TB175

Compact Excavator

BOOK No. CL3E003

WORKSHOP MANUAL

Serial No. 17510003~

TAKEUCHI

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SAFETY PRECAUTIONS

SAFETY ALERT SYMBOL

This symbol means Attention! Be Alert! Your Safety Is Involved.
The message that follows the symbol contains important information about safety.
Read and understand the message to avoid personal injury or death.

■ SIGNAL WORDS

Safety messages appearing in this manual and on machine decals are identified by the words "DANGER", "WARNING" and "CAUTION". These signal words mean the following:

⚠ DANGER	⚠ WARNING	⚠ CAUTION
The word "DANGER" indicates an imminently hazardous situation which, if not avoided, can result in serious injury or death.	The word "WARNING" indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.	The word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT: The word "IMPORTANT" is used to alert against operators and maintenance personnel about situations which can result in possible damage to the machine and its components.

This manual is intended for trained and qualified personnel only. Warnings or cautions described in this manual do not necessarily cover all safety measures. For maintenance work, each person must take adequate safety precautions against possible hazards present in the respective working environment.

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.


E3A040

- 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 injury.
- Use hearing protection when operating the machine. Loud prolonged noise can cause hearing impairments, even the total loss of hearing.

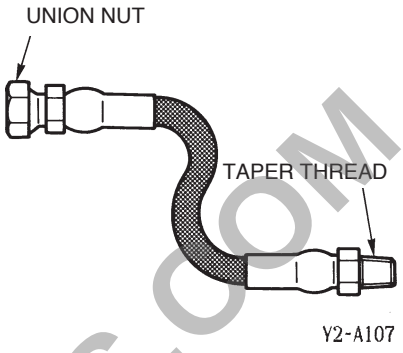
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TIGHTENING TORQUES

Hydraulic Hoses

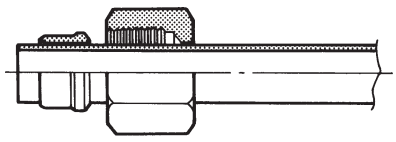
Hose Fitting Size	Torque			
	Union Nut (G)		Taper Thread (R)	
	N·m	ft-lb	N·m	ft-lb
1/8	9.8 $^{+4.9}_{0}$	7.3 $^{+3.5}_{0}$	11.8 ±1.2	8.7 ±0.8
1/4	24.5 $^{+4.9}_{0}$	18.1 $^{+3.5}_{0}$	29.4 ±2.9	21.7 ±2.1
3/8	49 $^{+4.9}_{0}$	36.2 $^{+3.5}_{0}$	53.9 ±5.4	39.8 ±3.9
1/2	58.8 $^{+4.9}_{0}$	43.4 $^{+3.5}_{0}$	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

Machine Type			Mono-Boom	2-Piece Boom
Machine Mass (not including operator)				
Rubber Crawler		kg	7280	7940
Steel Crawler		kg	7405	8145
Engine Rated Output		kW/min^{-1}	42.8/2100 (43.5/2100*)	←
Bucket Capacity (Standard Bucket)				
Rated Capacity		m^3	0.245	←
Struck Capacity		m^3	0.185	←
Performance				
Slew Speed		min^{-1}	7.6/10.7	←
Travel Speed: Rubber Crawler	1st / 2nd	km/h	2.9/5.5	←
Steel Crawler	1st / 2nd	km/h	2.8/5.3	←
Gradeability		% (degree)	35	←
Ground Pressure: Rubber Crawler		kPa	32.9	35.9
Steel Crawler		kPa	33.9	36.9
Noise Level: Sound-power level		dB (A)	LWA 100	←
Sound-pressure level		dB (A)	LpA 75	←
Auxiliary Hydraulic Flow Rate	1st / 2nd	L/min	69.3 (82**)/53.1	69.3/53.1
Dimensions				
Overall Length in Transport Position		mm	6555	6560
Overall Width		mm	2245	←
Overall Height: Rubber Crawler		mm	2570	2570 (2610***)
Steel Crawler		mm	2565	2565 (2605***)
Dimensions of Base Machine				
Tail Swing Radius		mm	1720	←
Distance of Rearmost Upper Structure from Axis of Rotation		mm	1715	←
Clearance Height under Upperstructure:				
Rubber Crawler		mm	785	←
Steel Crawler		mm	760	←
Distance between Centerlines of Drive Sprockets and Idlers:				
Rubber Crawler		mm	2210	←
Steel Crawler		mm	2180	←
Crawler				
Overall Length: Rubber Crawler		mm	2855	←
Steel Crawler		mm	2830	←
Overall Width		mm	2150	←
Crawler Shoe Width		mm	450	←
Minimum Ground Clearance :				
Rubber Crawler		mm	385	←
Steel Crawler		mm	360	←

*: 17510003~17512104
**: High flow
***: Equipped with roof guard.

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RECOMMENDED LUBRICANTS

Use different fuels, lubricants and greases according to the temperature, referring to the chart below.

- Change the lubricant earlier than as show in the table if it is extremely dirty or its performance has deteriorated severely.
- Whenever possible, use the same brand of lubricant as before. If changing with a different brand, replace the entire quantity – do not mix different brands.

Part	Type	Type by temperature -22 -4 14 32 50 68 86 104°F -30 -20 -10 0 10 20 30 40°C	Replacement interval	Capacity
Engine oil pan	Diesel engine oil API service CD	SAE 5W-20 SAE 10W-30 SAE 15W-40	After first 50 hrs. Every 250 hrs.	Upper limit 10.2L Lower limit 5.7L
Hydlaulic tank	Antiwear hydraulic oil (Option: Biode-gradable oil)	ISO VG68 ISO VG46 ISO VG32	Every 2000 hrs.	Total system 132L Tank level 68L
Fuel tank	Diesel fuel	Use a clean, Quality fuel for performance and optimum engine life. • To prevent fuel flow problems in cold weather, use diesel fuel with a pour point of at least -12°C (10°F) below the lowest expected ambient temperature. • Minimum cetane number is 45. Low temperature or high altitude operation may require the use of fuel with a higher cetane number.		Tank level 120L
Engine cooling system	Coolant (water**+Coolant***)	30% coolant mixture 50% coolant mixture	Every 1000 hours	9.5L
Travel reduction gear	Gear oil API-GL-4	SAE 90	After first 50 hrs. Every 1000 hrs.	1.5L
Carrier Roller	Diesel engine oil API service CD	SAE 30	—	150mL
Track Roller	Mobil gear SHC 680	——	—	17510003~ 17510098: 170mL 17510099~: 130mL
Idler	Diesel engine oil API service CD	SAE 30	—	150mL
Slew Grease Bath	Lithium grease EP-2 NLGI No. 2	——	—	8500mL
Slew bearing		——	Every 50 hrs.	As required
Working equipment		——	Daily or erery 10 hrs.	
Levers		——	When required	

* If the percentage of the traveling time within the total operating time is high, replace the gear oil earlier than the specified time.
** For water, use tap water (soft). Do not use well or river water.
*** When the ambient temperature drops below 0°C, add coolant (antifreeze). Follow the coolant manufacture's instructions to determine the mixture ratio.

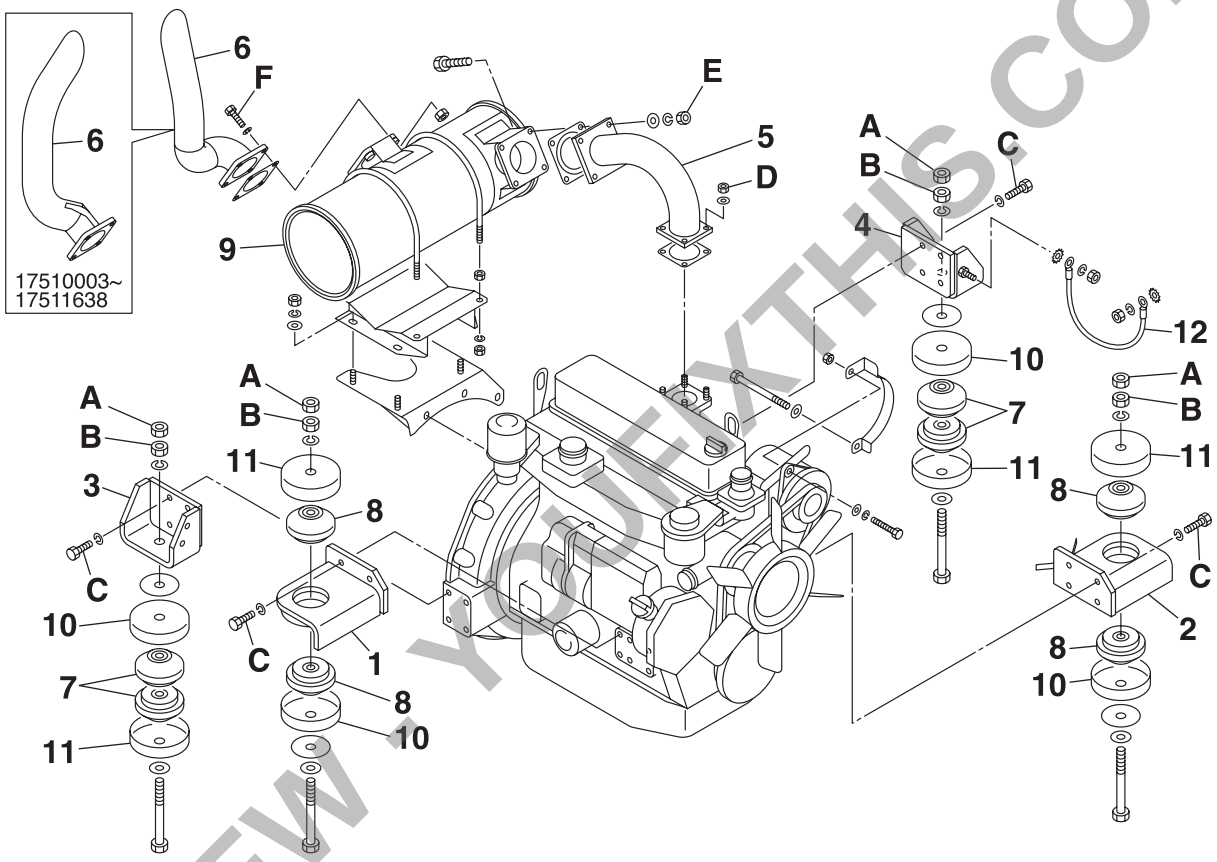
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DRIVE SYSTEM

CONSTRUCTION

Engine Mount: S/N 17510003~17512104



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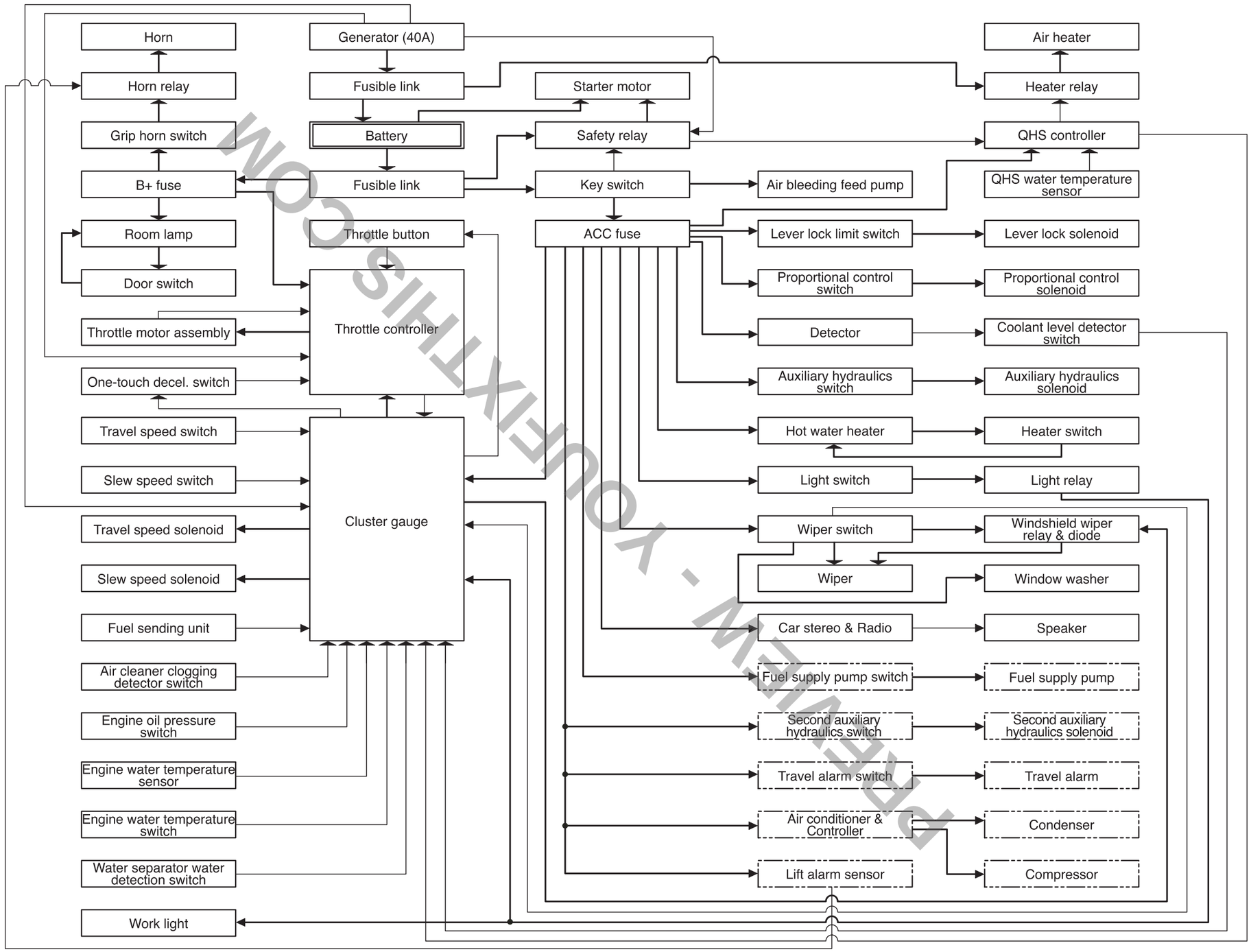
A: 241 N·m
B: 193 N·m
C: 55 N·m
D: 23 N·m
E: 47 N·m
F: 18 N·m
Apply thread-locking compound.

1. Engine Foot FR
2. Engine Foot FL
3. Engine Foot RR
4. Engine Foot RL
5. Exhaust Pipe
6. Exhaust Pipe
7. Cushion Rubber
8. Cushion Rubber
9. Silencer
10. Stopper
11. Stopper (inscribed as “A”)
12. Ground Cable

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ELECTRICAL SYSTEM DIAGRAM



The thick line indicates the power line and the thin line indicates the signal flow [ ] is optinal.

L3C8011

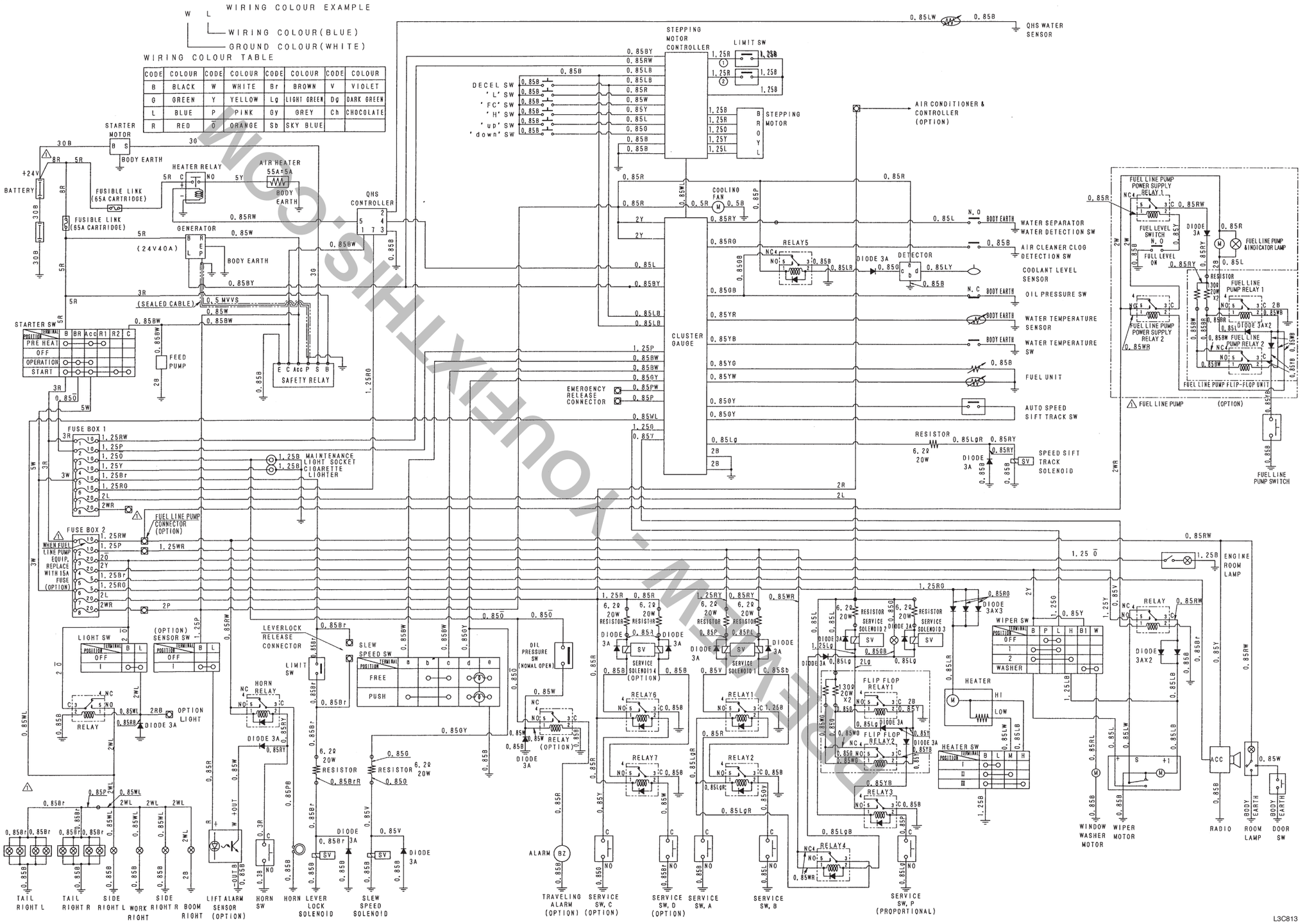
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ELECTRICAL SYSTEM

ELECTRICAL WIRING DIAGRAM

S/N: 17510003~17511262



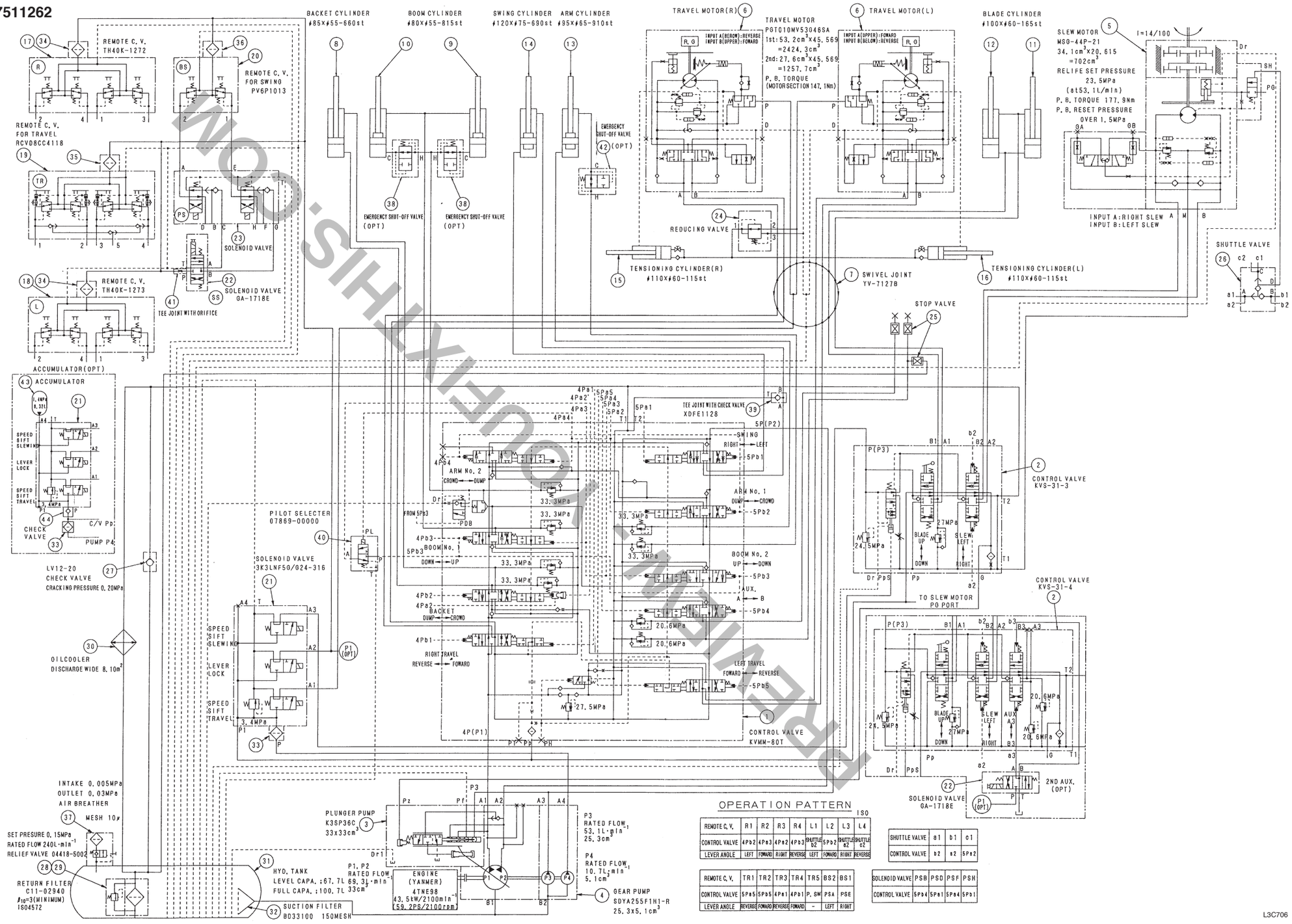
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HYDRAULIC SYSTEM

HYDRAULIC CIRCUIT DIAGRAM

Mono-Boom: S/N 17510003~17511262



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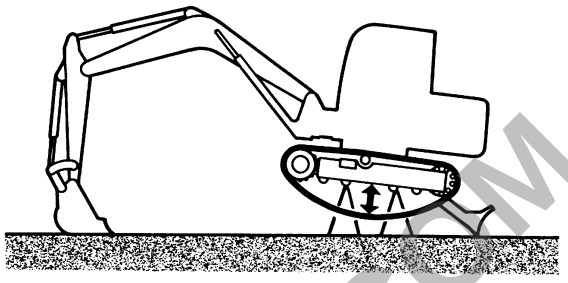
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DISASSEMBLY AND ASSEMBLY

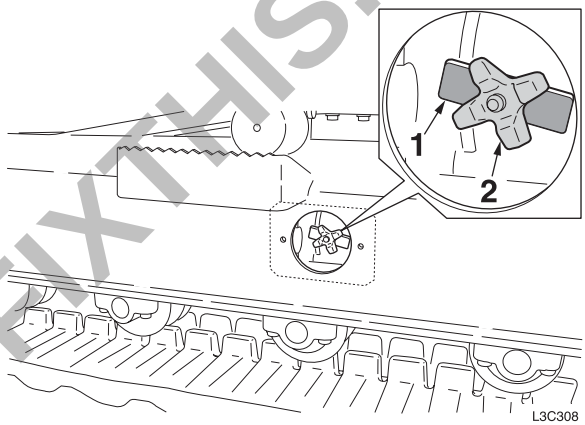
Removing the Rubber Crawler

When the travel speed switch is set to the 2nd speed side while the engine is running, the tensioning cylinder rods extend and the crawlers are tightened.
Always keep the switch at the 1st speed side except when tightening the crawlers.

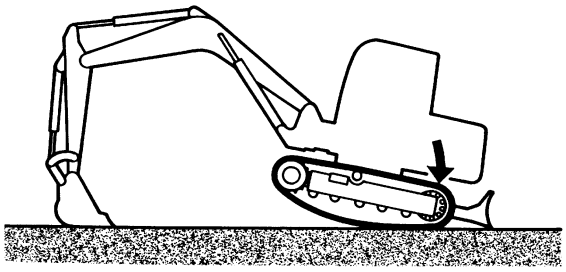
1. Start the engine and raise the machine body with the hoe attachment and dozer blade.
2. Stop the engine.
3. Remove the valve covers at the center of the left and right crawler frames.
4. Loosen the lock plate (1) counterclockwise.
5. Turn the valve handle (2) counterclockwise to loosen the tension of the crawler.
6. Once the crawler is completely loose, tighten the valve handle (2).
7. Tighten the lock plate (1).
8. Do the same for the other side.
9. Slowly lower the dozer blade side of the machine body, by the dozer blade lever. (Do not start the engine.)
10. Ground the crawlers and lower the machine body so that the crawler slack is maximum.
11. When the crawlers come away from the idlers, slide the crawlers to the outside and remove them.
12. Disengage the crawlers and sprockets, then remove the crawlers from the crawler frames.



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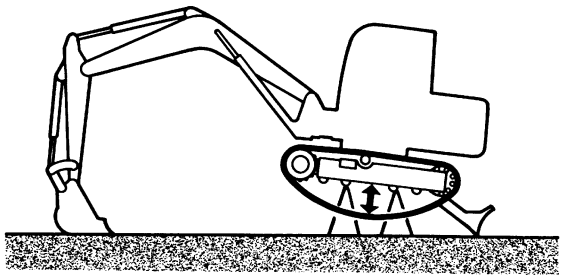
L3C308



L2C309

Installing the Rubber Crawler

1. Engage the crawlers with the left and right sprockets.
2. Set the left and right crawlers on the idlers.
3. Start the engine.
4. Press the travel speed switch once and set it to the 2nd speed side. The left and right crawlers are tightened simultaneously.
5. Check that the crawlers are properly tightened. Standard value.
   - ☞ "II. Specifications, Standards for judging performance" concerning adjustment dimensions and methods.

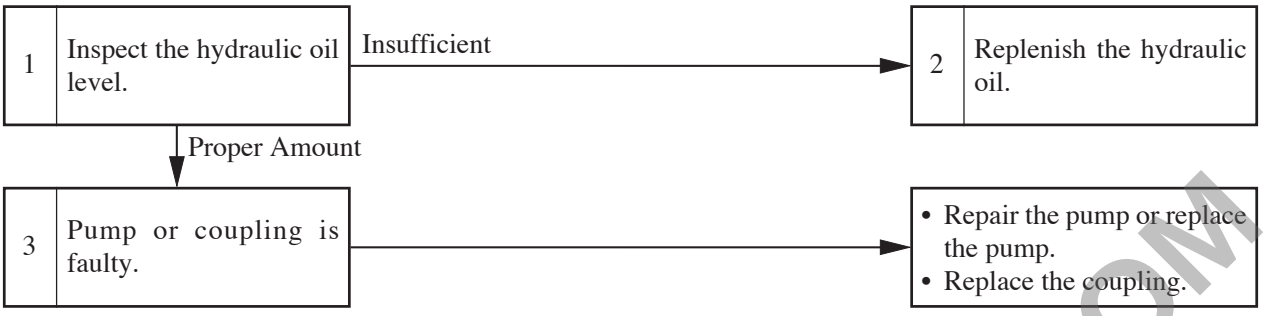


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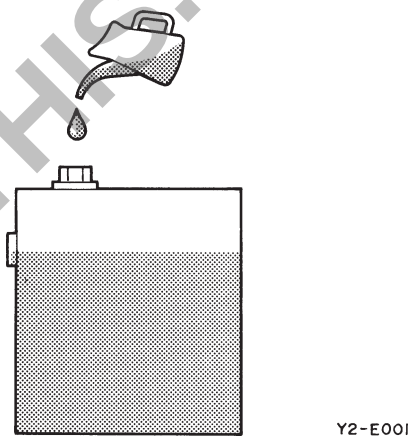
NO OPERATIONS CAN BE DONE.



1. Inspect the hydraulic oil level.
   ☞ "III. Machine Configuration, Hydraulic Tank"

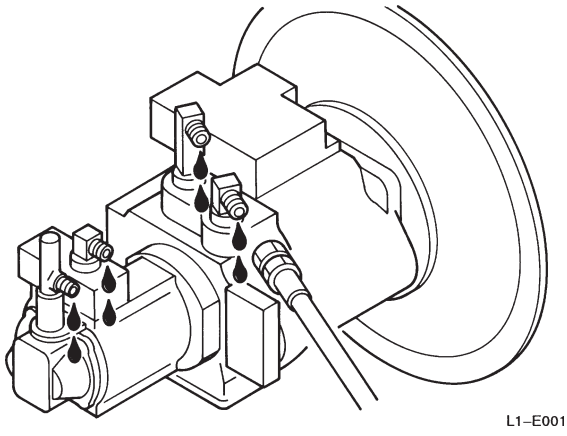
2. Replenish the hydraulic oil.
   Take out the plug and replenish the hydraulic oil.
   - The hydraulic oil supplied should be the same brand as the oil currently in the tank.

   ☞ "II. Specifications, Fluid Capacities"



3. Pump or coupling is faulty.
   a. Disconnect the discharge hose from the pump side.
      Also fit a plug in the disconnected hose to keep the hydraulic oil from pouring out.
   b. With the engine emergency stop knob pulled out all the way, turn the start switch to the "START" position to cause the engine to begin cranking. Check that the hydraulic oil is discharged from the pump at this time.

   If the pump is normal, hydraulic oil will be discharged from it. If hydraulic oil is not discharged, the pump or the coupling is faulty.



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ADJUSTMENT

Engine Speed Adjustment

The TB175's engine speed can be fine-adjusted from the throttle controller, without touching the engine itself.

As shown on the diagram on page III-64, there are four trimmers located next to the throttle controller's connector. These trimmers correspond to the speed setting buttons.

Adjustment procedure

The engine speed is rigorously adjusted before the TB175 is shipped from the factory, but this adjustment may go slightly off over time.

If a problem arises, the engine speed can be adjusted as described below.

In a safe place, lock the levers, then install a speed gauge on the engine so that the engine speed can be seen from the operator's seat.

Start the engine at the L position.

- Slowly loosen the L (1400 rpm) trimmer with a screwdriver and set it to 1400 ±50 rpm.
- Press the decel. switch (1100 rpm).
- Slowly loosen the decel. switch (1100 rpm) trimmer with a screwdriver and set it to 1100 ±50 rpm.
- Press FC (1800 rpm).
- Slowly loosen the FC (1800 rpm) trimmer with a screwdriver and set it to 1800 ±50 rpm.
- Press H (2200 rpm).
- Slowly loosen the H (2200 rpm) trimmer with a screwdriver and set it to 2200 ±50 rpm.

Turn the speed setting trimmers slowly.

Stop the trimmers at a position where the speed is stable. For the H position in particular, note that if the maximum speed limiter is activated, the speed will not increase any more even if the trimmer is turned further.

In addition, turn the trimmers less than one full turn. If possible, use an insulated screwdriver.

Throttle Motor Assembly Adjustment

The throttle motor assembly is rigorously adjusted before the TB175 is shipped from the factory, but if a problem arises, it can be adjusted as described below.

In a safe place, lock the levers, then install a speed gauge on the engine so that the engine speed can be seen from the operator's seat.

Adjustment procedure

a. Remove the machine's cover, then remove the throttle motor assembly's locking bolt.

When doing this, be careful not to loosen the control cable connected to the engine throttle lever. If it must be loosened, mark it, measure the amount by which the nut is screwed in, and make a note of this.

b. Disconnect the stepping motor's round waterproof connector.

When doing this, do not disconnect the two limit switch harnesses in the throttle motor assembly. Disconnecting the limit switch harnesses will result in loss of control.

c. It should now be possible to turn the stepping motor by hand.
Turn the lever inside in the direction of pulling the engine throttle.
Stop just before the spring action kicks in, then set the key switch to ON.
Check that all four throttle lamps on the cluster gauge light.

d. After checking that all four engine throttle lamps on the cluster gauge are lit, start the engine.
The engine should run at below the set speed (about 500 rpm).

e. Once the engine starts, slowly turn the stepping motor shaft lever to the stop side (in the direction of pushing the throttle cable towards the engine) until the engine stops.

f. Once the engine stop position is found, adjust the adjust bolt ON the stepping motor shaft lever so that limit switch 1 turns on at this stop position.
Push the limit roller in until a click is heard.
When adjusting, be careful to hold the motor shaft so that it does not turn. No tester, etc., is required.

g. Set the key switch to OFF.

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FOREWORD

This manual is intended for persons who engage in maintenance operations, and explains procedures for disassembly and reassembly of the machine, check and maintenance procedures, maintenance reference values, troubleshooting and outline specifications, etc. Please use this manual as a reference in service activities to improve maintenance techniques.
Further, please be advised that items contained in this manual are subject to change without notice due to design modifications, etc.

MACHINE FRONT AND REAR, LEFT AND RIGHT

The end where the dozer blade is mounted is the front and the end with the travel motors is the rear. Also the right and left sides of the operator when he is seated in the operator's seat are the right and left sides of the machine.

MACHINE SERIAL NUMBER

The machine serial number is stamped on the identification plate. When sending reports and inquiries, and when ordering parts, etc., be sure to include this number.

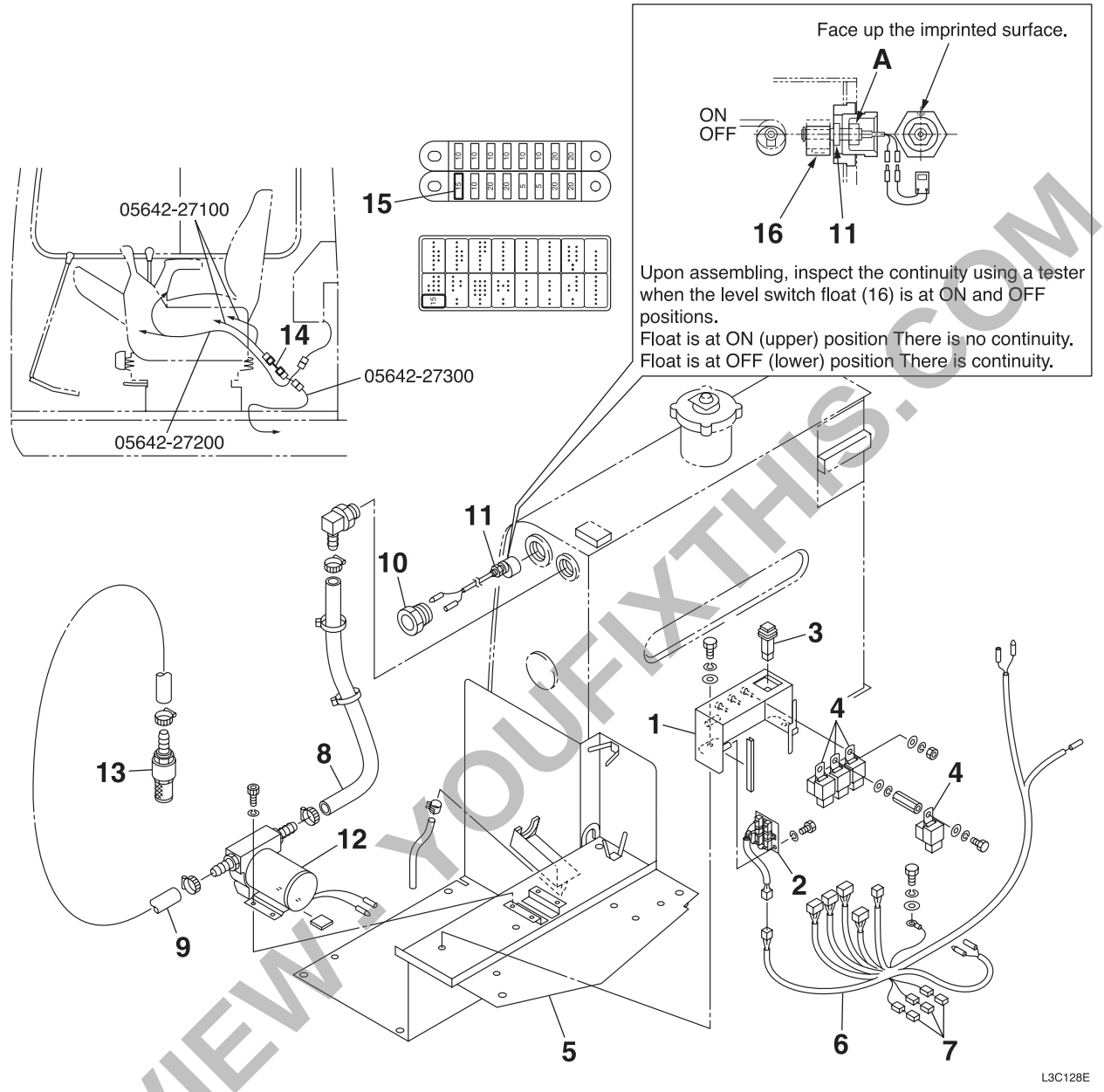
MANUAL CONTROL

Information on those to whom this manual is distributed is recorded in the ledger in the section in charge at this company, so please decide on a person to be in charge of it and control it. When there are updates or additions, etc., we will notify the person in charge.

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Fuel Supply Pump: S/N 17510354~



A: 0.78 N·m

1. Box
2. Resistor
3. Switch
4. Relay
5. Box
6. Wire Harness
7. Diode
8. Hose
9. Hose
10. Plug
11. Level Switch
12. Pump
13. Strainer
14. Wire Harness
15. Fuse
16. Float

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h. Reconnect the stepping motor's round waterproof connector.
With the key switch still at OFF, turn the stepping motor shaft lever until just before it pushes limit switch 1 and set it there.
Be careful not to push limit switch 1.

i. Set the key switch to ON. Check that the speed is set to 1400 rpm after the stepping motor shaft lever hits limit switch 1.
Set the key switch to OFF (to reset the system.)

j. Set the key switch back to ON. Check that the speed is set to 1400 rpm after the stepping motor shaft lever hits limit switch 1.
Also check that only the L indicator lamp on the cluster gauge is lit.

If the stepping motor or limit switch 1 chatters or vibrates after the system is reset, the engine stop position and the limit switch 1 ON position may not be the same.
If this happens, readjust the adjust bolt (step " f ").

k. Turn the key switch from ON to the start position and start the engine.
Press the throttle buttons on the armrest and the one-touch decel. switch to check that the throttle controller is operating properly, then lock the adjust bolt's nut.

l. Next, check that the engine stops without fail when the key switch is turned OFF from any engine speed set with the throttle control buttons. If the engine does not stop, perform the above adjustment again.

m. Next adjust the engine speed. Adjust the four throttle controller trimmers as described under "Engine speed adjustment" to the set speed.
If the set speed is not reached at the H position, adjust the maximum speed limiter.

Adjusting the maximum rotational speed of the engine

The maximum rotational speed of the engine has been set in the range of 2200 ±50 rpm when shipped from the factory. If this speed is not suitable for your application, you can adjust the setting by the following procedure. However, make sure the setting does not exceed the range of 2200 ±50 rpm, or it may cause engine failure.

n. Carefully perform the adjustments in steps "a" to " j ", then set the key switch to OFF.
Slightly loosen the adjust bolt for pushing limit switch 2 on the stepping motor shaft lever.
Be careful not to loosen it very much.

o. Start the engine as is. Press the H button on the armrest to set the full throttle mode. Read the rotational speed in the full throttle mode. If the rotational speed is not proper, adjust it by turning the trimmer of the throttle controller (see III-64).

Insert a sheet of paper between the engine's maximum speed stopper and the engine's speed control lever to confirm whether the speed stopper is contacting the control lever. Turn the trimmer until the speed stopper contacts the control lever.
The maximum rotational speed is maintained by the mechanism that adsorbs the overload on the motor shaft.
Again make sure that the engine's maximum rotational speed is within the range of 2200 ±50 rpm.

p. When the rotational speed at the H position reaches the speed mentioned above, pull the engine's emergency stop lever to stop the engine.
(The key switch should be kept ON.)
Then, while the engine is rotating at the maximum speed, tighten and lock the nut without allowing clearance between the roller of the limit switch 2 and the adjuster bolt.
(The limit switch contact can be left turned OFF.)

q. Once the above adjustment is completed, reassemble the throttle motor assembly as it was before.
Check that the throttle controller is operating properly, then install the machine's cover.

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OPERATION

Piston Pump

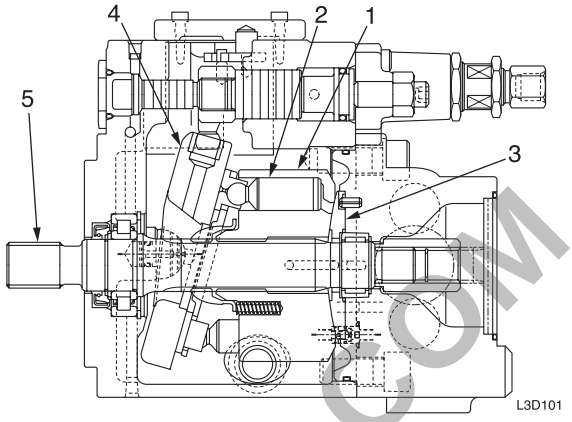
This pump is a variable displacement piston pump with a single cylinder block, which discharges two equal volumes.

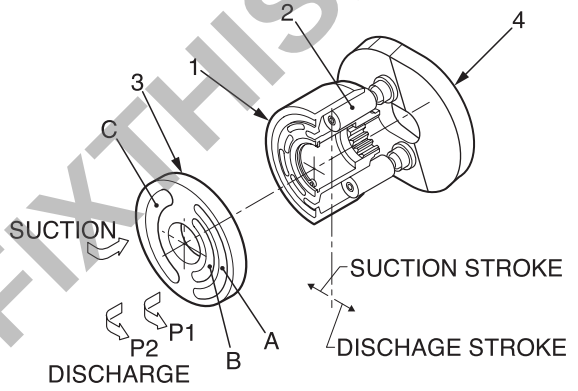
Ten pistons (2) are installed in the cylinder block (1), and the end surface is in contact with the valve plate (3). The suction port C and the discharge port A of the pump P1 and the discharge port B of the pump P2 are arranged in the valve plate (3). On the other hand, the swash plate (4) is fastened to the housing at a given inclination, and the pistons (2) rotate along this swash plate (4).

When the shaft (5) is rotated, the cylinder block (1) rotates, the pistons (2) in the cylinder block execute reciprocating movement along the swash plate (4), and the pump executes suction and discharge. At this time, the pistons in contact with the discharge port A of the valve plate (3) operate as the pump P1, while the pistons in contact with the discharge port B operate as the pump P2.

In this way, the ten pistons (2) execute one suction and discharge stroke with each revolution of the cylinder block (1), so that suction and discharge are executed continuously when the shaft (5) is rotated continuously.

As the piston stroke displacement depends on the inclination of the swash plate (4), the discharge flow quantity can be changed by changing the inclination of the awash plate (4).

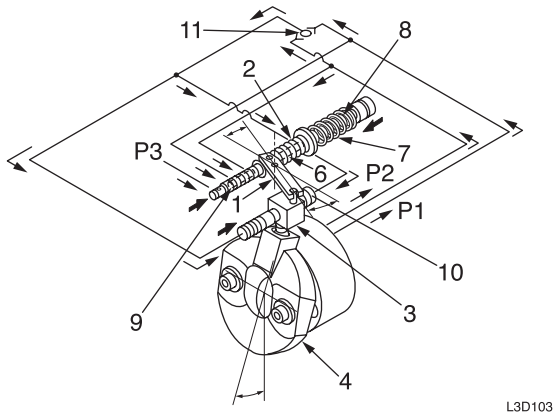




Discharge volume control

The lever (1) can pivot on the pin and is linked with the sleeve (2) and pin (3). The pin (3) is linked with the swash plate (4) to change the inclination of the swash plate.

The force exerted by the springs (7) and (8) acts on the spool (6) while the average discharge pressure from pumps P1 and P2 and discharge pressure from pump P3 act on the piston (9). Also, the discharge pressure selected by the shuttle valve (11) and transmitted through the sleeve (2) and spool (6) acts on the servo piston (10).



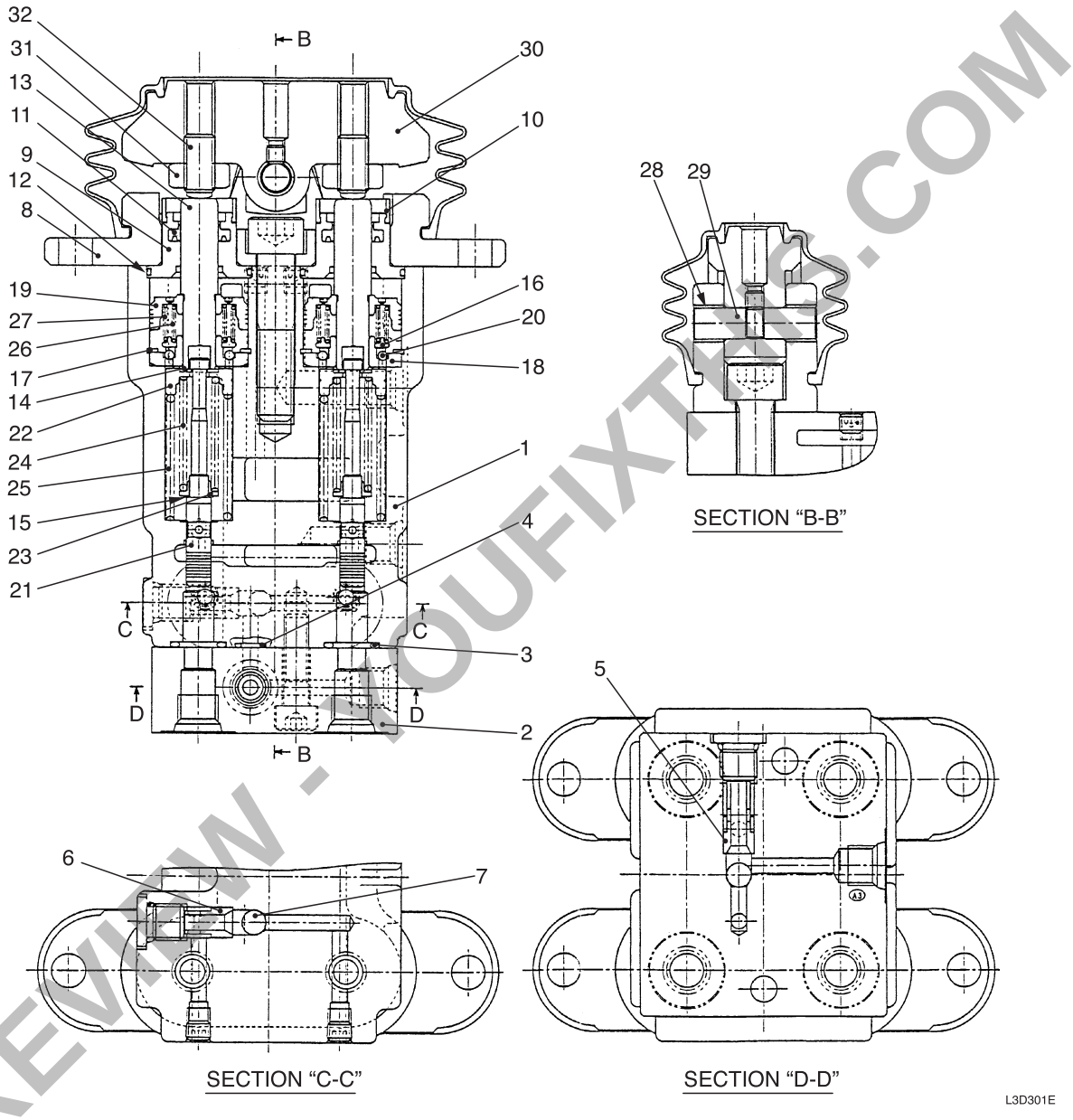
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PILOT VALVES (TRAVEL)

CONSTRUCTION

With Alarm



1. Casing	9. Plug	17. Snap Ring	25. Spring
2. Plate	10. Cup	18. Bushing	26. Spring
3. O-ring	11. Seal	19. Piston	27. Spring
4. O-ring	12. O-ring	20. Ball	28. Bushing
5. Sheet	13. Push Rod	21. Spool	29. Shaft
6. Sheet	14. Washer	22. Spring Seat	30. Cam
7. Ball	15. Washer	23. Washer	31. Set Screw
8. Cover	16. Spring Seat	24. Spring	32. Lock Nut

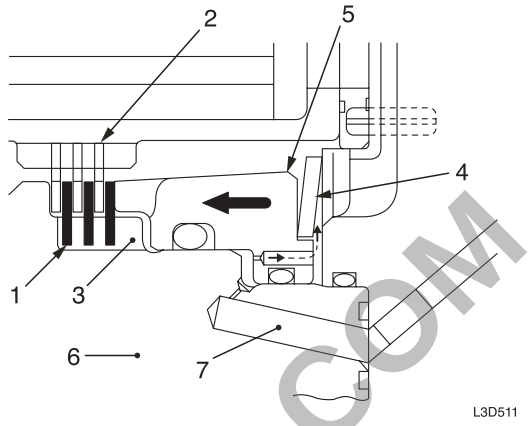
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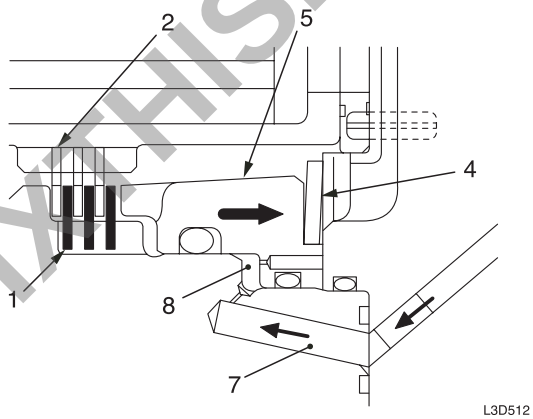
Parking brake

The center discs (1) are connected to the flange holder and the friction discs (2) are connected to the cylinder block (3) via the spline, respectively. The center discs (1) and friction discs (2) are pressed against the flange holder (6) by the spring (4) via the brake piston (5). The friction force between these discs generates the brake torque to prevent the cylinder block (3) from rotating.

When the pressure oil is introduced into the motor, the spool of the counterbalance valve moves and the oil flows from the parking brake release port (7) into the brake piston chamber (8). The oil pressure overpowers the spring force and moves the brake piston (5) to the right. This generates a clearance between the center discs (1) and friction discs (2) to release the parking brake. When the motor stops, the spool returns to the neutral position to close the parking brake release port (7). The pressure oil in the brake piston chamber (8) is introduced into the motor case and the spring (4) operates the parking brake.



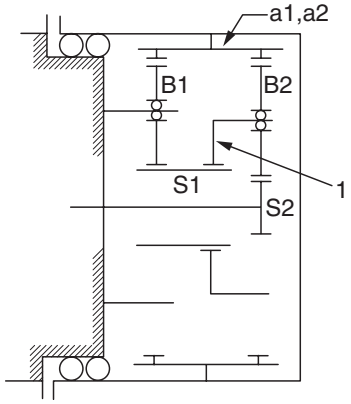
L3D511



L3D512

Reduction Gears

The reduction gear has a simple planetary two-stage configuration. It decelerates the high speed rotary motions of the hydraulic motor, converts them into low speed high torque, and rotates the case. The output shaft of the hydraulic motor is connected to the gear S2 via the spline. The rotation of the gear S2 is decelerated by one stage among the gears S2, B2 and a2. This one-stage decelerated rotation is further decelerated by two stages among the gears S1, B1 and a1 that are connected to the carrier 2 (1) via the spline. This rotation is conveyed to the rotary main body via the inner gears a1 and a2 as the driving force of the motor.

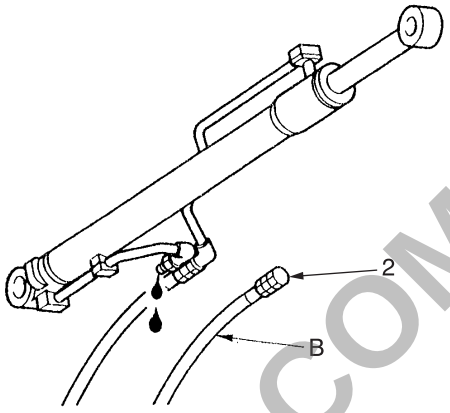


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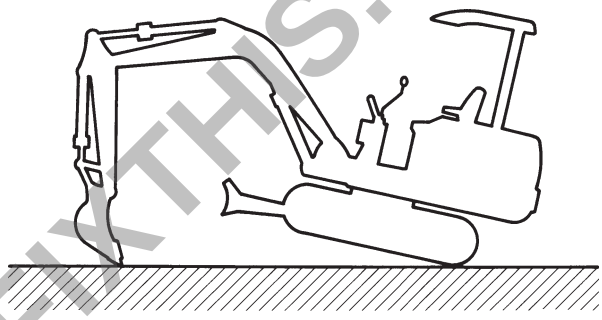
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b. Disconnect the head side hose (B) and let the hydraulic oil out of the cylinder's piping.
Insert a plug (2) in the disconnected hose.
- Test the left and right cylinders one at a time. Remove both hoses from the cylinder that is not being inspected at this time and plug the disconnected hoses.



L3E009

c. Operate the bucket and raise the machine's body.
At this time, if there is oil leaking from the piping of the cylinder where the hose was disconnected, and if the boom cylinder's rod is extended, the cylinder is leaking internally.
Also, if there is no leakage of oil from the cylinder's piping, if the boom cylinder's rod is extended, the control valve is leaking internally.


Y2-E309

If the cylinder is damaged internally, the system should be flushed out to remove any broken pieces (NAS Class 9).

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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

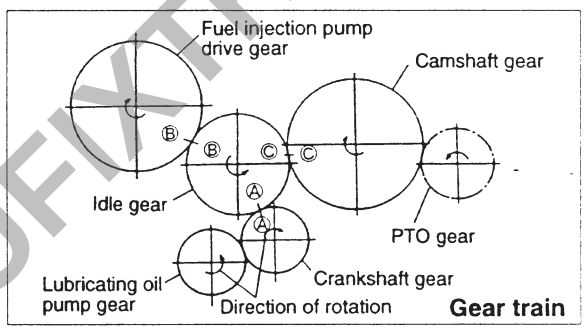
Reassemble:

- 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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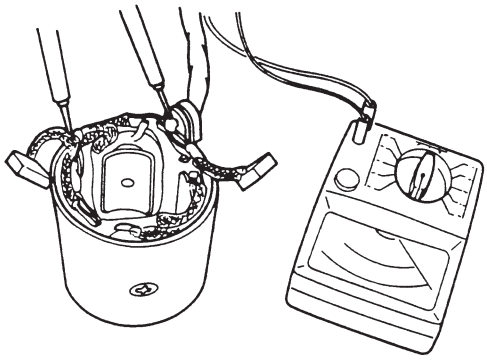
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(2) Field coil

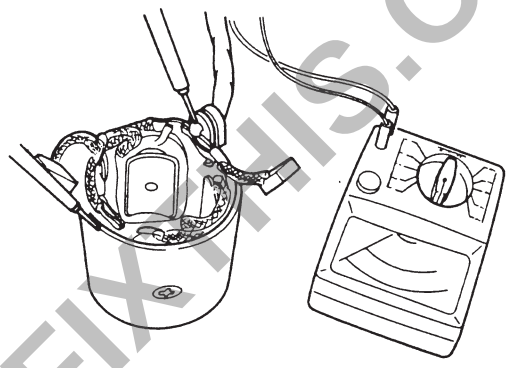
a) Field coil continuity and earth tests

Test type	Measurement point	Normal	Abnormal (cause)
Continuity test	Across field coils	Yes	None (open circuit)
Earth test	Between commutator and yoke	None	Yes (short-circuiting)

Replace if needed.



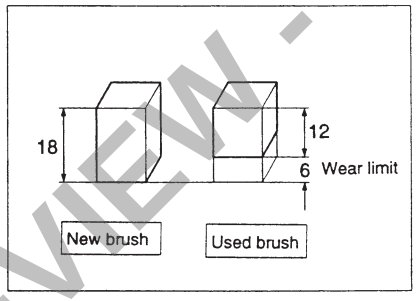
(Field coil continuity test)



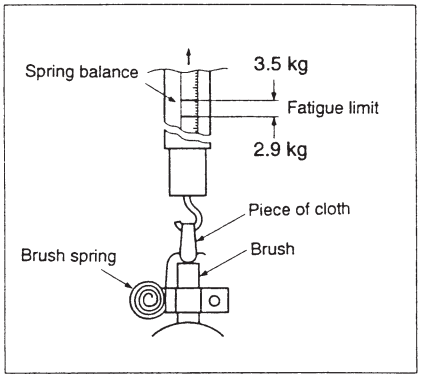
(Field coil insulation test)

(3) Brush

a) Check wear of the brush and the brush spring force.



(Wear limit for brush)



(Measuring brush spring force)

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(Unit: liter)

Model	Total volume (L)	Effective volume (L)
3TNV82A	5.5	1.9
3TNV84 (T)•88	6.7	2.8
4TNV84 (T)•88	7.4	3.4
4TNV94L98•(T)	10.5	4.5
4TNV106 (T) (CL class)	14.0	9.0
4TNV106 (T) (VM class)	14.0	7.5

Lube oil capacity may differ from the above volume depending on an engine installed on a machine unit.

(b)Replenishing oil pan with lube oil

If the remaining engine oil level is low, fill the oil pan with the specified engine oil to the specified level through the filler port.

[NOTICE]

The oil should not be overfilled to exceed the upper limit line. Otherwise a naturally-aspirated engine may intake lube oil in the combustion chamber during the operation, then white smoke, oil hummer or urgent rotation may occur, because the blowby gas is reduced in the suction air flow.

In case of turbo-charged engine oil may jet out from the breather or the engine may become faulty.

(4) Coolant water inspection

Daily inspection of coolant water should be done only by Coolant recovery tank.

⚠ CAUTION



- Never open the radiator filler cap while the engine and radiator are still hot. Steam and hot water will spurt out and seriously burn you. Wait until the radiator is cooled down after the engine has stopped, wrap the filler cap with a rag piece and turn the cap slowly to gently release the pressure inside the radiator.
- Securely tighten the filler cap after checking the radiator. Steam can spurt out during operation, if the cap is tightened loosely.

(a)Checking coolant water volume

Check the coolant water level in the Coolant recovery tank. If the water level is close to the LOW mark, open the Coolant recovery tank cap and replenish the Coolant recovery tank with clean soft water to the FULL mark.

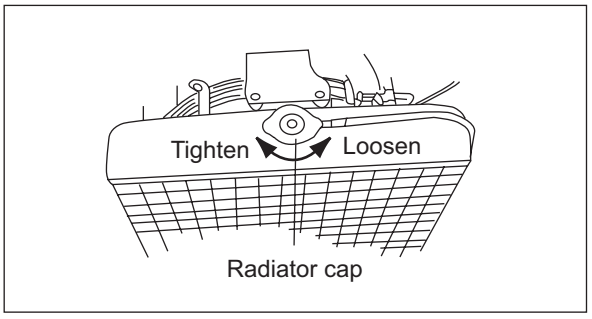
Standard

The water level of the Coolant recovery tank shall be between the upper and lower limit lines.

(b)Replenishing engine with water

If the Coolant recovery tank water level is lower than the LOW mark, open the radiator cap and check the coolant water level in the radiator. Replenish the radiator with the coolant water, if the level is low.

- Check the coolant water level while the engine is cool.
  Checking when the engine is hot is dangerous. And the water volume is expanded due to the heat.
- Daily coolant water level check and replenishing shall be done only at the Coolant recovery tank. Usually do not open the radiator cap to check or replenish.



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(5) Connecting rod

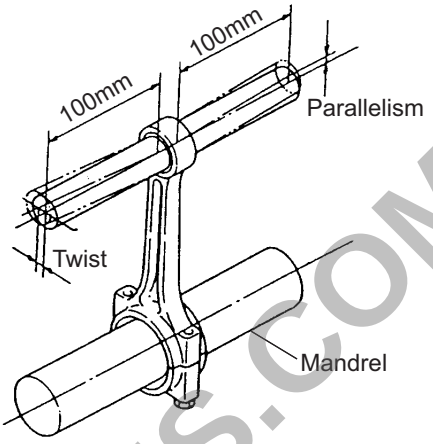
(a)Appearance inspection

Inspect the portion near the boundary of the chamfered portion and I-beam section of the big and small ends of the connecting rod as well as the portion near the oil hole of the bushing at the small end for cracks, deformation, and discoloration.

(b)Twist and parallelism measurement Use a connecting rod aligner and measure the twist and bend.

mm

Item	Standard dimension	Limit dimension
Twist and parallelism	0.03 or less per 100 mm	0.08



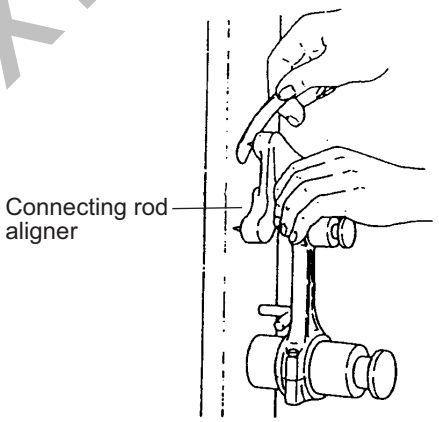
Twist and parallelism measurement

(c)Rod small end measurement

Measure the pin outside diameter according to 4.4.5.(4) (a) described above.

mm

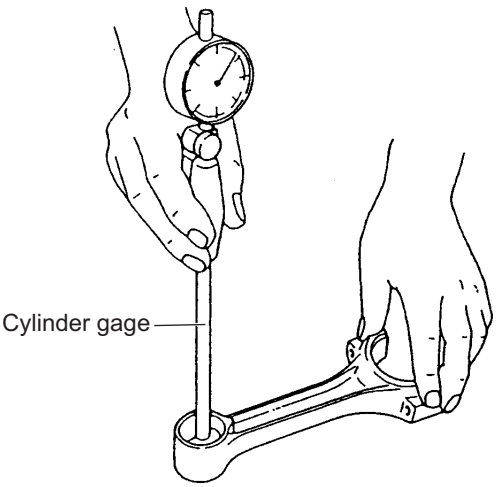
Model	Item	Standard	Limit
3TNV82A	Piston pin I.D. bushing	23.025 to 23.038	23.068
	Pin O.D.	22.995 to 23.000	22.967
	Clearance	0.025 to 0.043	0.101
TNV84 to 88	Piston pin I.D. bushing	26.025 to 26.038	26.068
	Pin O.D.	25.995 to 26.000	25.967
	Clearance	0.025 to 0.043	0.101
4TNV94L•98	Piston pin I.D. bushing	30.025 to 30.038	30.068
	Pin O.D.	29.987 to 30.000	29.959
	Clearance	0.025 to 0.051	0.109
4TNV106 (T)	Piston pin I.D. bushing	37.025 to 37.038	37.068
	Pin O.D.	36.989 to 37.000	36.961
	Clearance	0.025 to 0.049	0.107



Twist measurement using a connecting rod aligner

If the bushing is to be replaced because the oil clearance exceeds the limit, use spare part.

Model	Service part code
3TNV82A	119810-23910
TNV84 to 88	129100-23910
4TNV94L•98 (T)	129900-23910
4TNV106 (T)	123900-23910



Connecting rod small end

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11.2 Precaution on electric wiring

11.2.1 Alternator

In the cases listed below the warranty shall not be deemed to apply. Please be sure to read these conditions carefully when planning to use it with other equipment. Also be certain to give appropriate guidance on usage to the user.

(1) When the battery cable can be connected backwards

The alternator diode will be damaged and recharging made impossible if the plus and minus ends of the battery cable are confused. The stator coil will also be burned as a result. To prevent this, supply the user with a cable of such a length or structure that the plus and minus ends cannot be confused. Also warn the user not to connect the cable backwards.

(2) When charging output voltage is used for control purposes

The engine speed at starting is not proportional to the output voltage of the alternator, so this output voltage must not be used for any control systems. It is especially wrong to use it for the control signal of the safety relay for cutting the starter motor because this will damage the starter motor and cause engine starting failure.

(3) When the L line is used for control purposes

Consult with Yanmar first before connecting any load other than the charge lamp to the L line. Damage to the alternator and related equipment will not be warranted without such prior consultation.

(4) Non-use of the Yanmar wiring diagram

Use without prior consultation of any wiring diagram other than that provided by Yanmar removes any breakdown of any electrical equipment from the warranty.

(5) Regarding lamp control

Once the charge lamp goes out after the start of charging, it does not come on again even if the engine speed falls and charging is insufficient. The lamp will not light again if the charging circuit is normal. The lamp only comes on during operation if the alternator itself is broken or the drive V-belt breaks. However, when an LED is used for the charge lamp, the LED will shine faintly even during normal operation. This is due to the control system for the alternator lamp and is not an abnormality.

(6) Use of a non-specified V-belt

Use of a non-specified V-belt will cause inadequate charging and shorten the life of the belt. Use a belt of the specified type.

(7) Direct high pressure washing is prohibited

Water will enter the brush if the alternator is washed directly at high pressure, causing inadequate charging. Warn users not to use direct, high-pressure washing.

(8) Use of agricultural or other chemicals (direct contact or airborne)

Adhesion of agricultural and other chemicals, especially those with high sulfur content, to the IC regulator corrodes the conductor on the substrate, leading to over-charging (battery boiling) and charging malfunctions. Consult with Yanmar prior to use in such an environment. Use without prior consultation removes any breakdown from the warranty.

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