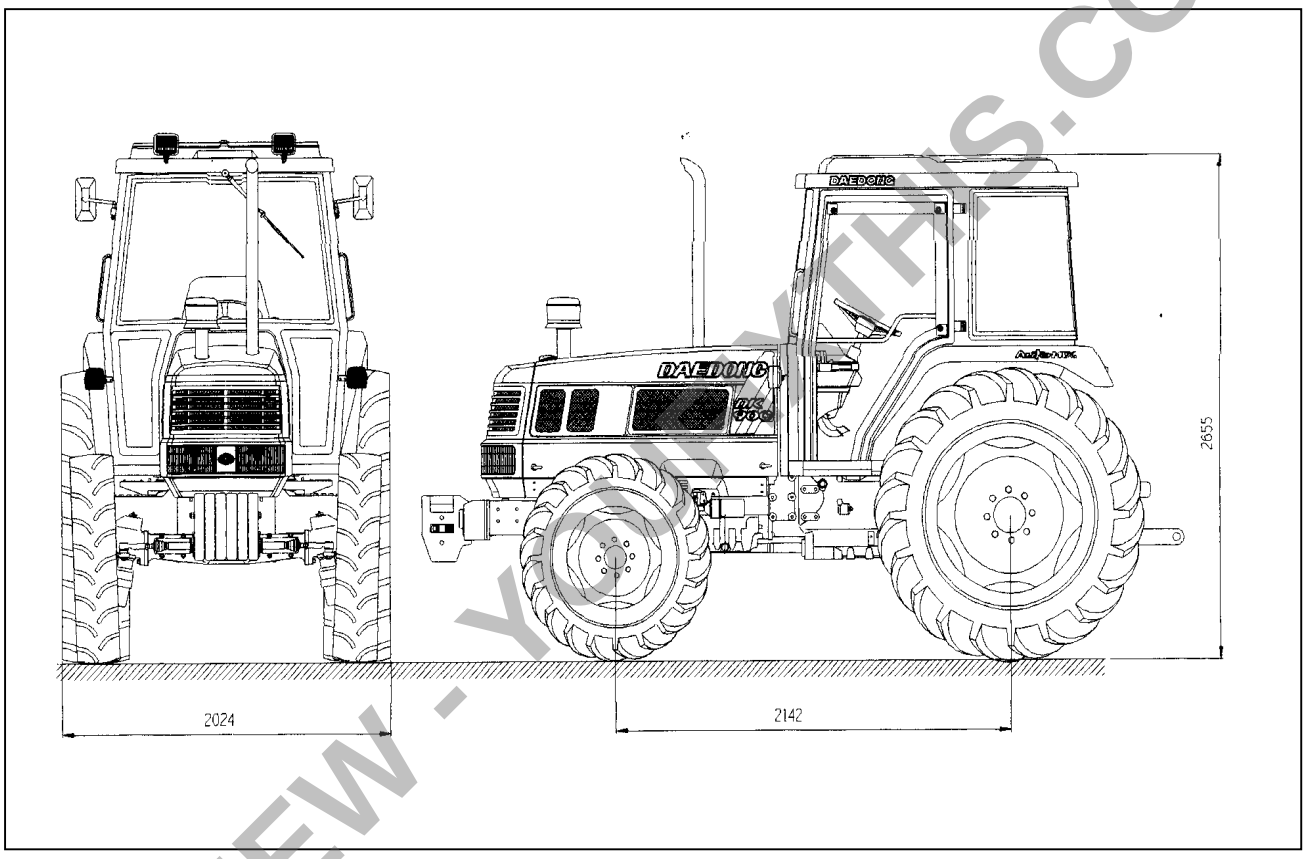
Symptom	Probable cause	Solution
Clutch slip	1. wearing of friction surface, pressure plate, and fly wheel	Replace
	2. transformation and damage of spring plate	Replace
	3. friction plate and lining contaminated by oil/grease	Replace/Flushing
When clutch operation is not soft	1. transformation of friction plate	Replace
	2. damage of hub spring of friction plate or loosened hub rivet	Replace
	3. friction plate and lining contaminated by oil/grease	Replace
Clutch drags	1. transformation of friction plate	Replace
	2. bad adjustment of operating lever	Adjust
Noise in clutching engaging/disengaging	1. wearing of release bearing	Replace
	2. damage of hub spring of friction plate	Adjust
Clutch pedal in too tight	1. sticking of operating link	Check and replace

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1. General information

1-1. Outside diagram



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To correct a valve seat with a valve seat cutter 2-4.9B

Special tools:

Cutter for 46° inlet valve seats, MS.281*

Cutter for 31° inlet valve seats, MS.642

Cutter for exhaust valve seats, MS.275*

Pilot for use with valve seat cutters, MS.150-9.5*

Handle set for use with valve seat cutters, MS.67B*

***Included in set of adjustable cutters for valve seats, MS.73**

① Before any work is done on the valve seats, new valve guides must be fitted, operation (2-4.8B).

② Fit the pilot in the valve guide and tighten the pilot.

③ Select the relevant cutter. Set the blades of the cutters to the diameter of the valve seat to be cut. Fit the cutter on the pilot and fit the handle (A). Ensure that the cutter is not allowed to fall on to the seat as this can damage the blades.

④ Carefully turn the cutter in a clockwise direction. Remove only the minimum material to ensure a good seat. Keep the seat as narrow as possible.

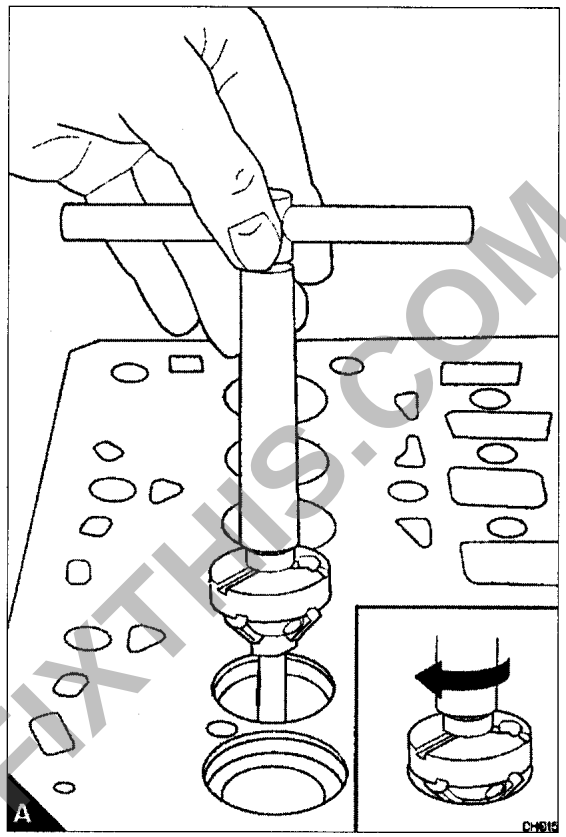
⑤ When the seat is cut, remove the cutter and the pilot. Remove any debris from the area of the valve seat and the port.

⑥ Fit the valve and lightly lap the valve and the seat.

⑦ Check that the valve depth is within limits, see data and dimensions.

Note

- If a valve seat has become too damaged or too worn to correct, a valve seat insert can be fitted, operation (2-4.9C). Turbocharged engines and some naturally aspirated engines have valve seat inserts fitted as standard and these inserts can be renewed.



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(7) Balancer unit

To remove and to fit **2-6.7A**

To remove

① Drain the lubricating oil from the sump and remove the sump, operation (2-11.4A).

Warning!

- The weight of the unit is approximately 25 kg (55 lb).

② Provide a support for the balancer unit before release of the setscrews from the engine.

③ Release the setscrews and lower carefully the balancer unit. Make a note of the positions of the setscrews of different lengths.

To fit

① Ensure that the contact faces of the cylinder block and of the balancer unit are clean and that the two thimbles (A1) are fitted correctly to the cylinder block.

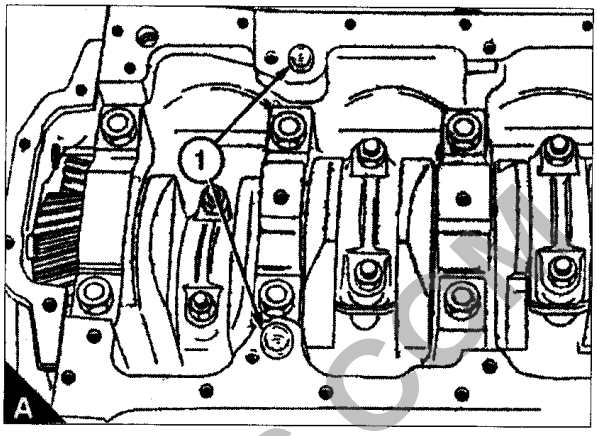
② Set the piston of number 1 cylinder to TDC, operation (2-9.2A).

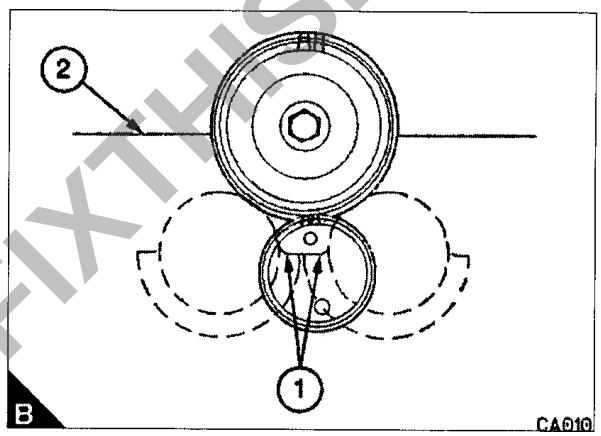
③ Before the balancer unit is fitted, ensure that the flat faces of the balance weights are level with each other (B1) and the weights hang down away from the cylinder block (B2). The timing of the balance weights to the drive shaft is correct when the large hole and small hole in the front of the drive shaft gear are in the positions shown in the illustration (B).

Note

- If the gear position shown in (B) cannot be obtained, then the balancer must be partially dismantled and the timing corrected.

④ Fit the balancer unit to the cylinder block with the correct screws in the centre positions of the balancer frame. Ensure, when the idler and crankshaft gears are in mesh, that the flat faces of the balance weight are level with each other and that they are towards the cylinder block. Check that the balancer unit is fitted correctly on the thimbles and fit the remainder of the setscrews in their correct position. Tighten the setscrews to 54 Nm (40 lbf ft) 5.5 kgf m.





⑤ Rotate the crankshaft through two turns to ensure that it is free to rotate.

⑥ Fit the lubricating oil sump, operation (2-11.4A) and fill the sump to the correct level with an approved oil.

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⑤ Remove the valve springs from the front valve with the valve spring compressor PD.6118B and the adaptor PD.6118-7, for pedestal studs, or the adaptor PD.6118-8, for pedestal setscrews.



Caution

- Fit a suitable collar near the top of the valve to hold the valve if the crankshaft is rotated too far.

⑥ Allow the valve to be held by the top of the piston.

⑦ Fasten a dial test indicator with its plunger in contact with the top of the valve stem (A2) and with a reading shown on the gauge. Rotate slowly the crankshaft, clockwise from the front, until the clockwise movement of the dial gauge pointer just stops. Make a suitable mark on the crankshaft pulley or damper to align with the temporary pointer. Continue to rotate the crankshaft, in the same direction, until the gauge pointer just begins to move in a counter-clockwise direction. Make another mark on the pulley or damper to align with the pointer. Mark the centre point between the two marks on the pulley or damper and remove the other two marks.

⑧ Rotate the crankshaft approximately 45° counterclockwise from the front and then clockwise until the mark on the pulley or damper is aligned with the pointer. Number 1 piston is now at TDC on the compression stroke.

An other method to set number 1 piston to TDC on the compression stroke 2-9.2B

① Fasten a temporary pointer to the timing case cover (or other suitable position) with its tip near to the outer edge of the crankshaft damper or pulley.

② Loosen the setscrews that retain the atomisers.

③ Remove the rocker cover.

④ Rotate the crankshaft clockwise, from the front, until the push rod for the inlet valve of the rear cylinder just tightens.

⑤ Rotate the crankshaft a further 1/8 of a turn clockwise. Insert a suitable lever between the rocker lever and the valve spring cap of number 1 inlet valve. Open the inlet valve and put a spacer approximately 5.0 mm (0.2 in) thick between the valve tip and the rocker lever.

⑥ Slowly rotate the crankshaft counter-clockwise until the piston makes contact with the open valve.
Make a temporary mark on the damper or pulley to align accurately with the tip of the pointer.

⑦ Rotate the crankshaft clockwise one or two degrees and remove the spacer between the valve and the rocker lever. Rotate the crankshaft 1/4 of a turn counter-clockwise. Put the spacer between the valve tip and the rocker lever.

⑧ Slowly rotate the crankshaft clockwise until the piston makes contact with the open valve. Make another temporary mark on the damper or pulley to align accurately with the tip of the pointer.

⑨ Make a temporary mark at the centre point between the two marks on the damper or pulley and remove the other two marks. Rotate the crankshaft counter-clockwise 1/8 of a rotate and remove the spacer between the valve and the rocker lever. Slowly rotate the crankshaft clockwise until the mark on the damper or pulley aligns accurately with the tip of the pointer. Number 1 piston is now at TDC on the compression stroke.

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To remove and to fit (Locked pump) 2-12.6A

To remove

① Remove the rocker cover.

② Loosen the setscrews which retain the atomisers.

③ Rotate the crankshaft clockwise, from the front, until the push rod for the inlet valve of number 1 cylinder just releases.

④ Remove the atomiser together with its seat washer from number 1 cylinder and fit the piston position probe, PD.221 (B1) instead. Fit the atomiser clamp to the probe and tighten the setscrews gradually and evenly to 12 Nm (9 lbf ft) 1.2 kgf m.

Caution

- Ensure that the piston comes lightly into contact with the piston position probe, or both the piston and the probe could be damaged.

⑤ Slowly rotate the crankshaft clockwise, from the front, until the piston just comes into contact with the piston position probe. The piston will now be set at 100° BTDC on the compression stroke of number 1 cylinder.

Caution

- Do not rotate the crankshaft when the pump is not on the engine; the loose fuel pump gear may damage the timing case. If it is necessary to rotate the crankshaft, fit the fuel pump temporarily to ensure that the gear is in the correct position. If the fuel pump is fitted temporarily in order to rotate the crankshaft, the locking screw must be released.

Note

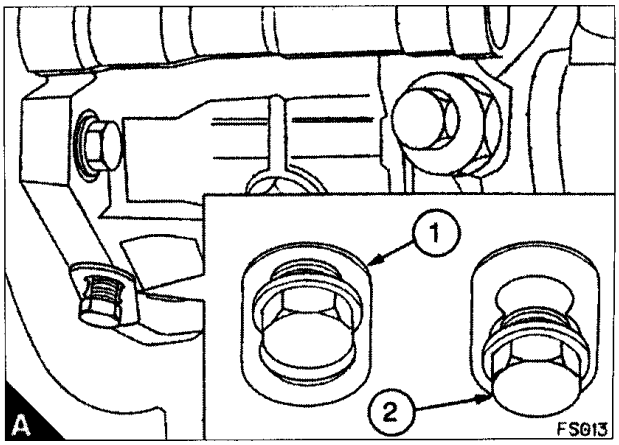
The fuel pump can be removed from the engine and fitted again if:

- The crankshaft is not rotated
- The drive shaft of the fuel pump is not rotated

Caution

- If the crankshaft or the pump shaft is rotated when the pump is off the engine. Or if the engine timing is not correct the timing of the fuel injection pump must be checked, operation (2-9.2D).

⑥ Release the locking screw and adjust the spacer (A1) to enable the locking screw (A2) to be tightened on the drive shaft of the fuel pump. Tighten the locking screw to 12 Nm (9 lbf ft) 1.2 kgf m. Check that the spacer is free to move. The drive shaft of the fuel pump is now fastened.



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B. Assembling

① Assemble transmission arm(27) from inside to outside of clutch housing.

② Assemble it to shuttle shaft(1) in accordance with the mounting direction of 6213NR bearing(4) (snap ring is located in front of shuttle shaft).

③ Assemble bush(2) and oil seal(3) to the inside diameter of shuttle shaft and insert retainer(5), thrust needle bearing(6), inner race(7), needle bearing 2EA(8), 30 gear(9) and spline hub(10) in order. Tighten snap ring(11) and check it.

④ Sub-assemble shuttle synchronizer assembly(A).

⑤ Assemble synchronizer assembly(A) to 33 gear(D) outside diameter spline.

⑥ Put spring(25) and ball(26) into the shuttle shift fork(22) and then insert assembly tool.

⑦ Assemble shuttle shift fork to synchronizer assembly(A).

⑧ Push shuttle shaft sub-assembly from the front to back of the clutch housing.

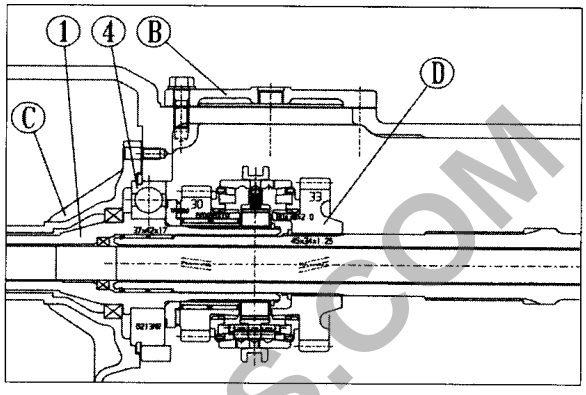
⑨ After assembling O-ring(24) to the shuttle fork rod(23), apply grease it and match the hole of clutch housing with the hole of shuttle shift fork to assemble

⑩ After matching the groove of the side of clutch housing with the fork rod groove, adjust it with seal washer(31) and holding bolt(30).

⑪ Replace the assembly packing of propeller shaft case(C) with the new one and assemble it.

⑫ After assembling O-ring(8) to transmission arm (27), apply grease on it and push it toward shuttle fork.

⑬ Insert stopper(29) in the groove of transmission arm and adjust it with M8 bolt(32).



Tightening torque

① Shuttle fork rod adjusting bolt(30) : 2.40~2.80kgf.m(17.36~20.26ft-lbs)

Main spare part specification

① Overall length of shuttle shaft(1)
DK60, DK65 : 436mm(17.16in)
DK75, DK80, DK90 : 450mm(17.72in)

② Synchronizer assembly dimension : 58.2±0.2

③ Quantity of stopper pin : ϕ6 : 6EA, ϕ5 : 4EA

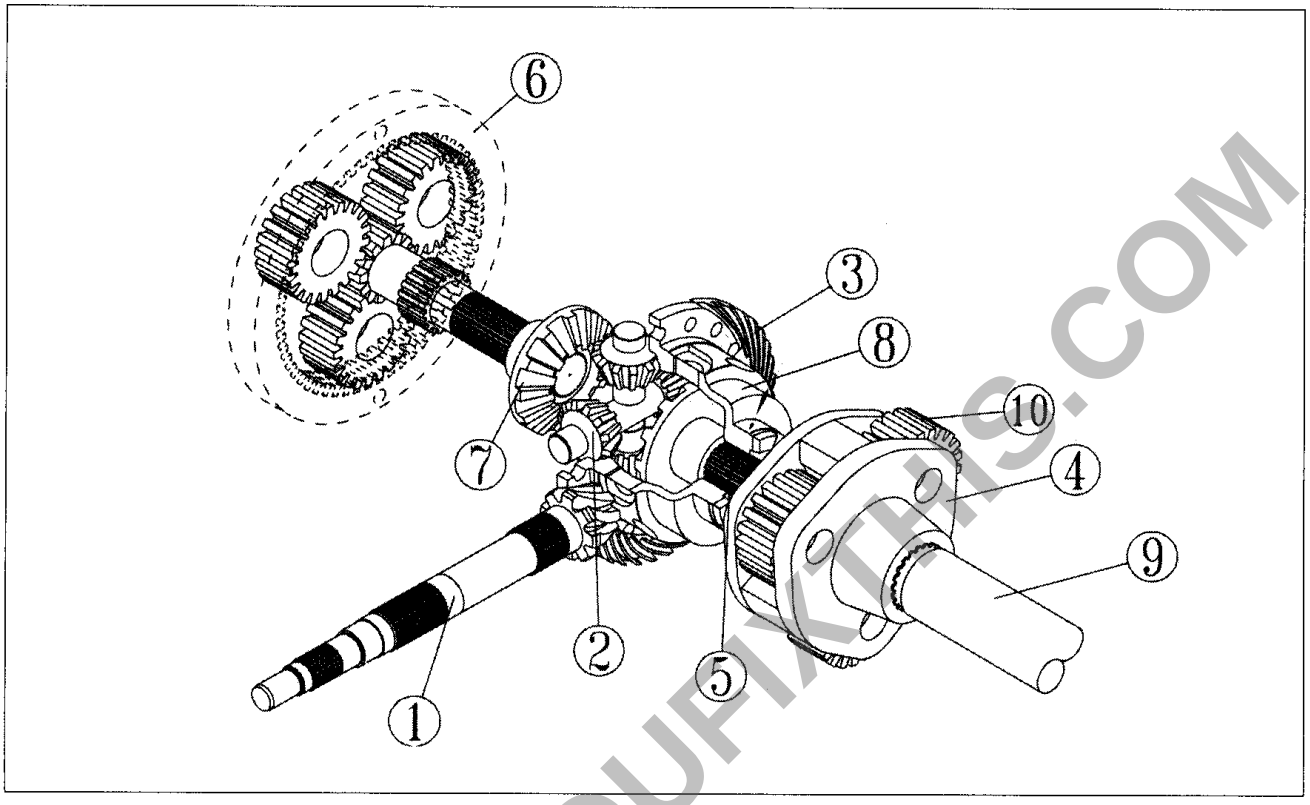
Caution

- When assembling 6213NR bearing(4), snap ring shall be placed in front of shuttle shaft(1).
- When assembling oil seal(3), the lip part shall be facing to backward of shuttle shaft(1).

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5) Rear axle operation



A. Rear axle operation related components

① Spiral bevel pinion

② Differential pinion 13

③ 37 spiral bevel gear

④ Planetary gear assembly

⑤ 13 gear shaft

⑥ 56 internal gear

⑦ Differential bevel gear 22

⑧ Differential gear assembly

⑨ Rear axle

B. Operation principle of rear axle

A final reduction gear reduces the final speed and increases the torque on the rear axle.

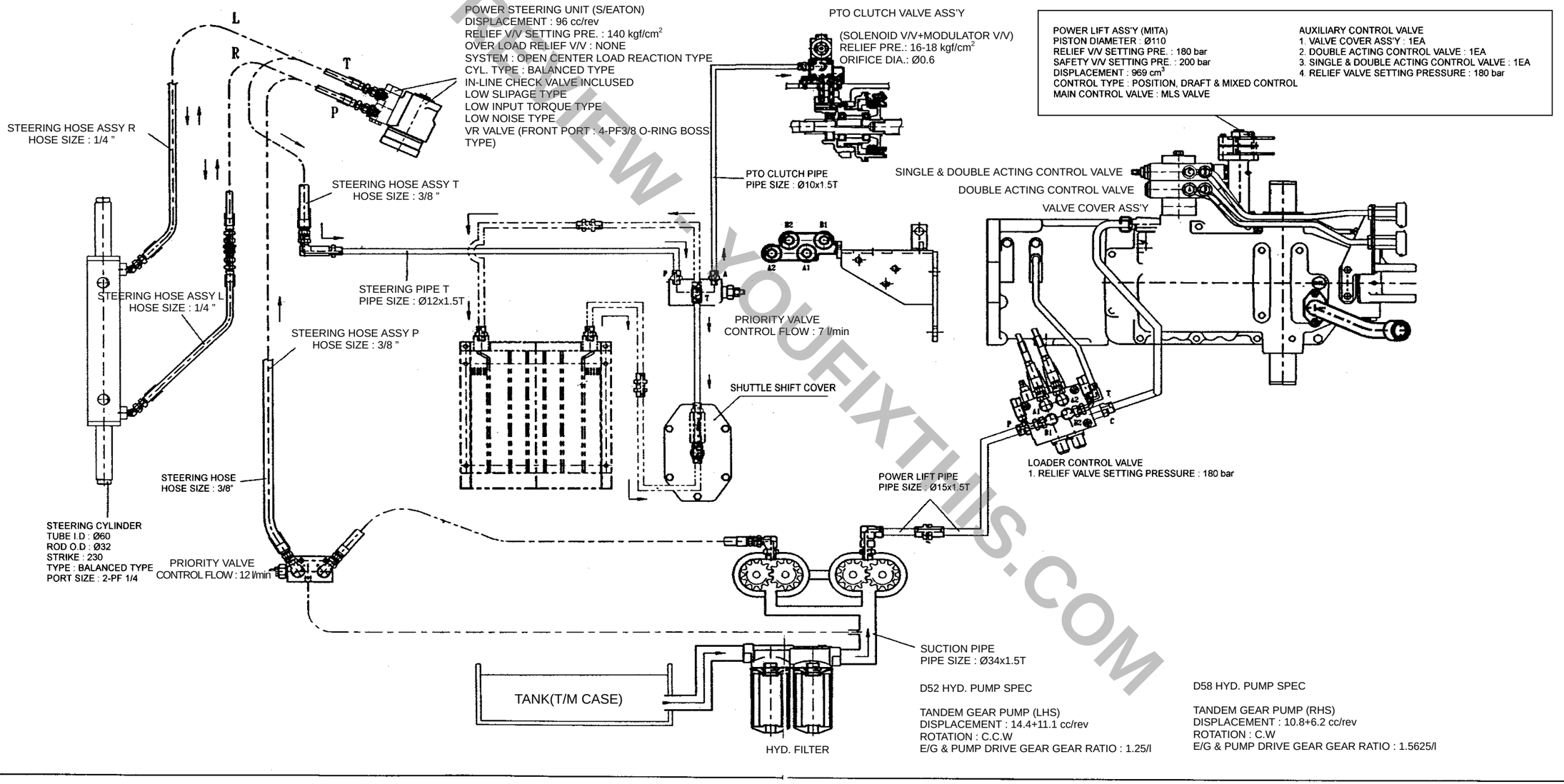
A final drive gear is an interlocking ring gear type system. The 13 gear shaft(5) of a final drive section is connected to planetary gear assembly(4) and be meshed with planetary gear of 56 internal gear(6). The rear axle(9) is fitted in the groove of planetary gear assembly(4). The power transmitted through differential gear rotates the planetary gear assembly.

This reduces the speed at the appropriate rate and increases the required torque.

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DK60, DK65 HYDRAULIC OIL FLOW SCHEMATIC-(MECHANICAL)



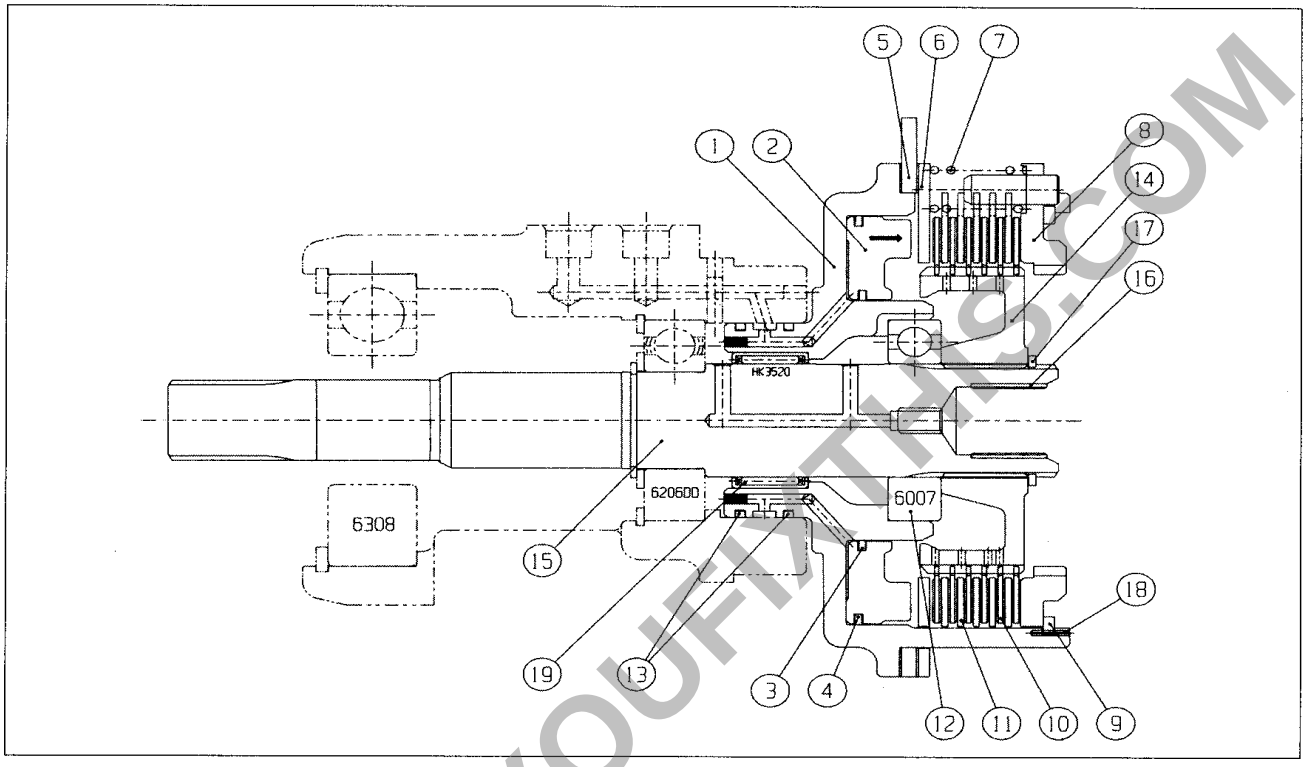
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C. PTO clutch valve

(1) Function of valve

▣ PTO switch ON



① Turning PTO switch ON dashboard, makes adjusted 7l/min oil influx pass steadily solenoid valve and modulator valve and enter A port of PTO clutch.

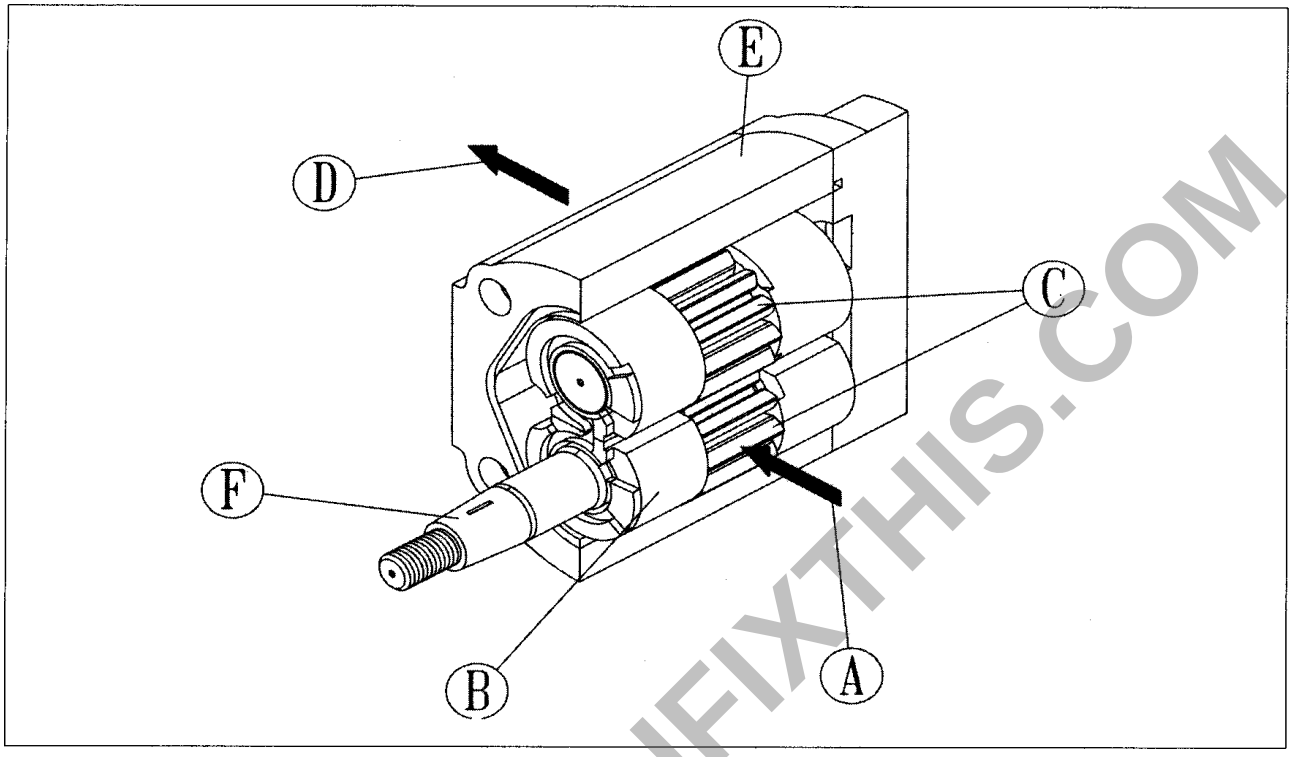
② This oil presses return spring(7) by flowing through the rear side of piston(2) and shifts piston to the arrow direction. Return plate(6), clutch disc(10), and clutch plate(11) slide to pressure plate(8) and power from PTO propulsion shaft→PTO clutch shaft(15) is relayed to PTO drive shaft.

③ Pressure inside PTO clutch system, increases as the movement of modulator valve and up to controlled pressure(16~18kgf/cm^{2}228~256psi) by relief valve. Also, turning the PTO clutch switch ON flows oil to L port of PTO clutch and lubricates shaft and bearing parts.

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3) Structure and mechanism



A : Pump inlet
B : Bushing
C : Gear
D : Pump exhaust
E : Pump housing
F : Drive shaft

① To operate handle and hydraulic cylinder, hydraulic pump provides steady current of oil and hydraulic pump ass'y consists of two pumps with different displacement

② Two pumps operate simultaneously and utilize outer gear structure to transport certain amount of oil flux per every rotation.

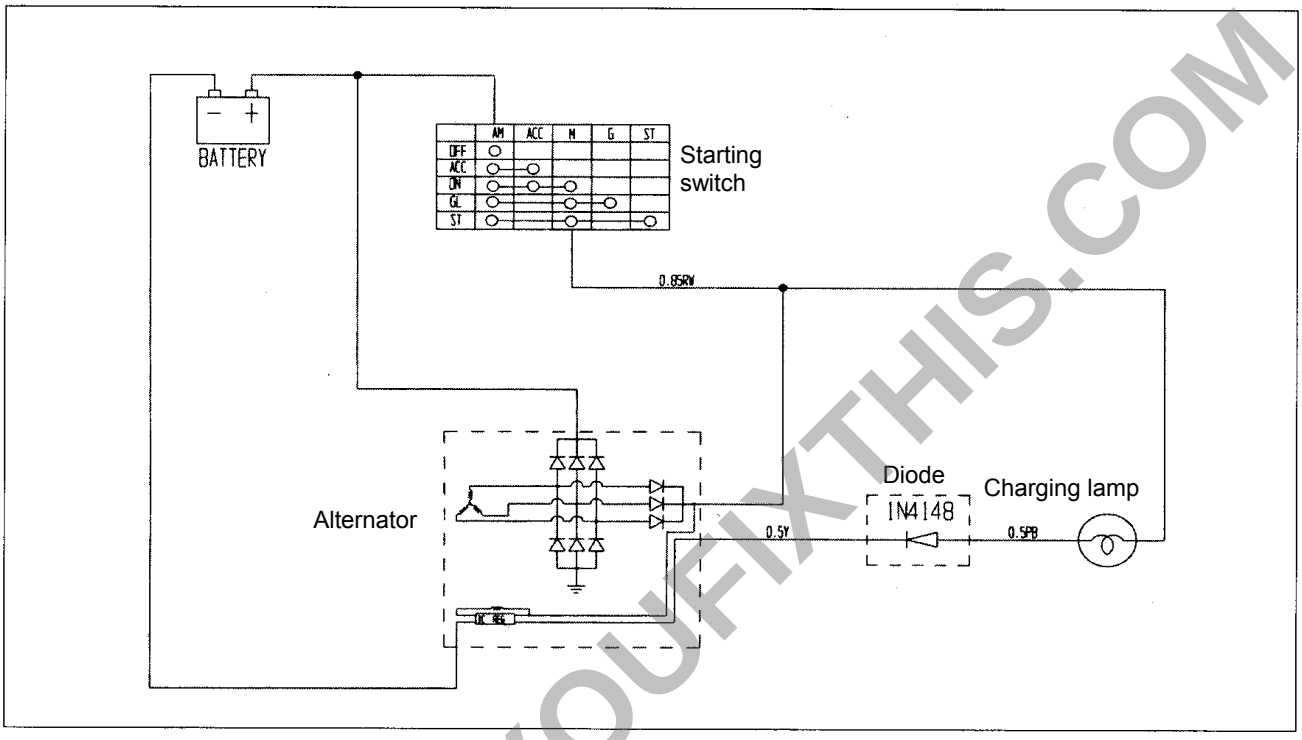
③ Cam shaft drive gear of engine operates hydraulic pump and pump gear(C) spins to influx and efflux transmission oil. Vacuum is produced to influx oil into pump(A) when gear disengages. Oil moves together with gears as gears rotate.

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8-3. Charging system

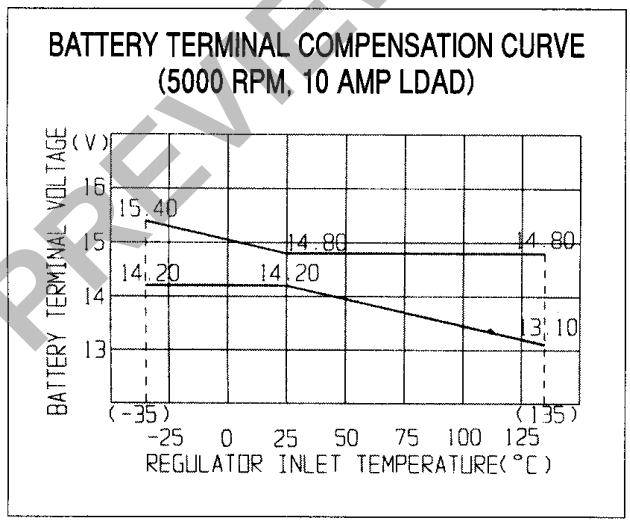
[1] Circuit

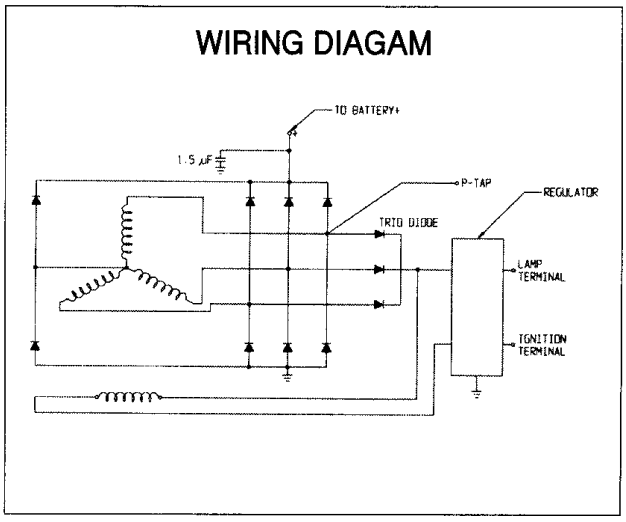


[2] Generator specifications

(1) DK60, DK65

- Authorized power : 12V 50A
- Manufacturer : Korea delpai





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