KIOTI®

CK2510(H)
CK2810(H)
CK3010(H)

WORKSHOP MANUAL

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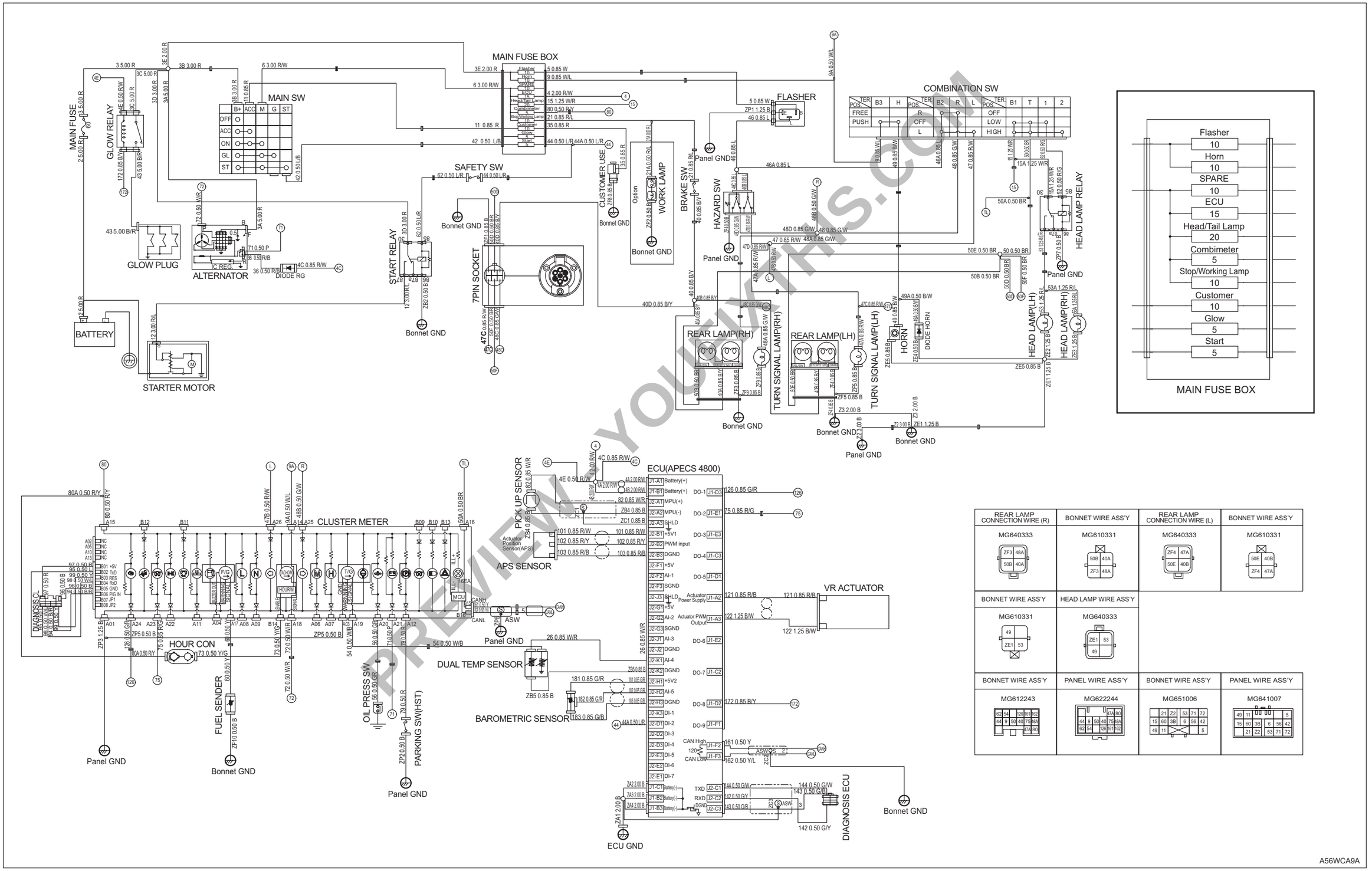
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2.2 CIRCUIT DIAGRAM

CK2510 / CK2510(H)



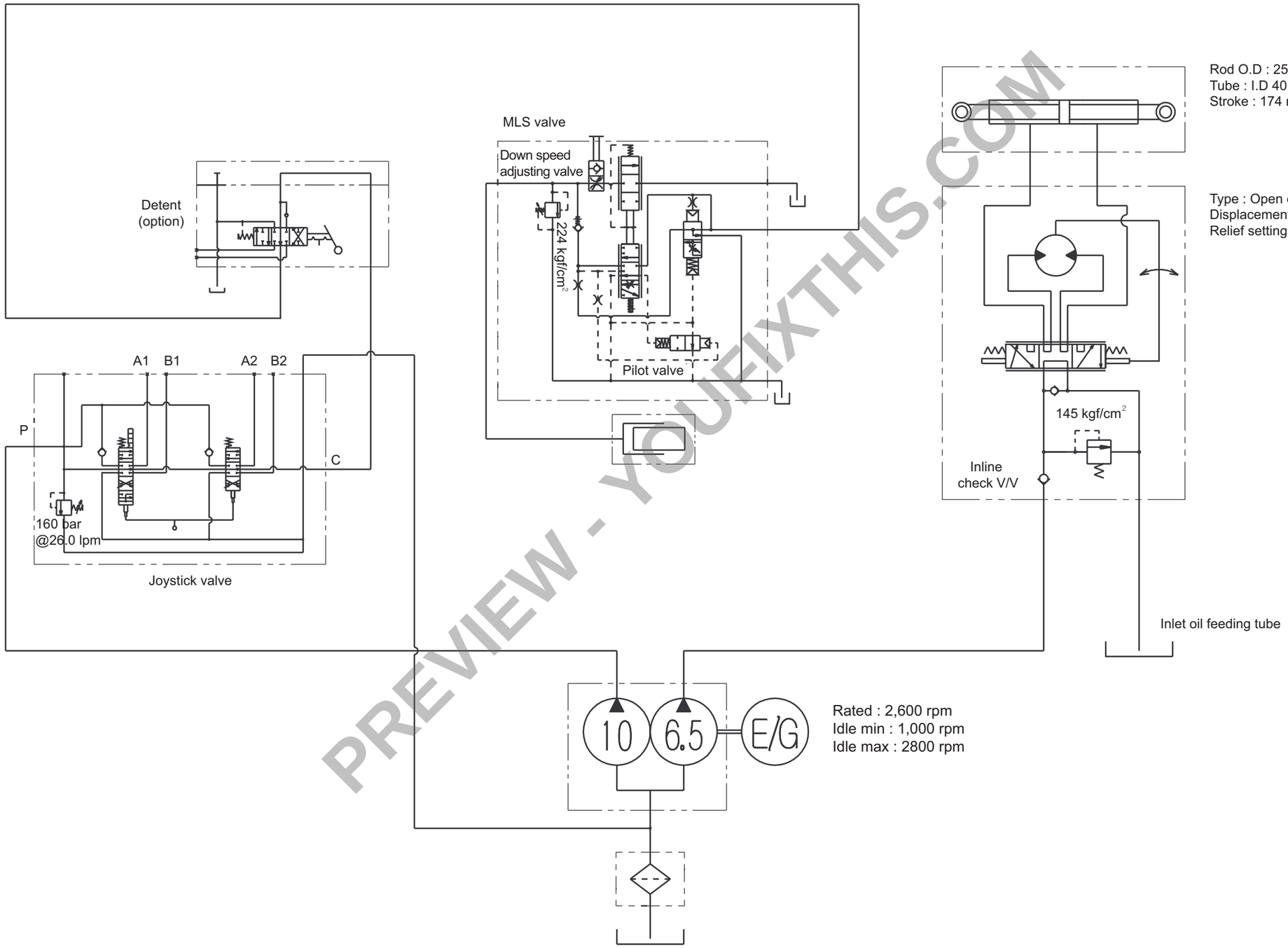
REAR LAMP CONNECTION WIRE (R)	BONNET WIRE ASS'Y	REAR LAMP CONNECTION WIRE (L)	BONNET WIRE ASS'Y
MG640333	MG610331	MG640333	MG610331
BONNET WIRE ASS'Y	HEAD LAMP WIRE ASS'Y		
MG610331	MG640333		
BONNET WIRE ASS'Y	PANEL WIRE ASS'Y	BONNET WIRE ASS'Y	PANEL WIRE ASS'Y
MG612243	MG622244	MG651006	MG641007

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2.2 HYDRAULIC CIRCUIT DIAGRAM

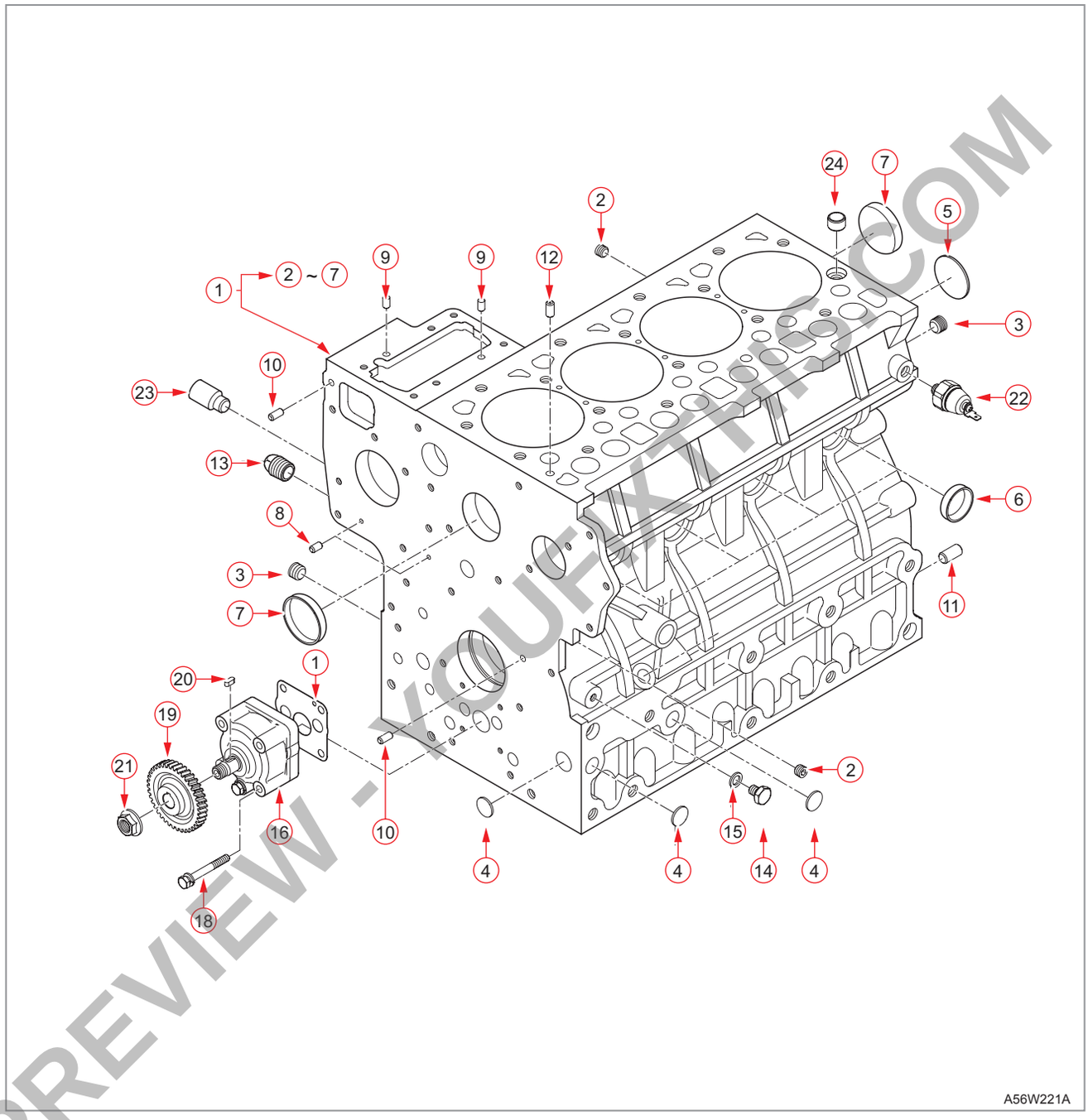
CK2510 / CK2810 / CK3010



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6. EXPLODED VIEW

6.1 E010 CYLINDER BLOCK GROUP



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COMPONENTS

(1) Total cylinder block assy
(2) Plug
(3) Plug
(4) Plug
(5) Plug
(6) Cap
(7) Cap
(8) Pin, parallel
(9) Pin, parallel
(10) Pin, parallel
(11) Pin, parallel
(12) Pin, tube
(13) Plug
(14) Plug
(15) Gasket
(16) Oil pump assy
(17) Gasket, oil pump
(18) Bolt, washer
(19) Gear, oil pump drive
(20) Key
(21) Nut, flange
(22) Oil switch
(23) Guide, oil gauge
(24) Pin, tube

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2.6 TIGHTENING TORQUES

Item	Size x Pitch	Nm	kgf-m	lb-ft
Cylinder head screws	M11 x 1.25	Refer to “IMPORTANT” below		
Head cover bolts	M6 x 1.0	8.8 ~ 11.8	0.9 ~ 1.2	6.5 ~ 8.7
* Bearing case screw 1	M9 x 1.25	46.1 ~ 51.0	4.7 ~ 5.2	34.0 ~ 37.6
* Bearing case screw 2	M10 x 1.25	68.6 ~ 73.6	7.0 ~ 7.5	50.6 ~ 54.2
* Flywheel screw	M12 x 1.25	98.1 ~ 107.9	10.0 ~ 11.0	72.3 ~ 79.6
* Connecting rod screws	M8 x 1.0	46.1 ~ 51.0	4.5 ~ 5.0	34.0 ~ 37.6
Rocker arm support bolts	M10 x 1.25	60.8 ~ 70.6	6.2 ~ 7.2	44.8 ~ 52.1
Drain plug	M12 x 1.25	32.4 ~ 37.3	3.3 ~ 3.8	23.9 ~ 37.3
Glow plugs	M10 x 1.25	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Oil switch	PT1/8	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Nozzle locating screws	M20 x 1.5	49.1 ~ 68.7	5.0 ~ 7.0	36.2 ~ 50.6
Injection pipe nuts	M12 x 1.5	24.5 ~ 34.3	2.5 ~ 3.5	18.1 ~ 25.3

REMARK

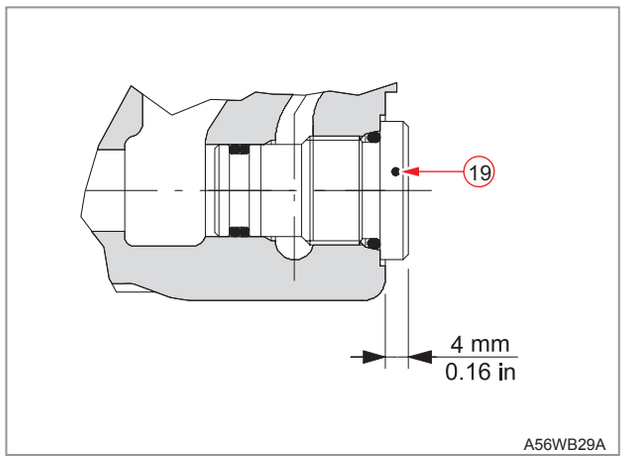
- **For *marked screw, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **The letter “M” in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.**

IMPORTANT

- **Tightening for cylinder head bolts**
  Tightening order (using the angle controlled tightening method)
  1st step: Tighten the bolts to 4.0 kgf-m (39.2 Nm, 28.8 lb-ft)
  2nd step: Rotate the bolts additional 90°
  3rd step: Rotate the bolts additional 80°
- **For more details, refer to 7.1.14 “Cylinder head”**

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4.1.3 JOY-STICK VALVE ASSEMBLY



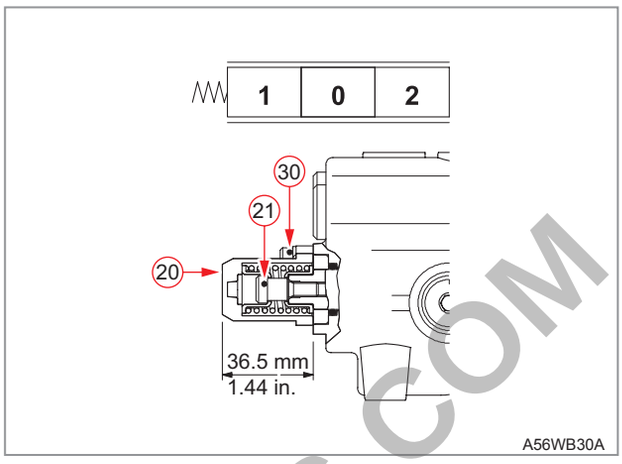
(19) Plug

1. Install the plug (19).

Item	Tightening torque
Blocking plug	42 Nm 4.3 kgf-m 31 lb-ft

2. Install the load check poppets: with O-rings, springs and check plugs (17).

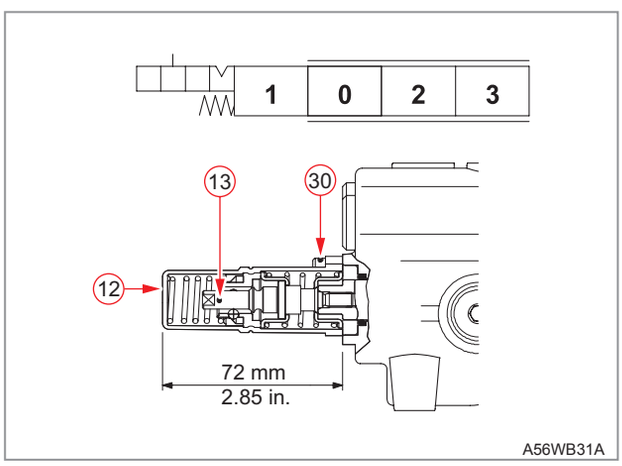
Item	Tightening torque
Check plugs	24 Nm 1.8 kgf-m 17.7 lb-ft



(30) Screw
(21) Spool control kit
(20) End cap

3. Install O-ring (15) in their grooves in the valve body and carefully slide the spool (25) into its bore.
4. Install the end cap (20) and secure the assembly with cap screws.

Item	Tightening torque
End cap mounting screw	6.6 Nm 0.7 kgf-m 4.9 lb-ft



(30) Screw
(13) Spool control kit
(12) End cap

5. Assemble the float spool in the same manner using steps 3 through 4.

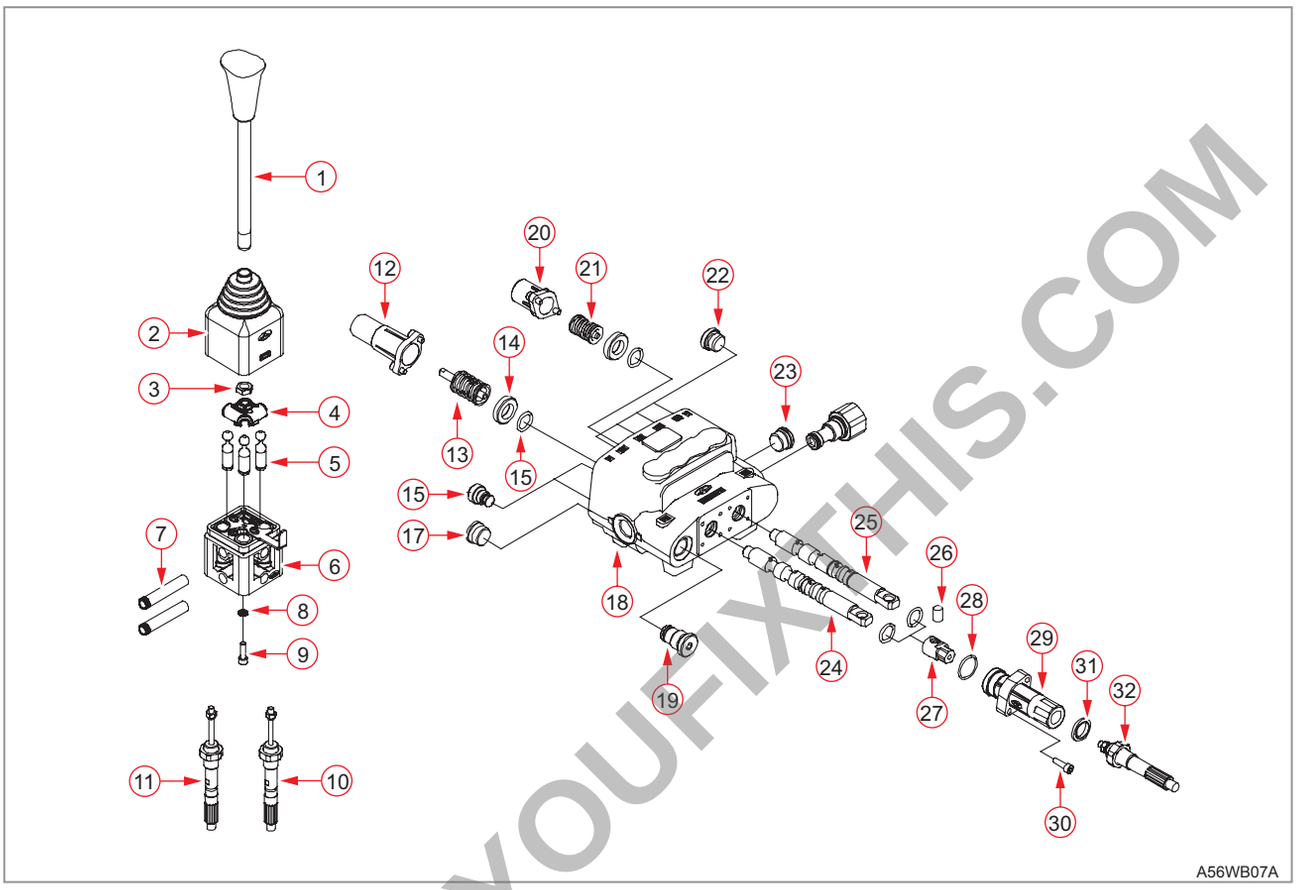
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The manual preheating operation can be activated by holding the ignition switch in the "G" position. In this circuit diagram, a signal power from the terminal G is supplied to the preheat relay through the preheat controller. Then, this signal voltage closes the contact of the preheat relay, and the battery voltage ready at the preheat relay, which was supplied through the main fuse from the battery, is supplied to the glow plug through the preheat relay to preheat the glow plug.

There is no indication on the cluster meter for post-heating operation, but the preheat indicator is illuminated for the manual preheating operation.

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4.1.2 JOY-STICK VALVE DISASSEMBLY



(1) Lever knob
(2) Rubber
(3) Nut
(4) Selector
(5) Pin
(6) Body
(7) Ring
(8) Washer
(9) Screw
(10) Cable
(11) Cable
(12) End cap
(13) Spool control kit
(14) Ring
(15) O-ring
(16) Plug
(17) Plug
(18) Body
(19) Plug
(20) End cap
(21) Spool control kit
(22) Plug
(23) Plug
(24) Spool
(25) Spool
(26) Rod pin
(27) Joint
(28) O-ring
(29) Flange
(30) Screw
(31) Washer
(32) Nut

1. Loosen the nuts (32) of cable and remove the screws (30), rod pins (26) and cables (11, 10).
2. Remove End cap screws, End cap (12) from the float spool (24).
3. Remove End cap screws, End cap (20) from the spool (25).
4. Gently slide the float spool (24) with spool control kit (13), Ring (14) and O-ring (15) out of the valve body.

IMPORTANT

- **The float spool (24) and spool (25) are not interchangeable and will only work in their respective bores.**

  Ensure that the spools are inserted into the proper bores during reassembly.

5. Disassemble the spool (25) in the same manner as the float spool using step through 4.
6. Remove the load check plugs (17) with O-rings, springs and load check poppets from the check valve ports.

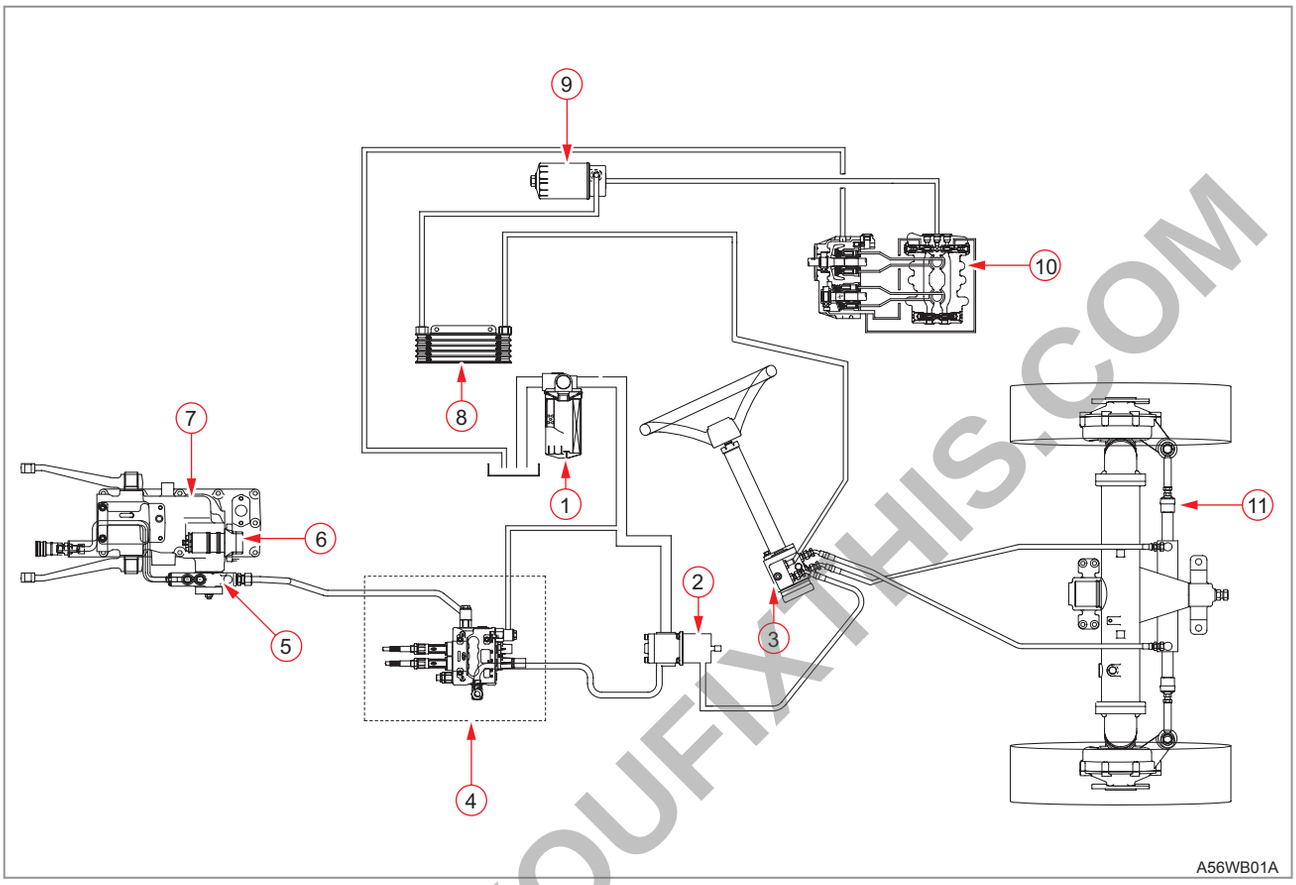
▶ INSPECTION:

1. Inspect the spools and the spool bores for pitting, scratches, of excess wear. If found defective, replace the Joy-stick valve assembly.
2. Check that the spool moves freely in the spool bore.
3. Inspect the load check valve poppets for pitting or scratches.
4. Inspect all springs for distortion. Replace if found to be defective.
5. Replace all O-rings and seals during reassembly and lightly lubricate with petroleum jelly.

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2. OPERATING PRINCIPLE

2.1 HYDRAULIC SCHEME



(1) Oil filter
(2) Gear pump
(3) Power steering unit
(4) One lever joy-stick valve
(5) Auxiliary valve (detent type): optional
(6) Control valve (MLS valve)
(7) Hydraulic cylinder
(8) Oil cooler (CK2510H / CK2810H / CK3010H)
(9) HST filter (CK2510H / CK2810H / CK3010H)
(10) HST (CK2510H / CK2810H / CK3010H)
(11) Steering cylinder

The hydraulic system consists essentially of a fluid tank, hydraulic pump, oil filter, oil cooler (CK2510H / CK2810H / CK3010H), HST(CK2510H / CK2810H / CK3010H), Joy-stick valve, control valve, and lift links.

The rear axle and transmission case serves as a common hydraulic fluid tank and supply fluid to the hydraulic pump (2) through the filter (1) and suction tube.

The hydraulic pump supplies fluid to the system control valve and the high-pressure line.

The control valve, when operated, affects raise, neutral, or lowering action of the lift arms.

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3. SPECIFICATIONS

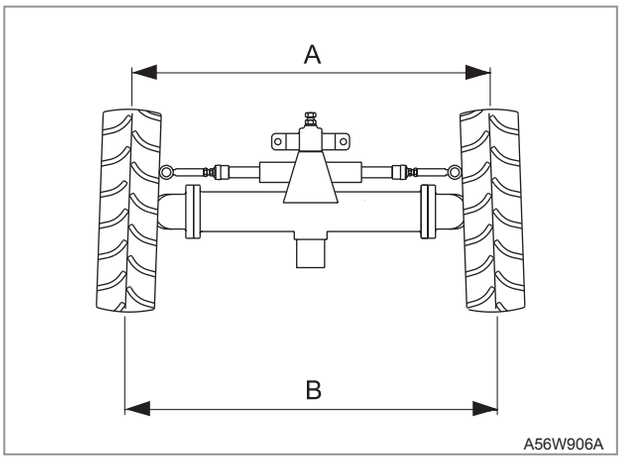
MODEL			CK2510	CK2810 CK3010	CK2510H	CK2810H CK3010H
Engine	Model		3A139			
	Type		Liquid-cooled, 3-cylinder diesel			
	Engine gross	HP (kW)	24.0 (17.9)	28 (20.8)	24.0 (17.9)	28 (20.8)
	Displacement	cc (cu.in)	1,393 (85)			
	Rated revolution	r.p.m min-1	2,600			
	Fuel tank capacity	ℓ (gal.)	25 (6.6)			
Drive train	Clutch		Dry type single stage			
	Transmission		Synchro/constant		Hydrostatic	
	Speeds		6F 2R		INF.2	
	Differential lock		Standard			
	Brake		Wet disc type			
	P.T.O		Trans		Live continuous	
	Rear	(rpm)	1 speed (540 rpm at 2,460 engine rpm)			
	Mid(optional)	(rpm)	1 speed (2,000 rpm at 2,555 engine rpm)			
Hydraulic system	Total pump capacity (Max. flow rate)	ℓ/min (gpm)	42.9 (11.3)			
	3-point hitch		Cat. I			
	Maximum lifting capacity (24in. behind lift point)	kgf (lbs.)	546 (1,203)			
	Hydraulic lift control system		Position control			
	Steering		Hydrostatic			
Standard tire size	Front AG (TURF, INDUSTRIAL)		7 - 12 (23 x 8.50 - 12, 23 x 8.50 - 12)			
	Rear AG (TURF, INDUSTRIAL)		11.2 - 16 (33 x 12.5 x 16.5, 12 - 16.5)			
Traveling speeds	Forward (At rated engine rpm)	km/h (mph)	1.20 ~ 17.34 (0.75 ~ 10.78)		0 ~ 17.15 (0 ~ 10.66)	
	Reverse (At rated engine rpm)	km/h (mph)	1.48 ~ 6.73 (0.92 ~ 4.18)		0 ~ 12.01 (0 ~ 7.46)	
Dimensions	Overall length (with 3p)	mm (in.)	2,770 (109.1)			
	Overall width (minimum tread)	mm (in.)	1,250 (49.2)			
	Overall height (Top of ROPS)	mm (in.)	2,108 (82.9)			
	Wheel base	mm (in.)	1,520 (59.8)			
	Min. ground clearance	mm (in.)	330 (12.9)			
	Tread Front	mm (in.)	989 (38.9)			
	Tread Rear	mm (in.)	950 (37.4)			
Other spec.	Weight (with ROPS)	kgf (lbs.)	1,025 (2,260)			
	Min. turning radius with brake	m(ft)	2.72 (8.92)			
	Max. drawbar vertical load	kgf(lbs)	250 (551)			
	Max. trailer loading weight	kgf(lbs)	1,000 (2,205) without trailer brake 2,000 (4,409) with trailer brake			

* The specifications are subject to change for the purpose of improvement without any notice.

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4. MEASURMENT AND ADJUSTING

4.1 TOE-IN

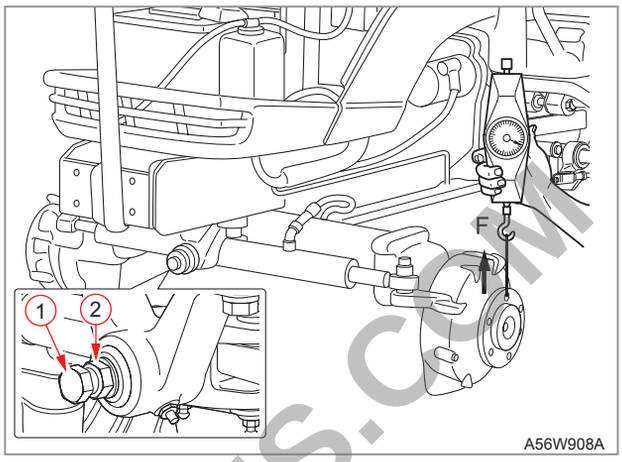


(A) Front width (B) Rear width

1. Apply air pressure as specified to tires.
2. Measure the front width (A) and the rear width (b) between the front wheels while straightened to obtain the difference (toe-in).
3. For other than specified, loosen the tightening nut on the ball joint for adjustment while turning the screw on the ball joint. Be sure to make the exposure of left and right rods in the steering cylinder equal this time.

Item	Factory spec.
Toe-in (B-A)	2 ~ 8 mm 0.08 ~ 0.31 in.

4.2 ROCKING FORCE OF FRONT AXLE

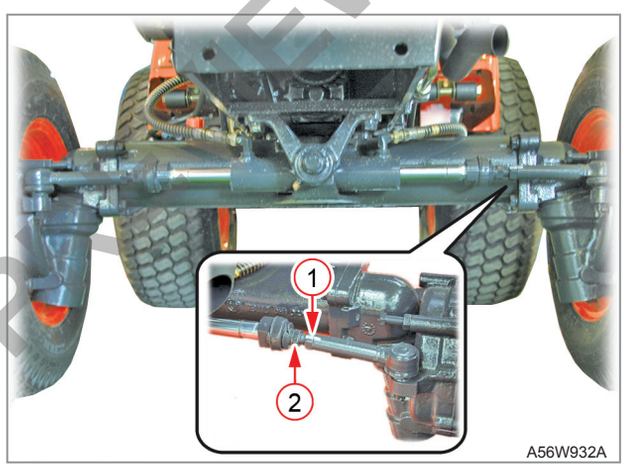


(1) Adjusting screw (2) Lock nut

1. Jack up the front side of tractor and remove the front wheel.
2. Set a spring balance to the front gear case cover.
3. Measure the front axle rocking force.
4. If the measurement is not within the factory specifications, adjust with the adjusting screw (1).
5. Tighten the lock nut (2) firmly.

Item	Factory spec.
Front axle rocking force	49.0 ~ 117.7 N 5.0 ~ 12.0 kgf 11.0 ~ 26.5 lbs

ADJUSTING

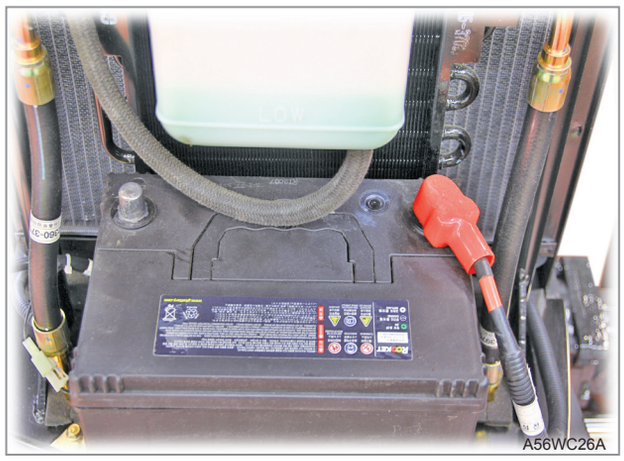


(1) Lock nut (2) Joint end

1. Loosen the lock nuts (1).
2. Turn the joint ends (2) to factory specification.
3. Retighten the lock nuts (1).

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4.7 BATTERY


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CAUTION

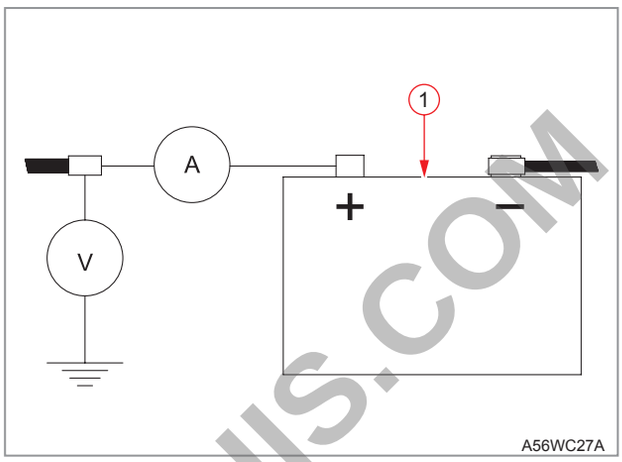
- **To avoid accidental short circuit, "be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Never remove the battery cap while the engine is running.**
- **• Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash affected areas thoroughly with water immediately.**
- **• Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**

IMPORTANT

- **Operating machine without a properly installed, adequately sized battery may cause alternator failure.**

4.7.1 CHECKING

BATTERY VOLTAGE



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(1) Battery
(A) Ampmeter (V) Voltmeter

1. Stop the engine and turn off the main key switch.
2. Connect the Voltage meter like figure.

Sect.	Factory spec.
Battery voltage	More than 12 Volt

CHARGING CURRENT MEASURING

1. Start the engine then detach the positive cord of the battery.
2. Connect the Ampere meter like figure.
3. Operates all electrical system (like head lights …).

Sect.	Rated spec.
Current	50 A
Voltage	14 ~ 15 V
Engine rpm	2,600 rpm

CAUTION

- **Must connect the Ampere meter after engine is started.**
- **If electric load applied (lights, etc.) is not enough or battery is fully charged, you can not get the following results.**

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2.2 ENGINE BODY

2.2.1 CYLINDER HEAD

Item	Factory Specification	Allowable Limit
Cylinder head surface flatness	-	0.05 mm / 100 mm 0.002 in. / 3.94 in.
Top clearance	0.750 ~ 0.9 mm 0.0294 ~ 0.0354 in.	-
Thickness of head gasket (MSL Gasket)	When tightened 1.21 mm 0.0476 in.	-
Compression pressure (when cranking with starting motor)	3.24 ~ 3.73 MPa 33 ~ 38 kgf/cm^2 469 ~ 540 psi	2.55 MPa 26 kgf/cm^2 370 psi

* Variance of compression pressure among cylinders should be 10% or less.

2.2.2 VALVES

Item		Factory Specification	Allowable Limit
Valve clearance (cold)	IN. EX.	0.25 mm 0.0098 in. 0.30 mm 0.0118 in.	±0.05mm ±0.0020 in.
Valve seat angle	IN. EX.	1.047 rad. 60° 0.785 rad. 45°	-
Valve face angle	IN. EX.	1.047 rad. 60° 0.785 rad. 45°	-
Valve recessing		0.2 ~ 0.5 mm 0.0079 ~ 0.0197 in.	0.8 mm 0.0315 in.
Clearance between valve stem and valve guide		0.040 ~ 0.070 mm 0.0016 ~ 0.0028 in.	0.10 mm 0.0039 in.
Valve stem O.D		7.960 ~ 7.975 mm 0.31339 ~ 0.31398 in.	-
Valve stem I.D		8.015 ~ 8.030 mm 0.3156 ~ 0.3161 in.	-

2.2.3 VALVE TIMING

Item		Factory Specification	Allowable Limit
Inlet valve	Open Close	0.14rad 8° before T.D.C 0.611rad 35° after B.D.C	-
Exhaust valve	Open Close	0.785rad 45° before B.D.C 0.140rad 8° after T.D.C	-

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7. MAINTENANCE SCHEDULE CHART

No.	Item \ Maintenance interval		Run hour								Run age		Remarks	
			50	100	200	400	600	800	1500	3000	1 year	2 year		
1	Engine oil	Change	⊙	●										
2	Engine oil filter	Replace	⊙		●									
3	Hydraulic oil filter	Replace	⊙		●									
4	HST oil filter	Replace	⊙		●									
5	Transmission fluid	Change	⊙			●								
6	Front axle oil	Change	⊙			●								
7	Front axle pivot	Adjust					●							
8	Engine start system	Check	●											
9	Greasing	Apply	●											
10	Wheel bolt torque	Check	●											
11	Battery condition	Check		●									*3	
12	Air cleaner element	Clean		●									*1	#
		Replace									●		*2	
13	Fuel filter element	Replace			●									#
14	Fan belt	Adjust		●									*3	
15	Clutch pedal free play	Adjust	⊙	●										
16	Brake pedal free play	Adjust		●										
17	Radiator hose and clamp	Check			●									
		Replace										●		
18	Power steering hose and oil line	Check			●									
		Replace										●		
19	Fuel line	Check		●										#
		Replace										●		
20	Intake air hose	Check			●									
		Replace										●	*3	
21	Toe-in	Adjust			●									
22	Engine valve clearance	Adjust						●						
23	Fuel injection nozzle injection pressure	Check							●					#
24	Injection pump	Check								●				#
25	Cooling system	Clean										●		
26	Coolant	Replace										●		
27	Fuel system	Check											*3	
28	Fuse	Replace											*3	
29	Light bulb	Replace											*3	
30	Tire pressure	Check											*3	

IMPORTANT

- ⊙ ***must be performed after the initial 50 hours of operation.***

  ***1 The air cleaner should be cleaned more frequently a in dusty condition than in a normal condition.**

  ***2 Every year or every 5 times of cleaning.**

  ***3 Replace only if necessary.**

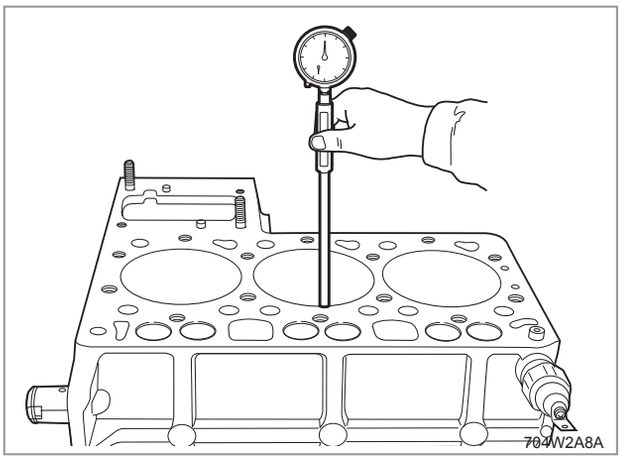
- ***The items listed above (# marked) are registered as emission related critical parts by KIOTI in the U.S.EPA exhaust emission standards non-road emission regulation. As the tractor owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.***

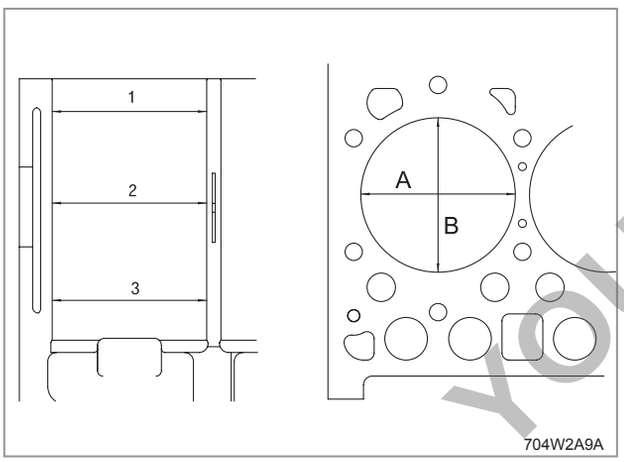
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7.2.7 CYLINDER BORE

CYLINDER BORE DIAMETER





(A) axial direction
(B) transverse direction

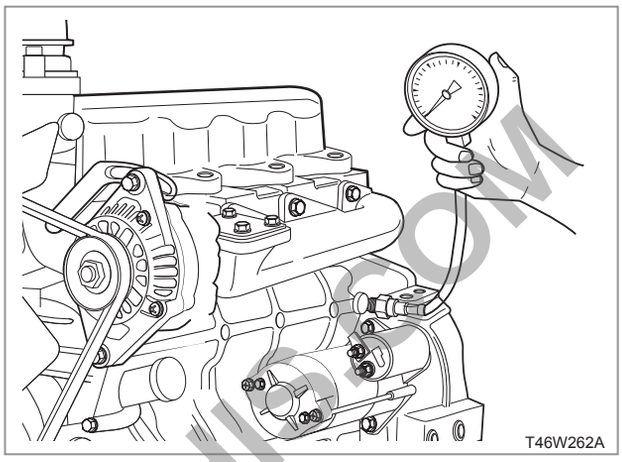
(1,2,3) Measuring points

1. Measure the cylinder liner I.D. at sit positions shown in the figure to find the maximum wear.

Cylinder liner I.D.	80.000 ~ 80.022 mm 3.1496 ~ 3.1505 in.

7.2.8 LUBRICATING SYSTEM

ENGINE OIL PRESSURE



1. Remove the oil pressure switch. Install the adapter and pressure tester in its place.
2. Start the engine and run it until it is warmed up. Measure the oil pressure at both idling and rated speed.
3. If the oil pressure is less than the allowable limit, check the oil level, oil filter, oil pump relief valve, oil passages and oil clearance.

Engine oil pressure	At idle speed	Factory spec.	more than 68.6 kPa 0.7 kgf/cm² 7.11 psi
	At rated speed	Factory spec.	245 ~ 441 kPa 2.5 ~ 4.5 kgf/cm² 35.6 ~ 64.0 psi
		Allowable limit	245 kPa 2.5 kgf/cm² 35.6 psi

(Reference)

Tightening torque	Oil pressure switch	14.7 ~ 19.6 Nm 1.5 ~ 2.0 kgf-m 10.8 ~ 14.5 lb-ft

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1. SPECIFICATIONS

Item		Reference Value
Hydraulic pump (Only for steering)	Type	Gear
	Pump capacity	16.9 ℓ /min 4.46 GPM
	Pump gear ratio	1 : 1
Power steering unit	Power steering unit volume	40 cc/rev
	Relief pressure	145 kgf/cm^2 14.2 MPa
Steering cylinder	Tube O.D	50 mm 1.969 in.
	Tube I.D	40 mm 1.575 in.
	Rod O.D	25 mm 0.984 in.
	Stroke	174 mm 6.850 in.
Steering wheel	Operation force condition: (Engine speed approx. 2,600 rpm)	Less than 0.6 kgf 5.9 N 1.3 lbs.

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