TB80FR

Compact Excavator

Serial No. 17810006~
BOOK No. CL2E000

WORKSHOP MANUAL

TAKEUCHI

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I . GENERAL
II . SPECIFICATIONS
III. MACHINE CONFIGURATION
IV. HYDRAULIC UNITS
V . TROUBLESHOOTING
VI. ENGINE

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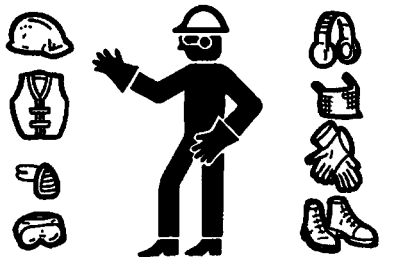
SAFETY PRECAUTIONS

Observe all safety rules

- Operation, inspection and maintenance of this machine must be performed only by a trained and qualified person.
- All rules, regulations, precautions and safety procedures must be understood and followed when performing operation, inspection and maintenance of this machine.
- Do not perform any operation, inspection and maintenance of this machine when under the adverse influence of alcohol, drugs, medication, fatigue, or insufficient sleep.

Wear appropriate clothing and personal protective equipment

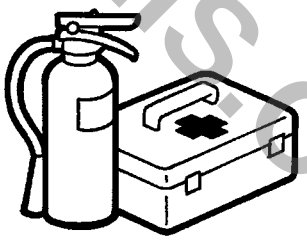
- Do not wear loose clothing or any accessory that can catch on controls or in moving parts.
- Do not wear oily or fuel stained clothing that can catch fire.
- Wear a hard hat, safety shoes, safety glasses, filter mask, heavy gloves, ear protection and other protective equipment as required by job conditions. Wear required appropriate equipment such as safety glasses and filter mask when using grinders, hammers or compressed air, as metal fragments or other objects can fly and cause serious personal injury.
- Use hearing protection when operating the machine. Loud prolonged noise can cause hearing impairments, even the total loss of hearing.



E3A040

Provide a fire extinguisher and first aid kit

- Know where afire extinguisher and first aid kit are located and understand how to use them.
- Know how to contact emergency assistance and first aid help.



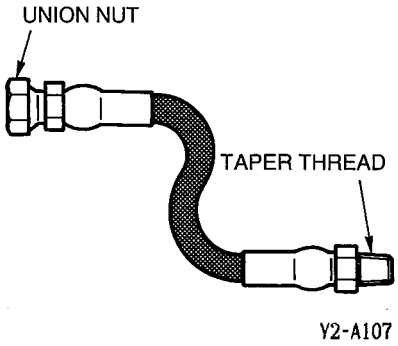
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TIGHTENING TORQUES

Hydraulic Hoses

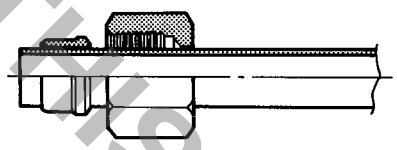
Hose Fitting Size	Torque			
	Union Nut (G)		Taper Thread (R)	
	N·m	ft-lb	N·m	ft-lb
1/8	$9.8\ ^{+4.9}_{0}$	$7.3\ ^{+3.5}_{0}$	11.8 ±1.2	8.7 ±0.8
1/4	$24.5\ ^{+4.9}_{0}$	$18.1\ ^{+3.5}_{0}$	29.4 ±2.9	21.7 ±2.1
3/8	$49\ ^{+4.9}_{0}$	$36.2\ ^{+3.5}_{0}$	53.9 ±5.4	39.8 ±3.9
1/2	$58.8\ ^{+4.9}_{0}$	$43.4\ ^{+3.5}_{0}$	88.3 ±8.8	65.1 ±6.4
3/4	$117.7\ ^{+4.9}_{0}$	$86.8\ ^{+3.5}_{0}$	147.1 ±14.7	108.5 ±10.7
1	$137.3\ ^{+4.9}_{0}$	$101.3\ ^{+3.5}_{0}$	196.1 ±19.6	144.7 ±14.3



Y2-A107

Bite Type Pipe Fitting for Steel Pipe

Pipe Outer Diameter (mm)	Torque	
	N·m	ft-lb
8	34.3 ±4.9	25.3 ±3.5
10	41.7 ±2.5	30.7 ±1.7
12	58.8 ±4.9	43.4 ±3.5
15	88.3 ±4.9	65.1 ±3.5
16	93.2 ±4.9	68.7 ±3.5
18	132.4 ±4.9	97.6 ±3.5
22	205.9 ±9.8	151.8 ±7.2
27.2	245.2 ±9.8	181.0 ±7.2
28	313.8 ±19.6	231.4 ±14.3
32	313.8 ±19.6	231.4 ±14.3
35	411.9 ±19.6	303.7 ±14.3


Y2-A108

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SPECIFICATION TABLES

SPECIFICATIONS

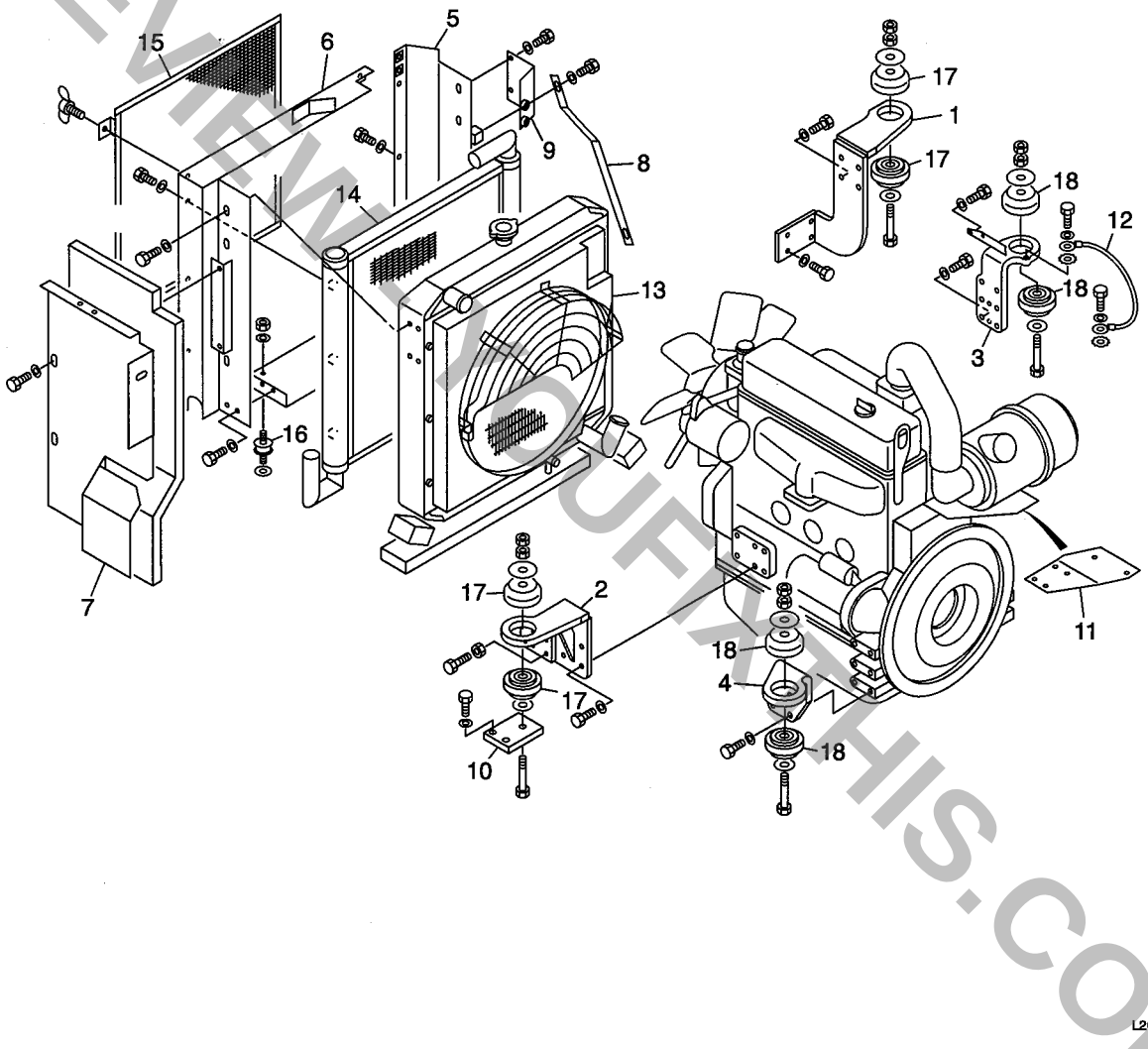
Serial Number		17810006~
Machine Type		Cab
Machine Mass (not including operator)		
Rubber Crawler	kg	7900
Steel Crawler	kg	8030
Engine Rated Output	kW/min^{-1}	41.2/1900
Bucket Capacity (Standard Bucket)		
Rated Capacity	m^3	0.245
Struck Capacity	m^3	0.165
Performance		
Slew Speed: Slow/Normal	min^{-1}	5/8.7
Travel Speed: 1st/2nd	km/h	3.2/5.8
Gradeability	% (degree)	58 (30)
Ground Pressure: Rubber Crawler	kPa	35.2
Steel Crawler	kPa	36.2
Noise Level: Sound-power	dB (A)	LWA100
Sound-pressure level	dB (A)	LPA79
Auxiliary Hydraulic Flow Rate	L/min	68.4
Dimensions		
Overall Length in Transport Position	mm	6145
Overall Width	mm	2300
Overall Height	mm	2715
Dimensions of Base Machine		
Tail Swing Radius	mm	1150
Distance of Rearmost Upper Structure from Axis of Rotation	mm	1150
Clearance Height under Upper Structure	mm	725
Distance between Centerlines of Drive Sprockets and Idlers	mm	2195
Crawler: Overall Length	mm	2830
Overall Width	mm	2300
Crawler Shoe Width	mm	450
Minimum Ground Clearance	mm	345

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DRIVE SYSTEM

CONSTRUCTION

Engine Mount, Radiator and Oil Cooler – 1/2



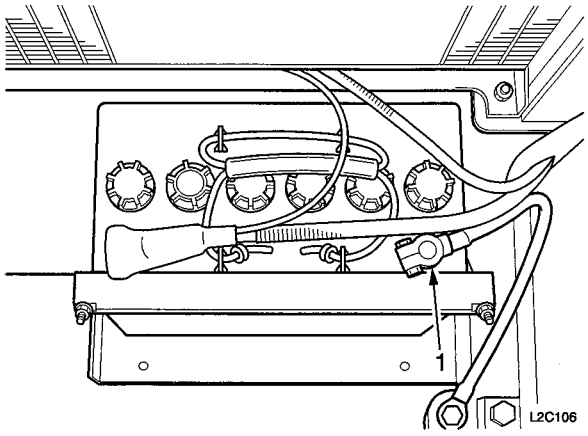
1. Engine Foot FR
2. Engine Foot FL
3. Engine Foot RR
4. Engine Foot RL
5. Bracket
6. Bracket
7. Plate
8. Plate
9. Plate
10. Plate
11. Plate
12. Ground Cable
13. Radiator
14. Oil Cooler
15. Gauge
16. Cushion Rubber
17. Cushion Rubber
18. Cushion Rubber (inscribed as "A")

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DISASSEMBLY AND ASSEMBLY

Removing the Engine

1. Disconnect the battery ground cable (1) from the battery.

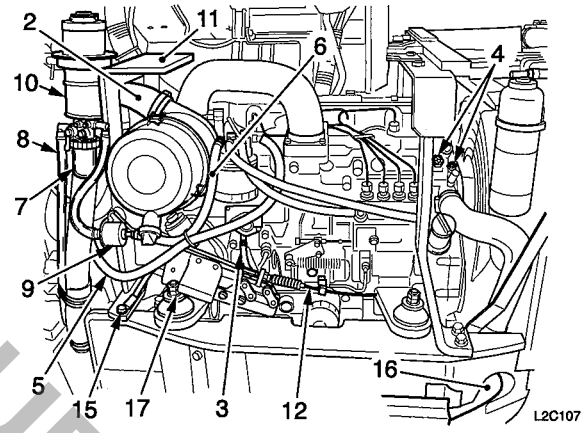


2. Remove the engine hood and side cover.
   ☞ "Removing the Covers"

3. Remove the counterweight.
   ☞ "Removing the Upper Frame"

4. Tilt up the floor frame.

5. Remove the radiator and oil cooler.
   ☞ "Removing the Radiator and Oil Cooler"

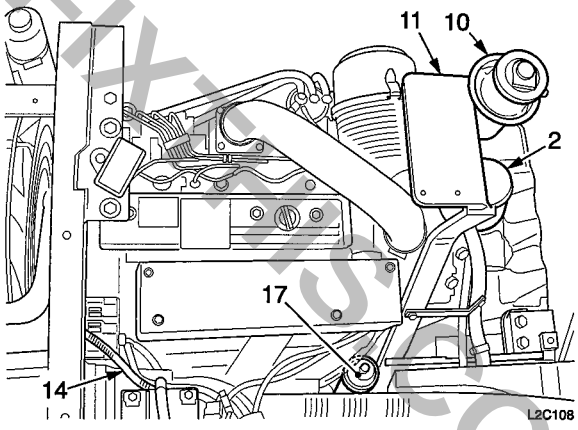


6. Disconnect the air hose (2) from the engine.

7. Disconnect the coolant drain hose (3).

8. Close the valves (4) and disconnect two heater hoses.

9. Disconnect the fuel hoses (5) and (6) from the engine.



10. Disconnect the fuel hose (8) from the water separator (7)

11. Disconnect the electric wiring to the feed pump (9).

12. Remove the filler cap (10) from the bracket (11).
    - Remove the filler cap with hose attached and put it on the fuel tank.

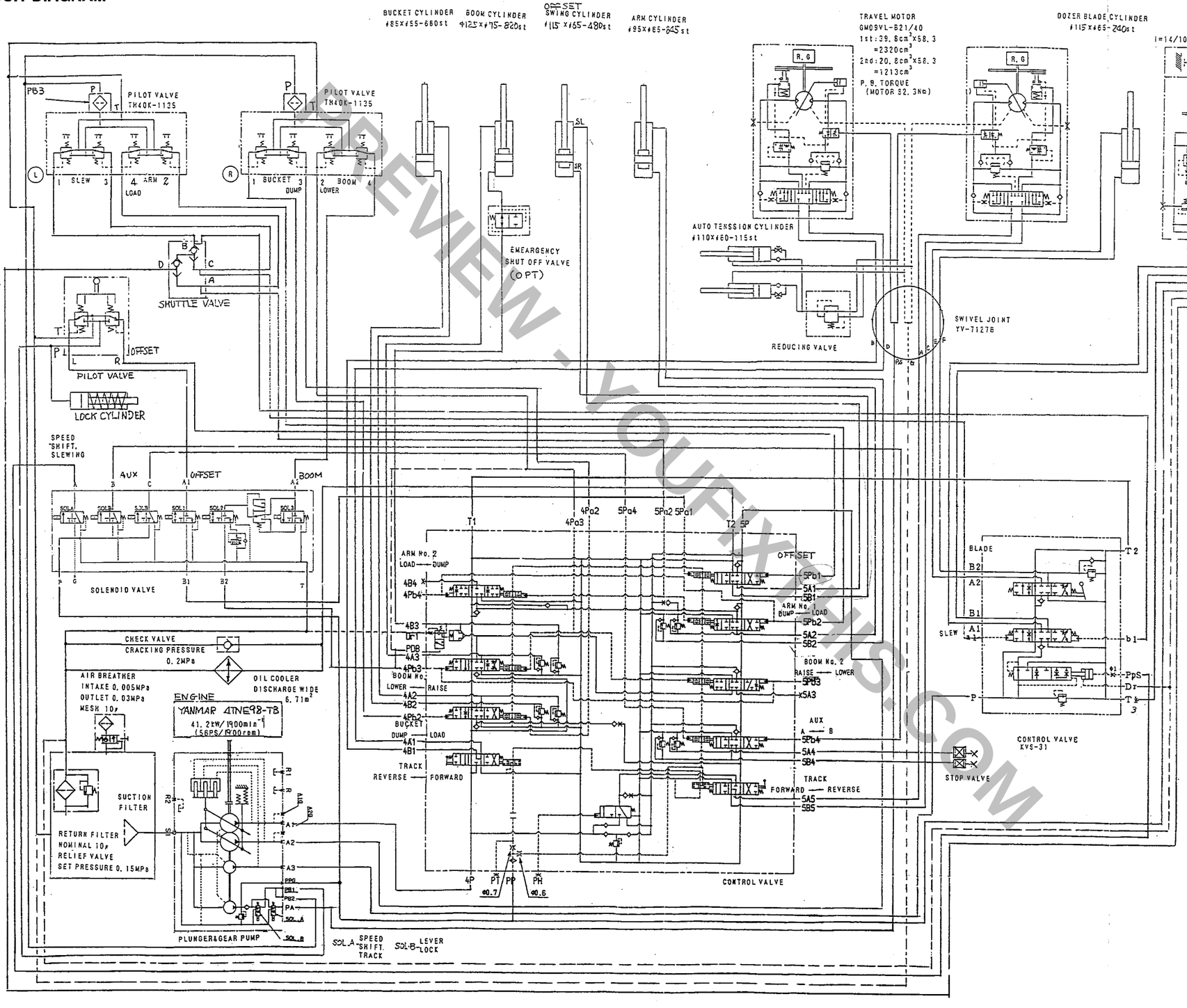
13. Remove the water separator (7) and the feed pump (9) together with the bracket (11).

14. Remove the hydraulic pump.
    ☞ "Removing the Hydraulic Pump"

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HYDRAULIC SYSTEM

HYDRAULIC CIRCUIT DIAGRAM



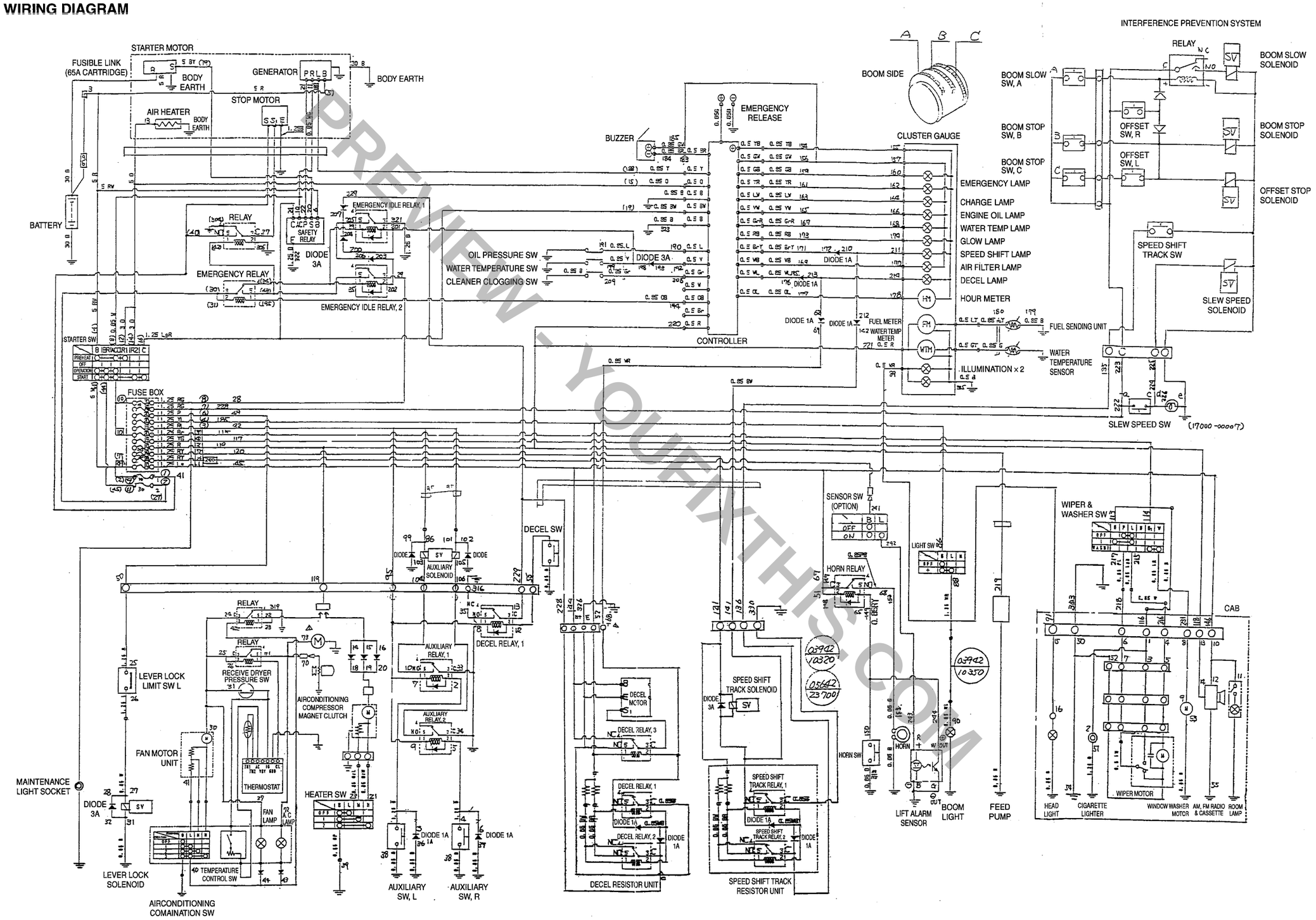
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L2C700

ELECTRICAL SYSTEM

ELECTRICAL WIRING DIAGRAM



L2C800

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CONTENTS

OVERALL MACHINE

No operations can be done. 4

All operations can be done, but there is no power. 5

The boom, bucket, slew and arm do not move at all, or the speed is low. 7

The boom cannot be raised or the left offset cannot be operated. The interference prevention system does not operate normally. 9

MACHINE TRAVEL

The machine will not travel at all. 13

Right or left travel is impossible. 14

Speed drops in the left or right travel, causing the machine to travel in a curve. 16

Machine won't accelerate during travel. 18

During travel, the hoe attachment cannot be operated 21

SLEWING

No slewing can be done. 22

Right or left slewing cannot be done. 25

Slewing speed is low, or there is no power. 27

The machine slews, but overrun when slewing stops is great, or it cannot be stopped. 29

Slewing in slow gear is not possible 31

BOOM

The boom cylinder doesn't move. 33

Boom cylinder operation is slow, or there is no power. 35

When the boom operation lever is pulled gently, the boom drops temporarily. 38

The amount of boom natural drop is great. 39

ARM

The arm cylinder doesn't move. 40

Arm cylinder operation is slow, or there is no power. 42

The amount of arm natural drop is great. 44

BUCKET

The bucket cylinder doesn't move, or there is no power. 45

The amount of bucket natural drop is great. 47

OFFSET

The offset cylinder doesn't move. 48

DOZER BLADE

The dozer blade cylinder doesn't move, or there is no power. 50

The amount of dozer blade natural drop is great or the dozer blade won't hold the machine up. 52

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3.13 Periodic Maintenence Schedule

The engine periodic inspection timing is hard to determine as it varies with the application, load status, qualities of the fuel and lubricating oils used and handling status. General rules are described here.

○: Inspection ◎: Parts replacement

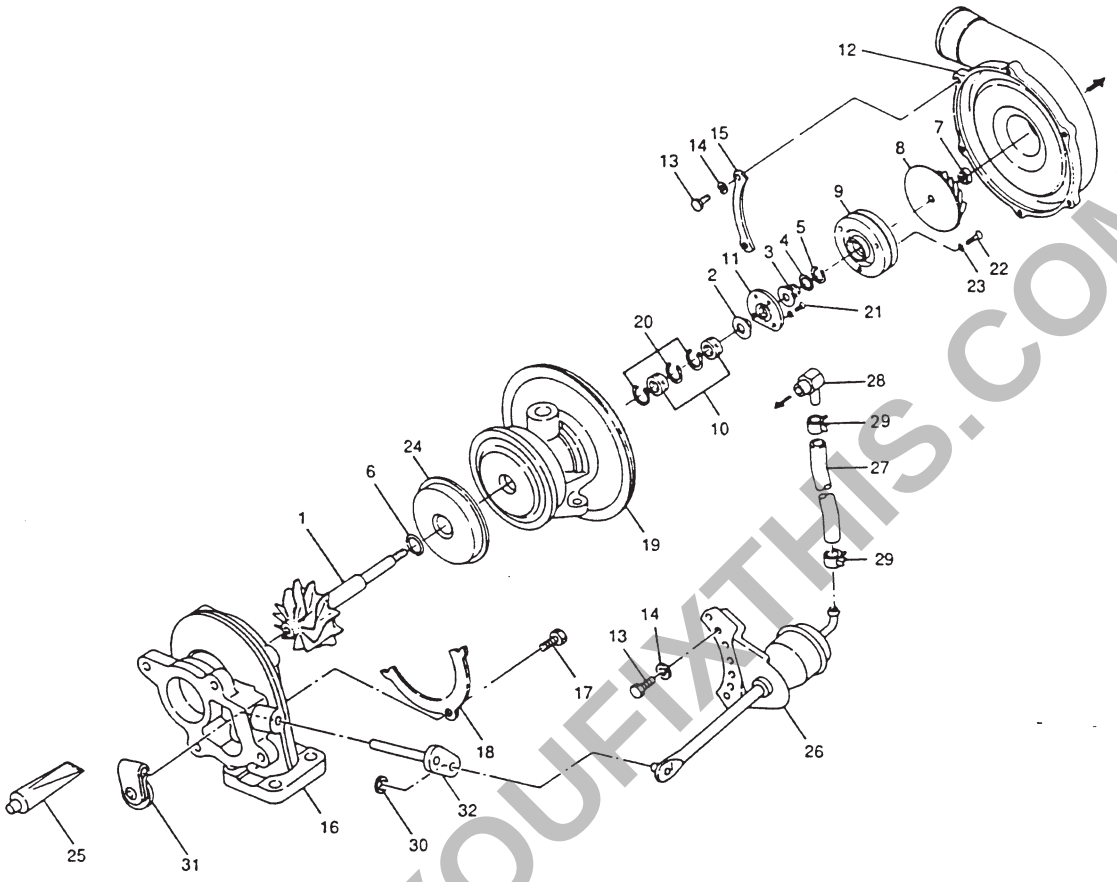
Classification	Item	Daily	Maintenance period				
			Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Fuel oil system	Fuel tank level check and fuel supply	○					
	Fuel tank draining		○				
	Water separator draining (Option)		○ Every 100 hours				
	Water separator cleaning (Option)				○		
	Fuel filter element replacement				◎		
Lubricating oil system	Lube oil level check	○					
	Lube oil replacement		◎ 1st time	◎ 2nd time and thereafter			
	Lube oil filter replacement						
Cooling water system	Cooling water level check and replenish	○					
	Radiator fin cleaning			○			
	Cooling fan V-belt tension check	○					
	Cooling water replacement					◎	
	Cooling water path flushing and maintenance						○
Fuel oil, lube oil and cooling water leakage check		○					
Rubber hose	Fuel pipe and cooling water pipe inspection and maintenance						○
Air intake system	Air cleaner cleaning and element replacement			○	◎		
	Turbocharger blower cleaning					○	
Electrical system	Warning lamp & instruments function check	○					
	Battery electrolyte level check and battery recharging	○					
Cylinder head	Intake/exhaust valve head clearance adjustment					○	
Fuel injection pump and valve	Fuel injection valve pressure inspection					○	
	Fuel injection timing inspection						○

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(3) Components

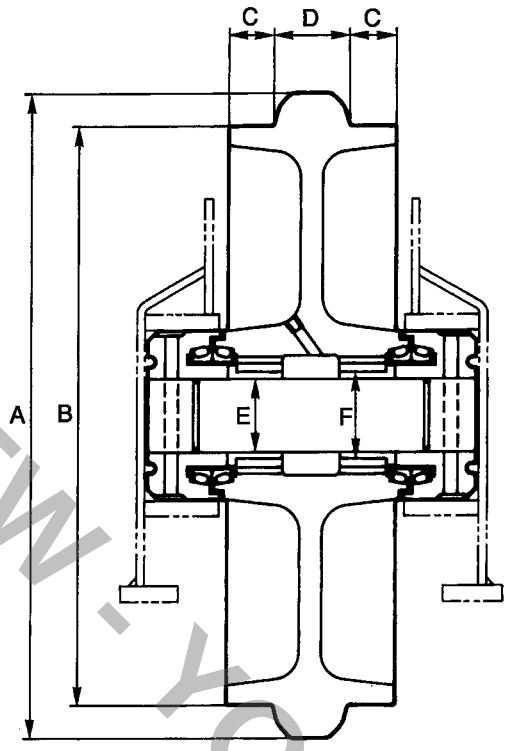


No.	Part name	No.	Part name
1	Turbine shaft	17	Bolt
2	Thrust bushing	18	Lock plate
3	Oil thrower	19	Bearing housing
4	Seal ring	20	Retaining ring
5	Seal ring	21	Screw
6	Seal ring (turbine side)	22	Screw
7	Lock nut	23	Lock washer
8	Impeller	24	Heat protector
9	Seal plate	25	Liquid gasket
10	Journal bearing	26	Waste gate actuator
11	Thrust bearing	27	Hose
12	Compressor housing	28	Adapter
13	Flanged bolt	29	Clip
14	Spring washer	30	Retaining ring
15	Clamp	31	Waste gate valve
16	Turbine housing	32	Link plate

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Idler



L2B008

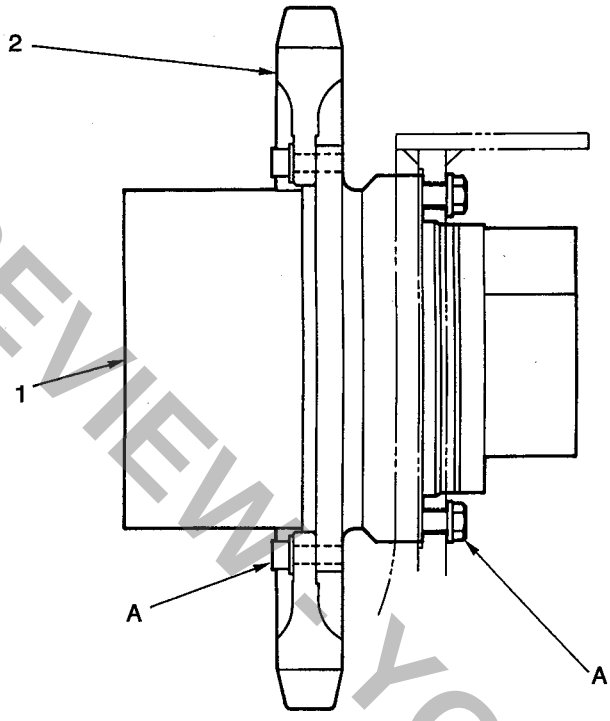
Unit: mm

Code	Item	Designated Standard					Servicing Procedure
A	Outer Diameter of Brim	Basic Dimension			Allowable Value		
		494 $^{0}_{-2}$			488		
B	Outer Diameter of Tread	436			430		Replace
C	Width of Tread	34.5			37		
D	Width of Brim	56			50		
E	Shaft and Bushing Bore Diameter Clearance	Basic Dimension	Allowable Tolerance		Standard	Allowable	
			Shaft	Hole			
		55	0 -0.03	+0.144 +0.098	0.098~0.174	—	
F	Idler and Bushing Outer Diameter Interference	65	+0.083 +0.041	+0.03 0	0.011~0.083	—	Replace
G	Shaft End Play	Standard Value			Allowable Value		
		0.9			1.4		

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Travel Motor

1. Travel Motor
2. Sprocket



L2C306

A: ⇨ 241 ±12.1 N·m [Apply thread lock]

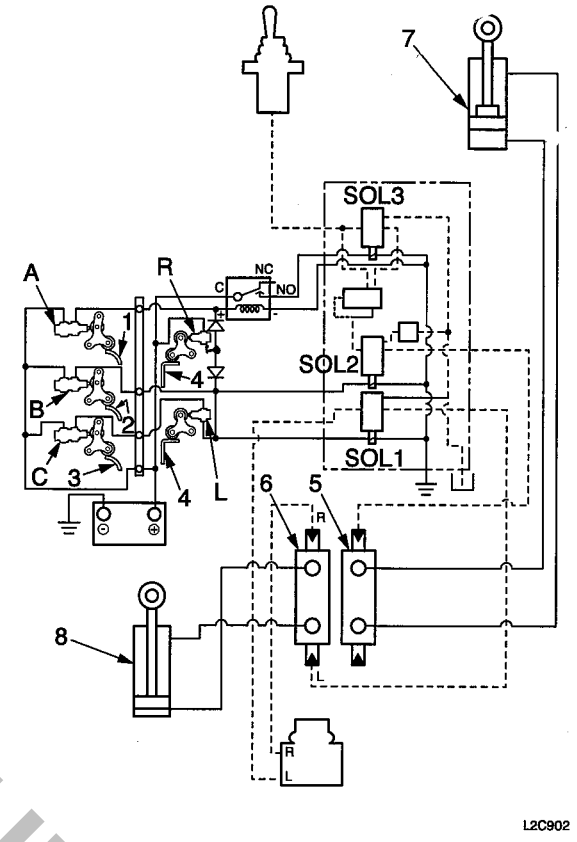
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OPERATION

The interference prevention system detects the boom position by the cams (1), (2), and (3), and the boom switches A, B, and C; and detects the offset arm position by the angle (4) and the offset switches R and L. When the attachment enters the interference area, the solenoids 1, 2, and 3 of the solenoid valve are switched by the detected signal to control the spools of the boom section (5) and the offset section (6) of the control valve. Then, the boom cylinder (7) raise is decelerated and stopped, and the left offset of the offset cylinder (8) is stopped, thus preventing interference between the attachment and the cab.

- Structure and operations of the solenoid valve
  ☞ "IV. Hydraulic Unit, Solenoid Valve"
- Switches and solenoids and their functions

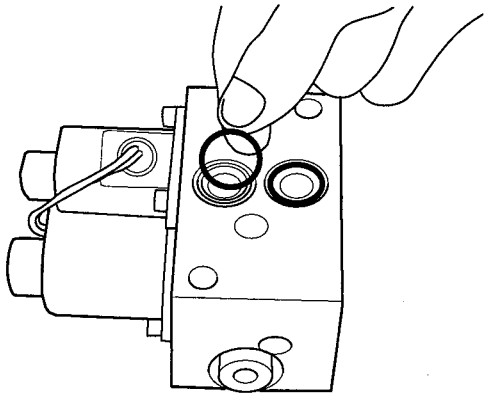
Switches	
Boom switch A	Decelerates boom raise.
Boom switch B	Prevents interference between boom and cab.
Boom switch C	Prevents interference between bucket and cab.
Offset switch R	Prevents interference between bucket and cab.
Offset switch L	Prevents interference between boom and cab.
Solenoids	
Solenoid 1	Stops left offset.
Solenoid 2	Stops boom raise.
Solenoid 3	Decelerates boom raise.



L2C902

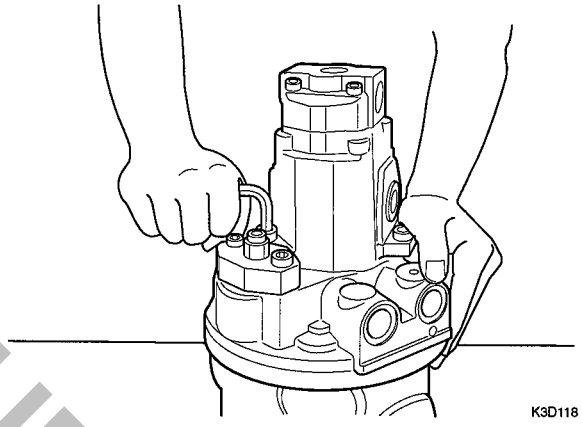
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d. Fit the O-ring to the body.



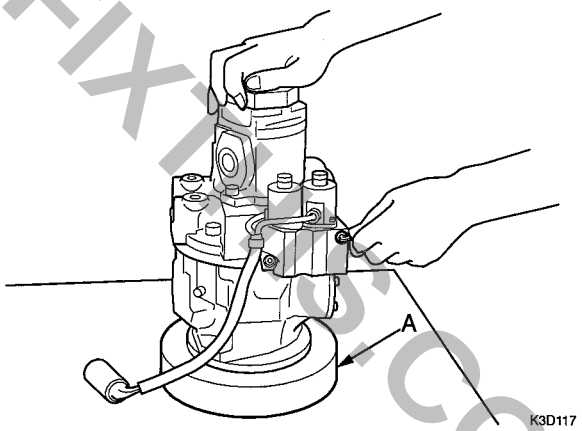
K3D156

22. Unite the main pump and gear pump and fix them with the cap screws.
    Cap screw: 55~69 N·m



K3D118

23. Mount the solenoid valve on the pump and fix it with the cap screws.
    Cap screw: 28~35 N·m



K3D117

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DISASSEMBLY AND ASSEMBLY

General Cautions

- Since all parts in control valves are precision machined, carry out disassembly and assembly operations in a clean place.
- Before disassembly, clean the outside surfaces around the valves.
- Clean each of the disassembled parts and apply clean hydraulic oil to them.
- Apply hydraulic oil to sliding surfaces and apply a thin coating of grease to seals when assembling them.
- Replace all seals with new ones each time the valves are disassembled.
- Spools and section bodies are specially selected for a precise fit. Therefore, if any damage is found in either of these parts, replace the section assembly as a unit.
- Be sure to number each section and spool to avoid mistakes during assembly.

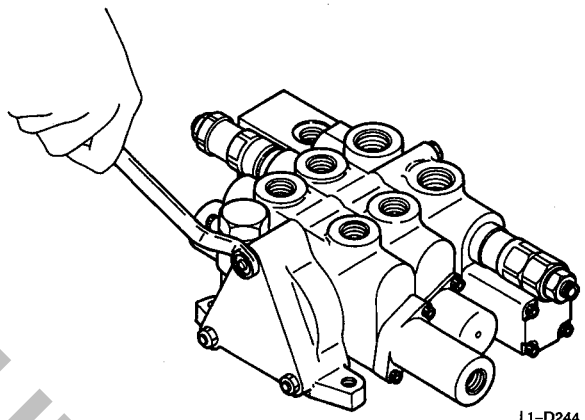
Following is an explanation of the control valve disassembly procedure.
Follow the procedure used to disassemble the control valve in reverse order when reassembling it.

- Before disassembly, number each section and spool.

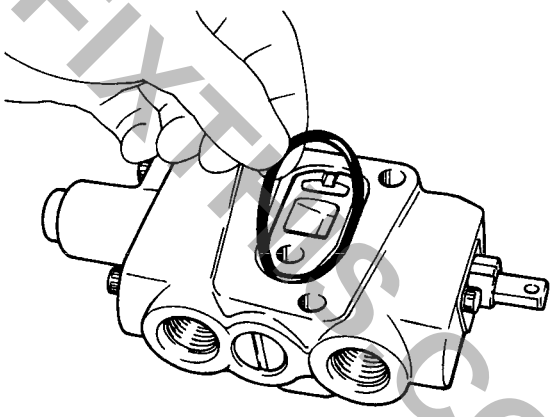
Disassembly

Valve Assembly

1. Loosen the nuts and remove the tie rods, then remove the sections.
   ⇐ Nut: 19.0 N·m

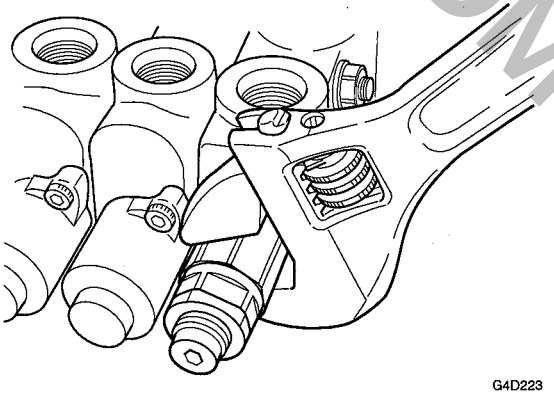

L1-D244

2. Remove the O-ring.
   - The mating surfaces are metal seals, so be careful not to scratch, bruise or otherwise damage them.


YI-D226

3. Remove the main relief valves and the port relief valves, then remove the O-rings from the relief valves.
   - Do not disassemble the relief valves unless it is necessary.
   - When using a spanner or adjustable wrench, be sure to attach it in the place shown in the figure at right.

   ⇐ Relief valve: 68.6~78.5 N·m

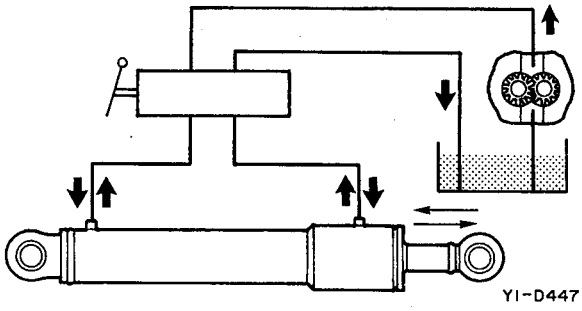

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Inspection after Assembly

No Load Operation Test

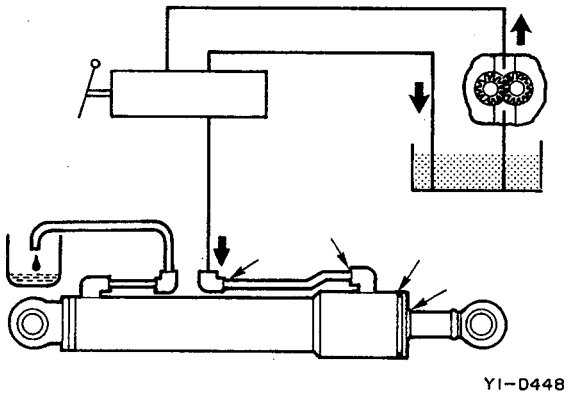
1. Place the cylinder in a horizontal position with no load.
2. Apply gentle pressure alternately to the ports at both ends, operating the piston rod 5 or 6 times.
3. Make sure there is no abnormality in the operating condition.



Leak Test

External Leakage

1. Apply test pressure for 3 minutes each to the retraction side and the extension side.
2. Make sure there are no abnormalities such as external leakage or permanent deformation, etc. in the rod seal, the rod cover mount, or in any welded portion.



Internal Leakage

1. Disconnect the extension side hose.
2. Apply test pressure to the retraction side for 3 minutes.
3. Measure the amount of oil that has leaked from the extension side.
   - The amount of leakage should be 1 cm^3 / 3min or less.

Bleeding Air from the Hydraulic Cylinder

Bleed the air out of the cylinder when the cylinder is removed or when the hydraulic piping, etc. is disconnected.

1. Start the engine and let it idle for approximately 5 minutes.
2. With the engine running at slow speed, extend and retract the cylinder 4 or 5 times.
   - Move the piston rod to a position 100 mm before the end of the stroke, being careful not to apply any relief at all.
3. With the engine at top speed, repeat the operation in (2), then with the engine running at slow speed, move the piston rod to the stroke end and apply relief.

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DISASSEMBLY AND ASSEMBLY

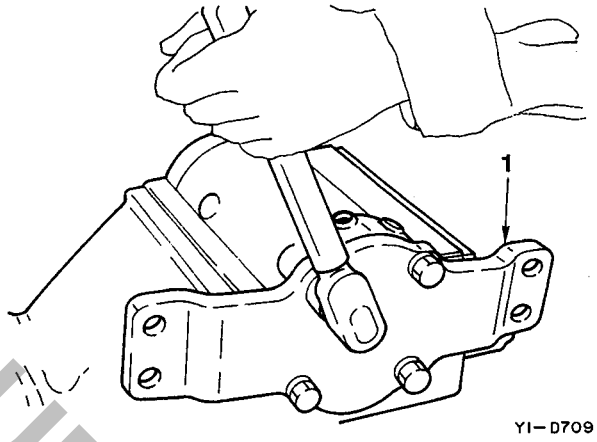
General Cautions

- Carry out disassembly and assembly in a clean work area and provide clean containers to hold the disassembled parts.
- Clean thoroughly around the ports and remove the paint on the joints of each part with a wire brush.
- Clean the disassembled parts with a cleaning fluid such as diesel fuel.
- Replace the seals with new ones each time the swivel joint is disassembled, applying a thin coating of grease to them.
- Check each part for abnormal wear or seizing. Also remove any burrs or sharp edges, etc. with sandpaper or by a similar method.
- Check for foreign matter or dirt, etc. in the seal grooves.

The following describes the disassembly procedure. For assembly, follow the disassembly procedure in the reverse order.

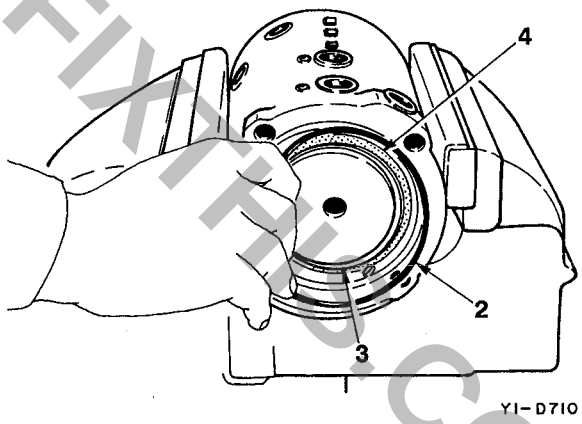
Disassembly

1. Take out the bolts and remove the spring washers, then remove the flange (1) from the hub.
   Bolt: 24.5~39.2 N·m
   - During assembly, place a pipe on the stopper pin of the shaft and check if the shaft rotates.



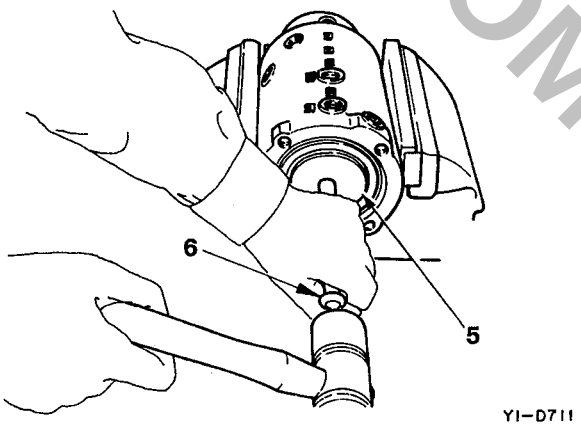
YI-D709

2. Remove the O-ring (2), snap ring (3) and thrust ring (4).
   - During assembly, make sure the snap ring fist securely in the groove.



YI-D710

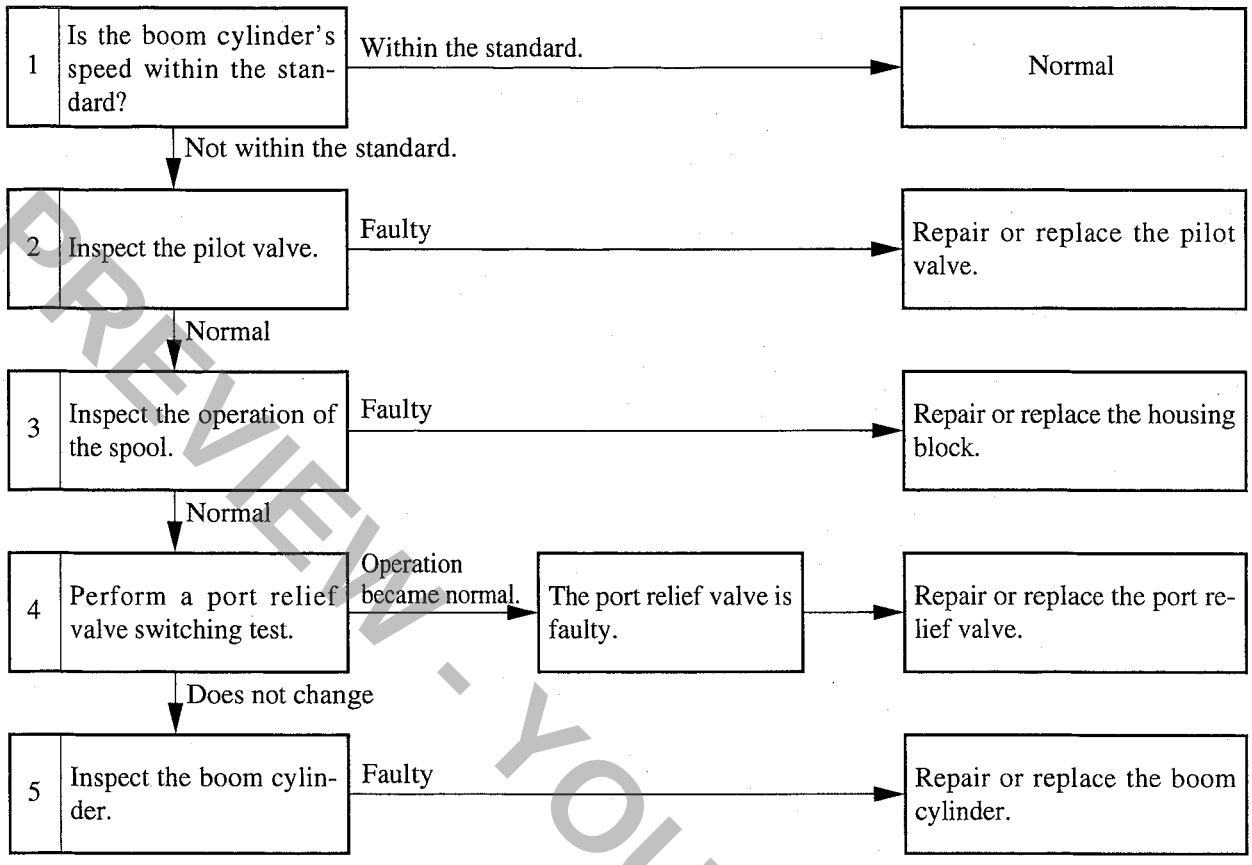
3. Remove the shaft (5) from the hub.
   - Place a knock pin (6) against the shaft end and tap with a hammer. Select a knock pin (6) made of copper or plastic, etc.
   - Apply a thin coating of hydraulic oil or grease to the outer circumference of the shaft.



YI-D711

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BOOM CYLINDER OPERATION IS SLOW, OR THERE IS NO POWER.



1. Is the boom cylinder's speed within the standard?
   ☞ "II. Specifications, Standards for Judging Performance"

2. Inspect the pilot valve.
   ☞ "V-34"

3. Inspect the operation of the spool.
   ☞ "V-34"

4. Perform a port relief valve switching test.
   ☞ "V-34"

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1.6 How to Read This Manual

(1) Range of Operation Explanation

This manual explains the troubleshooting, installation/removal, replacement, disassemble/reassembly, inspection, adjustment and adjusting operation procedures for the 4TNE94/98/106 (T) engine.

Refer to the manufacturer's manual for each of the fuel injection pump, governor, starting motor and alternator except for their installation.

(2) How to Read The Explanations

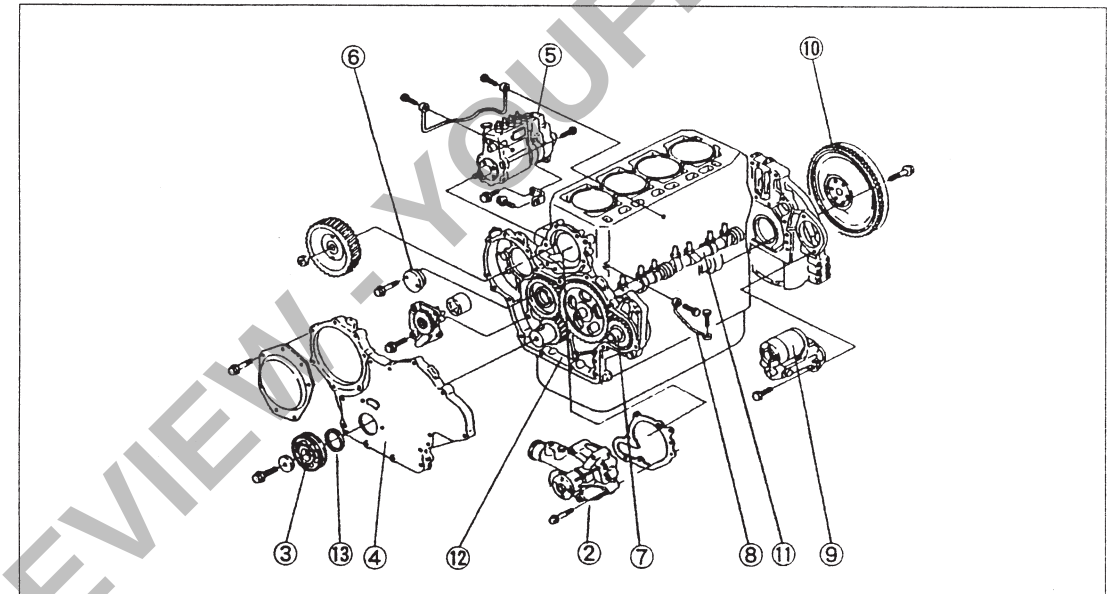
(2.1) An exploded view, sectional views, a system diagram, etc. are shown at the beginning of each section as required for easy understanding of the mounted states of the components.

(2.2) For the removal/installation of each part, the procedure is shown with the procedural step No. in the illustration.

(2.3) Precautions and key points for disassembly and reassembly of parts are described as ***points***. In the explanation for each point, detailed operation method, information, standard and precautions are described.

Description Example

• **Illustration**



The job contents are described in the disassembly procedure for Nos. not shown in the illustration.

• **Disassembly procedure**

(1) Follow steps (1) to (12) of the cylinder head disassembly procedure.
(2) Remove the cooling water pump.
(3) Remove the crankshaft pulley. (***Point 1***)

Operation point to be explained on a later page.

• **Operation Points**

Disassemble: Service point for removal
Reassemble: Service point for installation
Disassemble-Reassemble: Service point required in both removal and installation

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(4) Servicing points

Point 1

Disassemble:

- Remove the crankshaft pulley using a gear puller after removing the mounting bolt. When removing the pulley with the gear puller, use a pad and carefully operate so as not to damage the thread. Set the gear puller securely to prevent the pulley from being damaged.

Reassemble:

- When installing the crankshaft pulley, apply lube oil to the bolt and carefully assemble so as not to damage the oil seal.

T=107.9~127.5 Nm (11~13 kgf-m)

Point 2

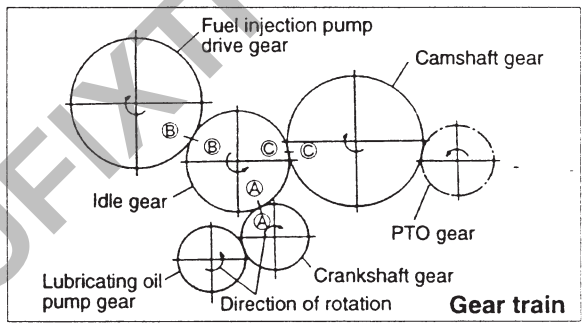
Reassemble:

- When installing the gear case cover, do not forget to install the two reinforcing bolts at the center.

- Measure the backlash of each gear.

(mm)

–	Standard	Limit
Crankshaft gear, Camshaft gear, Fuel injection pump gear, Idle gear, PTO gear,	0.08~0.14	0.16
Lubricating oil pump gear	0.09~0.15	0.17



Gear train

- Apply sealant and install the gear case cover by correctly positioning the two dowel pins.

Point 3

Disassemble:

- Remove the fuel injection pump drive gear mounting nut, remove the gear using the gear puller, and remove the fuel injection pump. Do not forget to remove the stay on the rear side. When extracting the gear using the gear puller, use a pad at the shaft and carefully operate so as not to damage the thread.

Reassemble:

- Drive gear nut T = 83.4~93.2Nm (8.5~9.5 kgf-m)

Point 4

Reassemble:

- Assemble crankshaft gear A, fuel injection pump drive gear B and camshaft gear C at the same time by aligning with idle gear A, B and C marks.
- Install the idle gear shaft with the oil hole facing upward.

Point 5

Reassemble:

- Install the PTO drive gear with its inner spline side facing the flywheel.

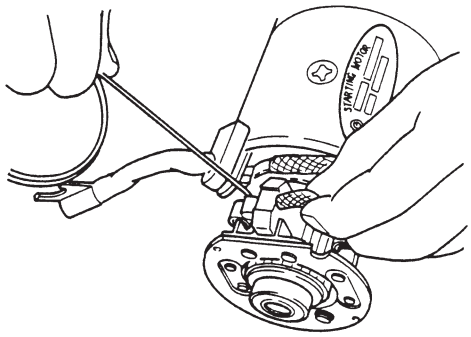
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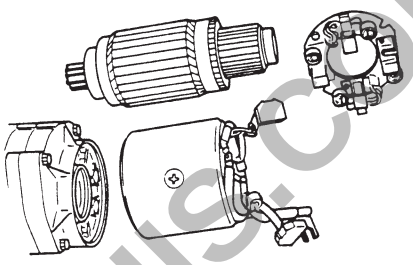
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(4) Removal of brush holder

For the negative ⊖ brush, bring the brush spring into contact with the side of the brush for lifting from the commutator surface.
For the positive ⊕ brush, extract the pull out the brush from the brush holder.
After the brush holder is removed, the armature and yoke can bedisassembled.



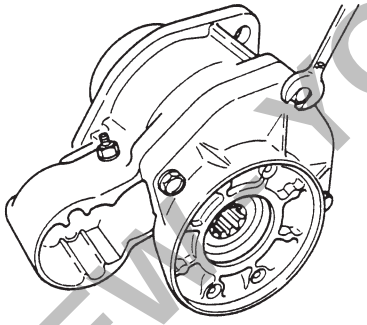
(Lifting up the brush)



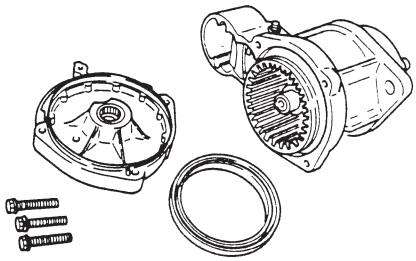
(After disassembly)

(5) Separating gear case from center bracket

Remove three M6 bolts (10 mm) fastening the gear case to the center bracket.
After removal of the M6 bolts, the center bracket and oil seal can beremoved.



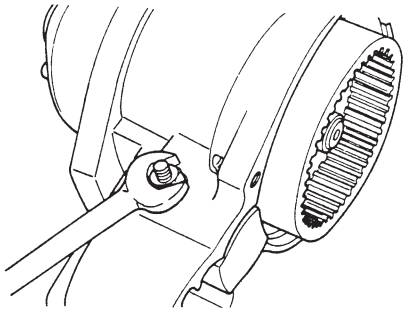
(Removing M6 bolts)



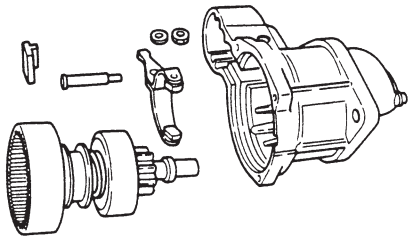
(Disassembling the center bracket)

(6) Removal of shift lever pin

Remove the M6 nut (10 mm) and pull out the shift lever pin.
Now, the dustcover, shift lever, gear case and gear shaft can be removed.



(Removing M6 nut)



(Disassembling the gear case and gear shaft)

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