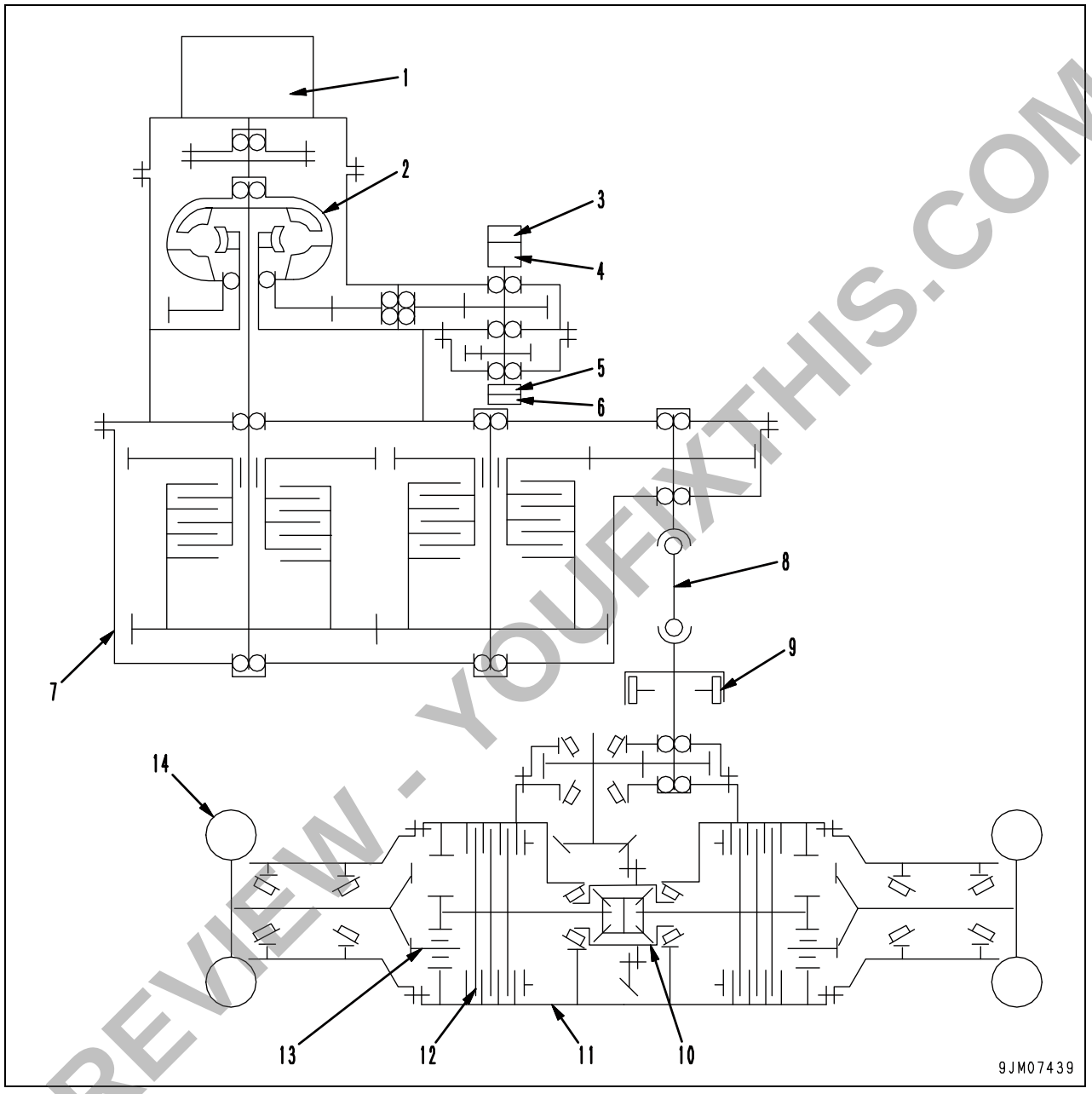
3.5 Power train system diagram

3.5 - 4.0 ton models

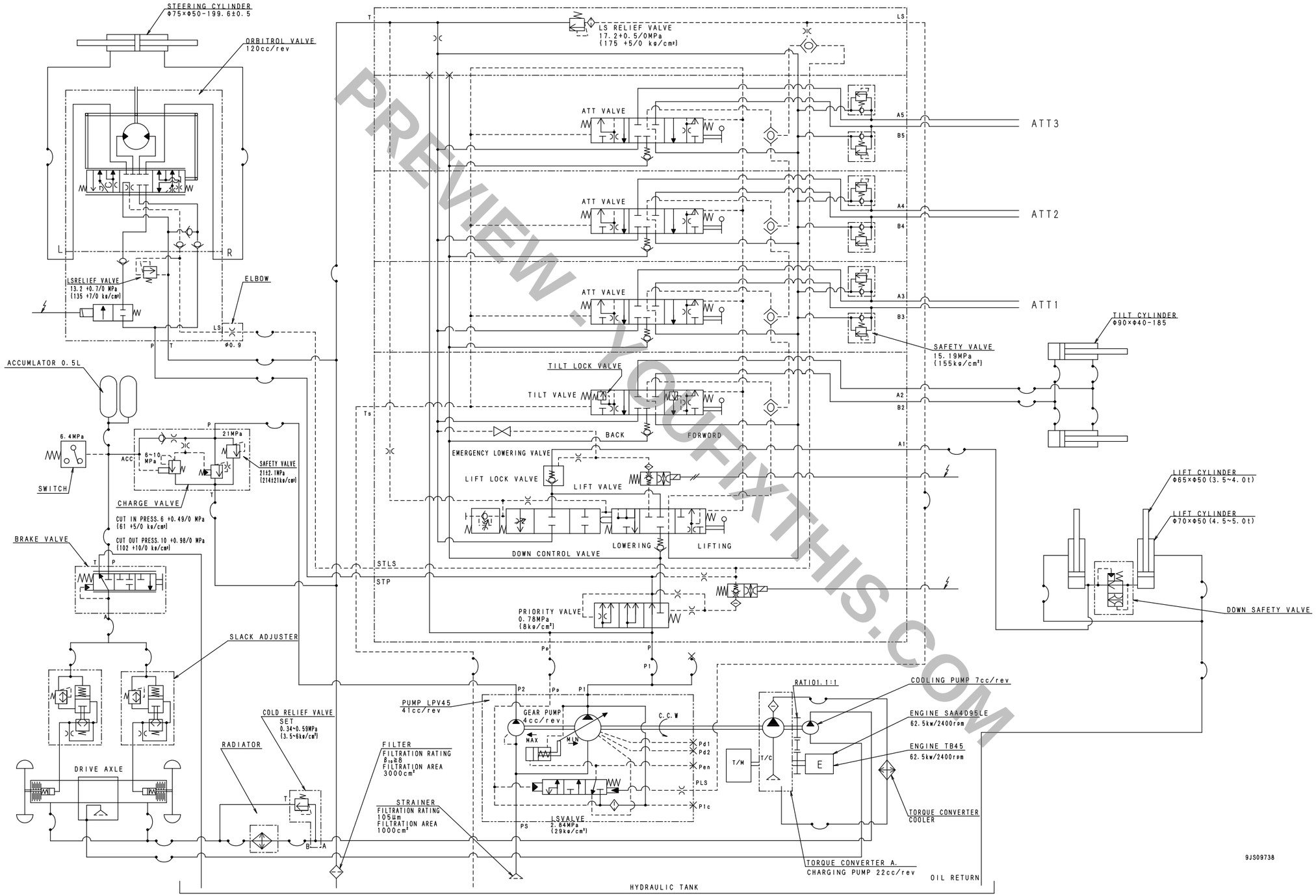


1. Engine
2. Torque converter
3. Brake pump
4. Work equipment pump
5. Torque converter charge pump
6. Brake cooling pump
7. Transmission
8. Drive shaft
9. Parking Brake
10. Differential
11. Front axle
12. Wet multiple disc type brake
13. Final drive
14. Front tire

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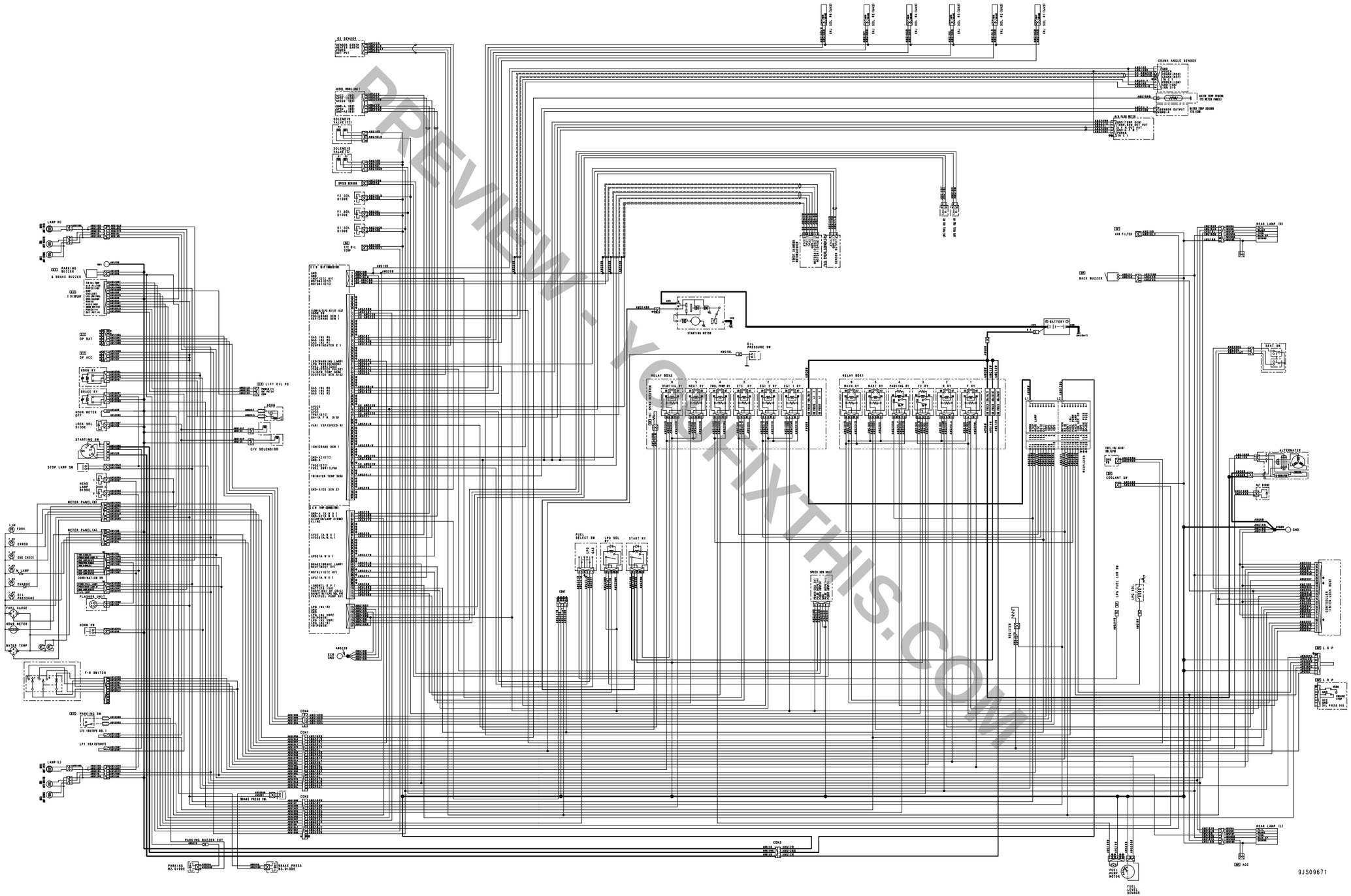
CX50 HYDRAULIC CIRCUIT DIAGRAM



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CX50 ELECTRICAL DIAGRAM - TB45 ENGINE - DUAL FUEL - TIER 2 - S/N 133001 - 134755



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1.8 Standard tightening torque tables

1.8.1 Bolts and nuts

Unless there are special instructions, tighten metric nuts and bolts to the torque below.
The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	11.8 - 14.7	1.2 - 1.5
8	13	27 - 34	2.8 - 3.5
10	17	59 - 74	6.0 - 7.5
12	19	98 - 123	10.0 - 12.5
14	22	157 - 196	16 - 20
16	24	245 - 309	25 - 31.5
18	27	343 - 427	35 - 43.5
20	30	490 - 608	50 - 62
22	32	662 - 829	67.5 - 84.5
24	36	824 - 1,030	84 - 105
27	41	1,180 - 1,470	120 - 150
30	46	1,520 - 1,910	155 - 195
33	50	1,960 - 2,450	200 - 250
36	55	2,450 - 3,040	250 - 310
39	60	2,890 - 3,630	295 - 370

The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	5.9 - 9.8	0.6 - 1.0
8	13	13.7 - 23.5	1.4 - 2.4
10	14	34.3 - 46.1	3.5 - 4.7
12	27	74.5 - 90.2	7.6 - 9.2

Fig. A

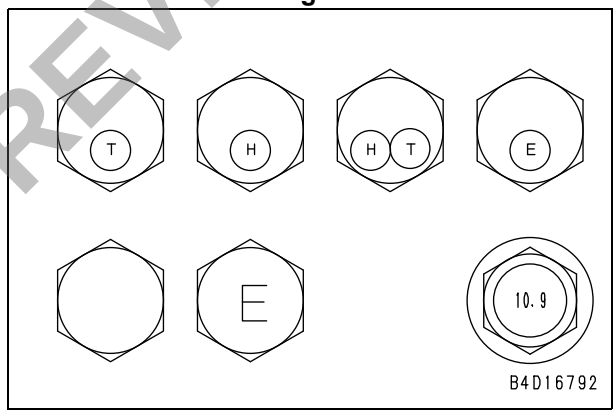
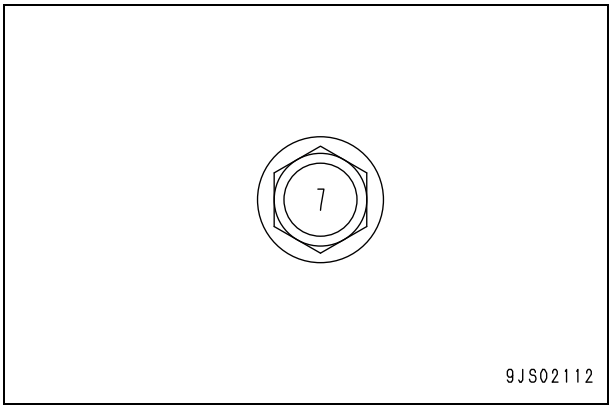


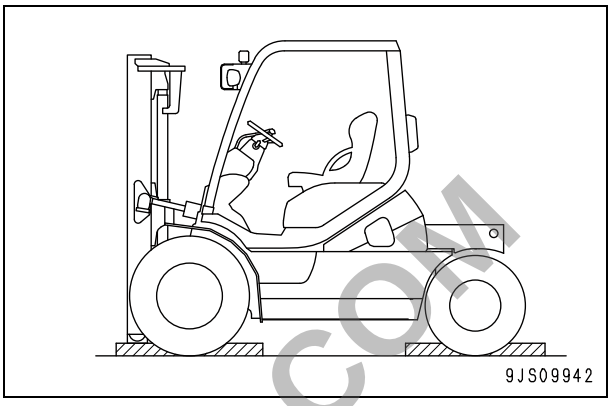
Fig. B



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7.4 Power train removal



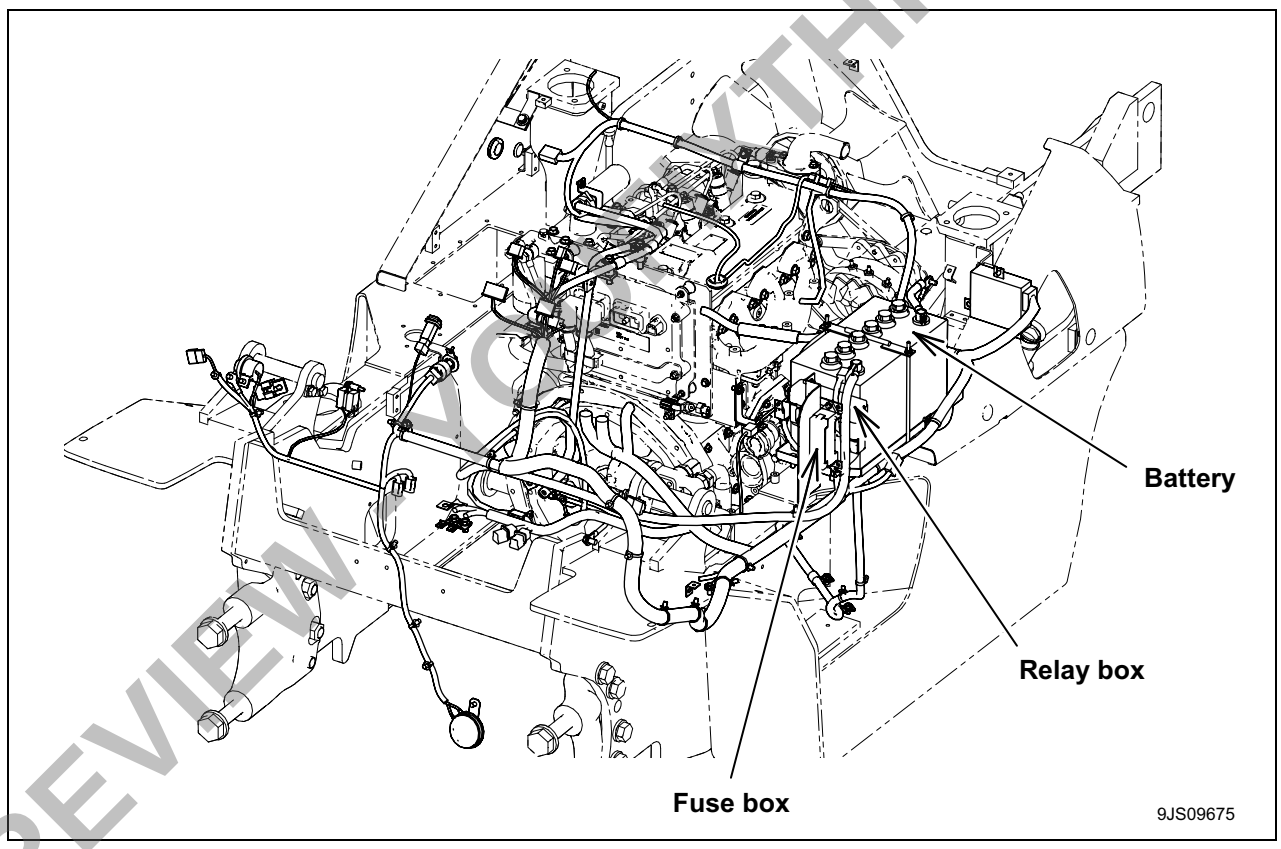
1. Remove overhead guard (ceiling section), hood, counterbalance-weight

⚠WARNING

Be sure to lower the fork and attachment to the ground or remove them. If the counterbalance-weight is removed with the mast and attachment raised, the lift truck will tip over.

2. Disconnect wiring and battery

Applicable model: Lift truck with SAA4D95LE-5-A engine



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6.1 Points to remember when troubleshooting

⚠WARNING

- **Stop the lift truck on a level place and check that lock pin, chocks, parking brake, are applied normally.**
- **When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.**
- **If the radiator cap is removed when the engine is hot, hot coolant may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.**
- **Be extremely careful not to touch any hot parts or to get caught in any rotating parts.**
- **When disconnecting wiring, always disconnect the negative (-) terminal of the battery first.**
- **When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first.**
- **When installing measuring equipment, be sure to connect it properly.**

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure. When carrying out troubleshooting, and important point is of course to understand the structure and function. However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, **do not hurry to disassemble the components**.
   When components are disassembled immediately upon any failure:
   - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
   - It will become impossible to find the cause of the failure.

   It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator.

   For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.
2. Points to ask user or operator
   - Have any other problems occurred apart from the problem that has been reported?
   - Was there anything strange about the lift truck before the failure occurred?
   - Did the failure occur suddenly, or were there problems with the lift truck condition before this?
   - Under what conditions did the failure occur?
   - Had any repairs been carried out before the failure? When were these repairs carried out?
   - Has the same kind of failure occurred before?
3. Check before troubleshooting
   - Is there abnormal symptoms in lift truck?
   - Check the check-before-starting items.
   - Check the other check items.
   - Other maintenance items can be checked externally, so check any item that is considered to be necessary.
4. Confirming failure
   Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation.
   - When operating the lift truck to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.
5. Troubleshooting
   Use the results of the investigation and inspection in Items 2 - 4 to narrow down the causes of failure, then use the troubleshooting flowchart to locate the position of the failure exactly.
   - The basic procedure for troubleshooting is as follows.
     - Start from the simple points.
     - Start from the most likely points.
     - Investigate other related parts or information.
6. Measures to remove root cause of failure
   Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again. To prevent this, always investigate why the problem occurred. Then, remove the root cause.

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1.1 Safety notice

Important safety notice

Proper service and repair are extremely important for safe lift truck operation. The service and repair techniques recommended by Komatsu Forklift and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu Forklift for the specific purpose.

To help prevent injury to workers, ⚠ WARNING is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

1.1.1 General precautions

⚠ WARNING

Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully before operating the lift truck. In addition, read this manual carefully before starting work.

1. Before carrying out any greasing or repairs, read all the safety labels stuck to the lift truck. For the locations of the safety labels and detailed explanation of precautions, see the Operation and Maintenance Manual.
2. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water, or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
3. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   a. Always wear safety glasses when hitting parts with a hammer.
   b. Always wear safety glasses when grinding parts with a grinder, etc.
4. When carrying out any operation with 2 or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR warning signs in the operator's compartment.
5. Only qualified workers must carry out work and operation which require license or qualification.
6. Keep all tools in good condition. Learn the correct way to use them, and use the proper ones of them. Before starting work, thoroughly check the tools, lift truck, service car, etc.
7. If welding repairs are needed, always have a trained and experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, shielding goggles, cap and other clothes suited for welding work.
8. Before starting work, warm up your body thoroughly to start work under good condition.
9. Avoid working continuously for long hours and take rests at proper intervals to keep the good condition. Take rests in a fixed safe place.

■ **Safety Points**

1. Good arrangement
2. Correct work clothes
3. Following of work standard
4. Making and checking of signs
5. Prohibition of operation and handling by unlicensed workers
6. Safety check before starting work
7. Wearing protective goggles (for cleaning or grinding work)
8. Wearing shielding goggles and protectors (for welding work)
9. Good physical condition and preparation
10. Precautions against work which you are not used to or you are used to too much

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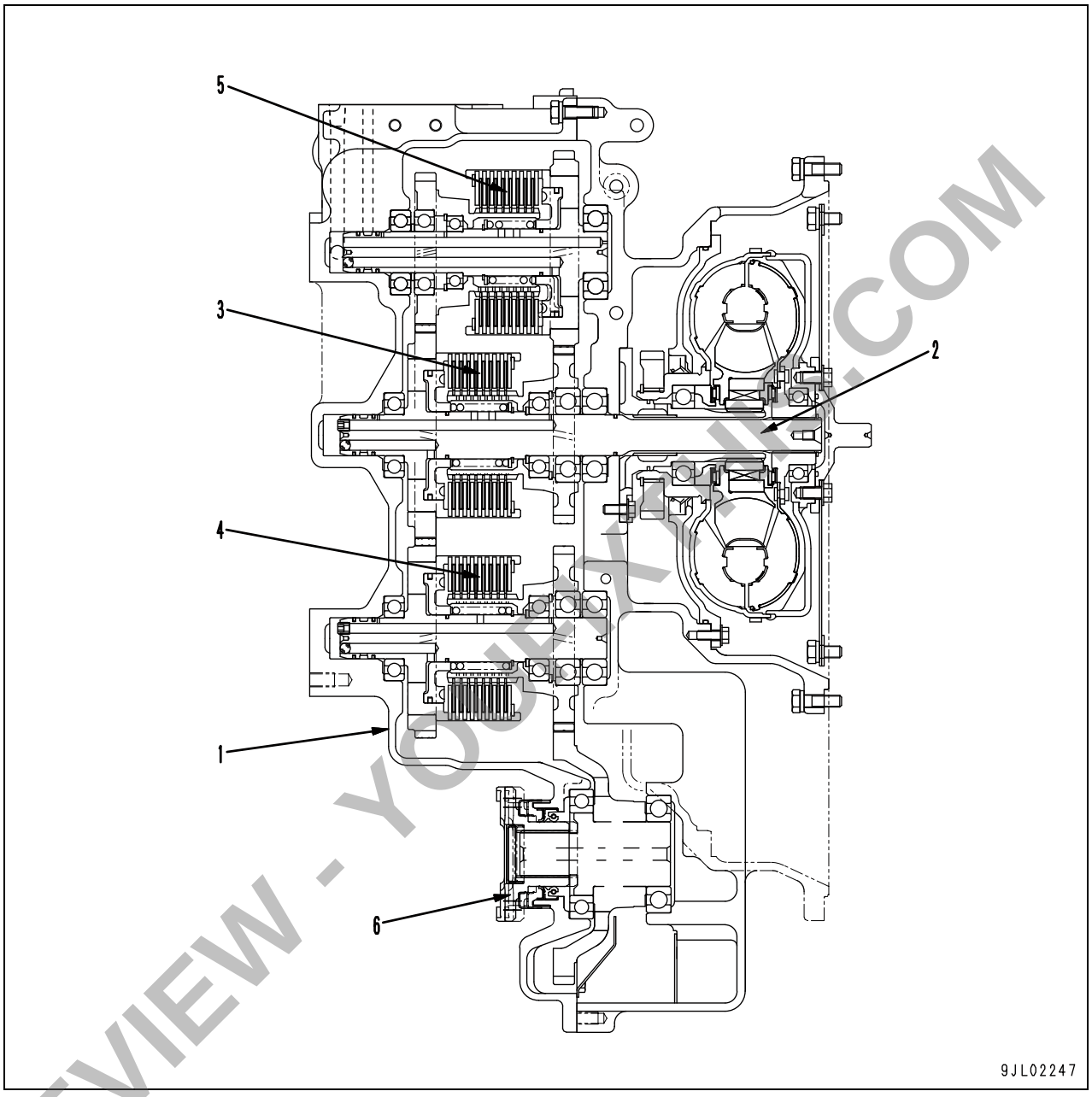
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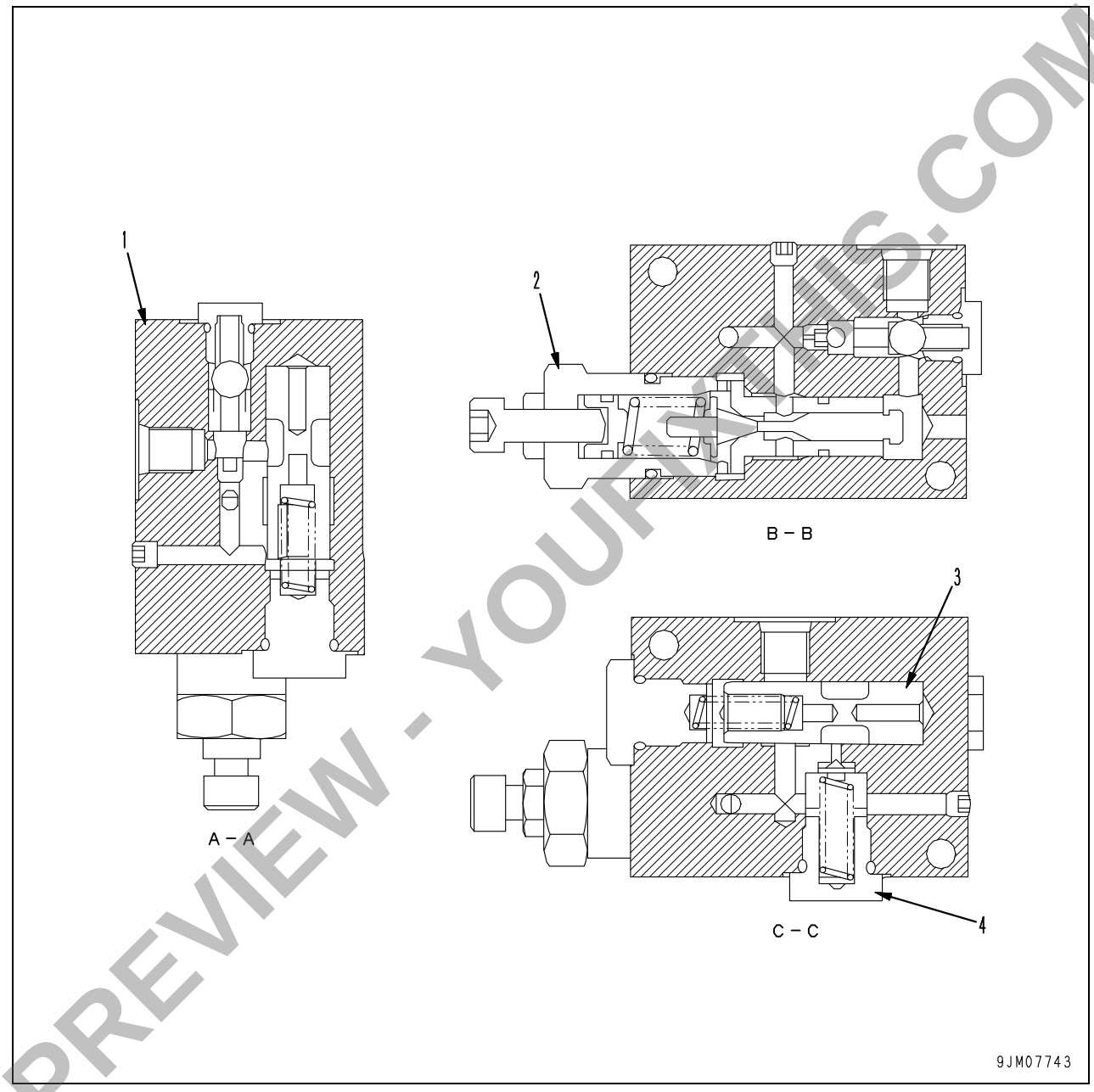
1. Transmission case
2. Input shaft
3. F clutch
4. R1 clutch
5. F2 clutch (For 4.5 - 5.0 ton)
6. Coupling

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Function

- The accumulator charge valve operates to keep the oil pressure from the pump at the specified level and charges the accumulator with pressure.
- If the oil pressure increases above the specified level, the oil from the pump flows to the drain circuit to reduce the pump load.



1. Valve body
2. Main relief valve
3. Unload spool
4. Safety valve

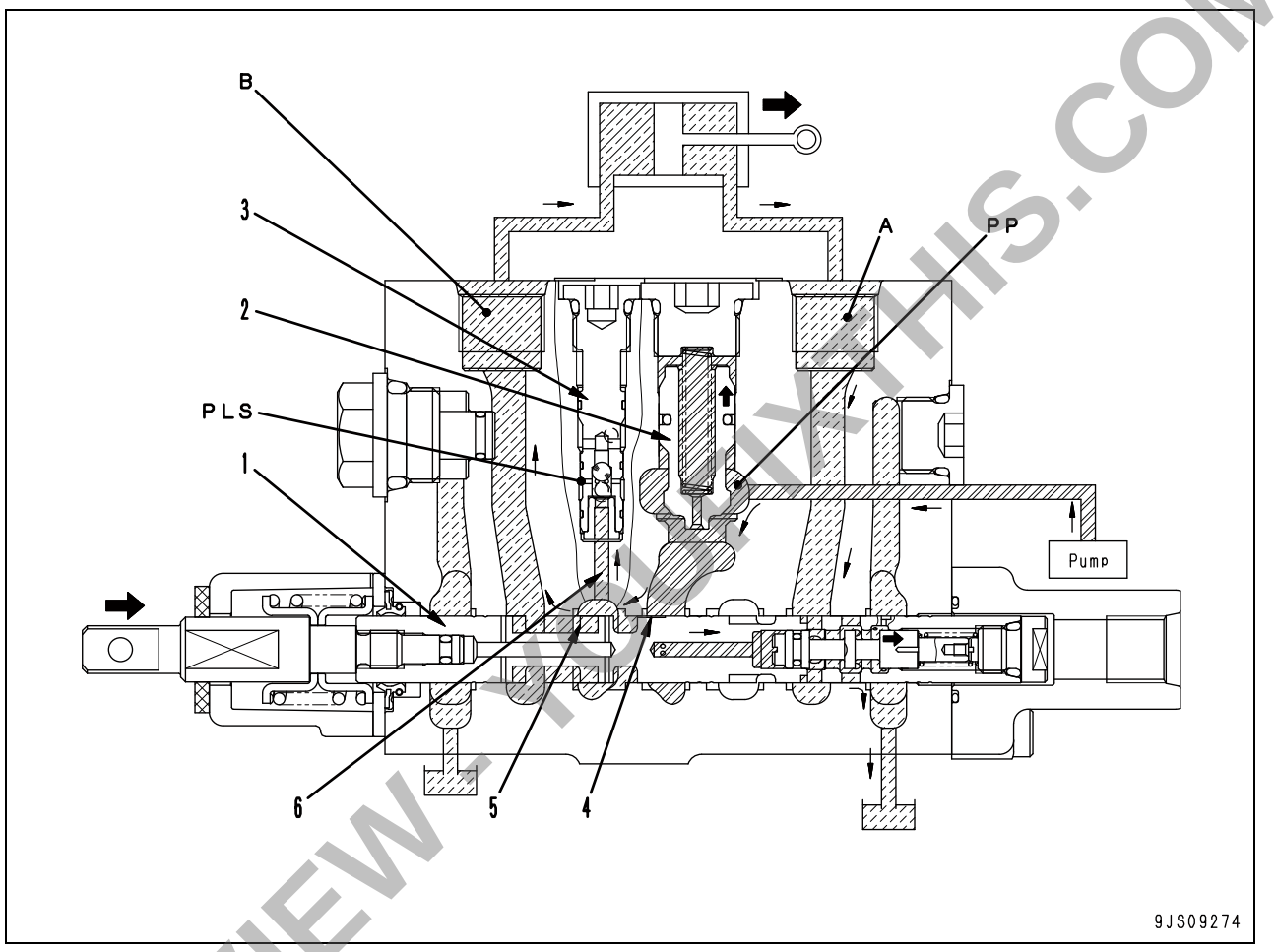
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3.44.2 Supply of LS pressure

Function

- The LS pressure means the actuator load pressure on the outlet side of the control valve.
- The downstream pressure of control notch (4) of spool (1) is supplied as LS pressure (PLS) to LS shuttle valve (3).
- The highest LS pressure of supplied LS pressures (PLS) is selected by the LS shuttle valve and supplied to the pump LS valve.



The figure shows the state when the fork is tilted forward.

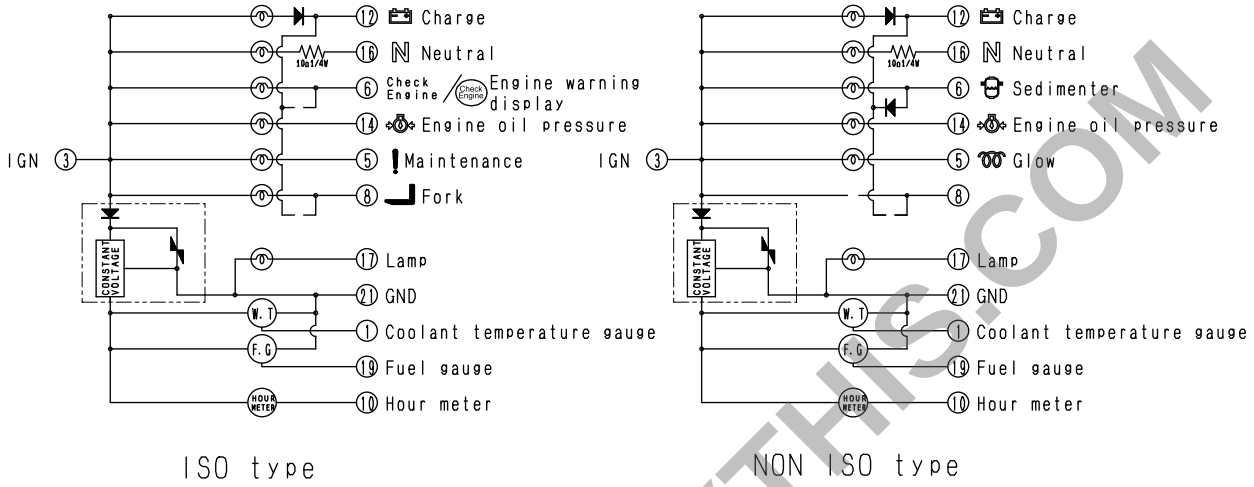
Operation

- If spool (1) is operated, pump pressure (PP) flows through load check valve (2), spool notches (4) and (5) to actuator circuit (B).
- The pressure decreased by spool notch (4) is supplied as LS pressure (PLS) through passage (6) to LS shuttle valve (3).
- Since the opening area of spool notch (5) is wide and less pressure loss is made, LS pressure approximates the actuator load pressure.

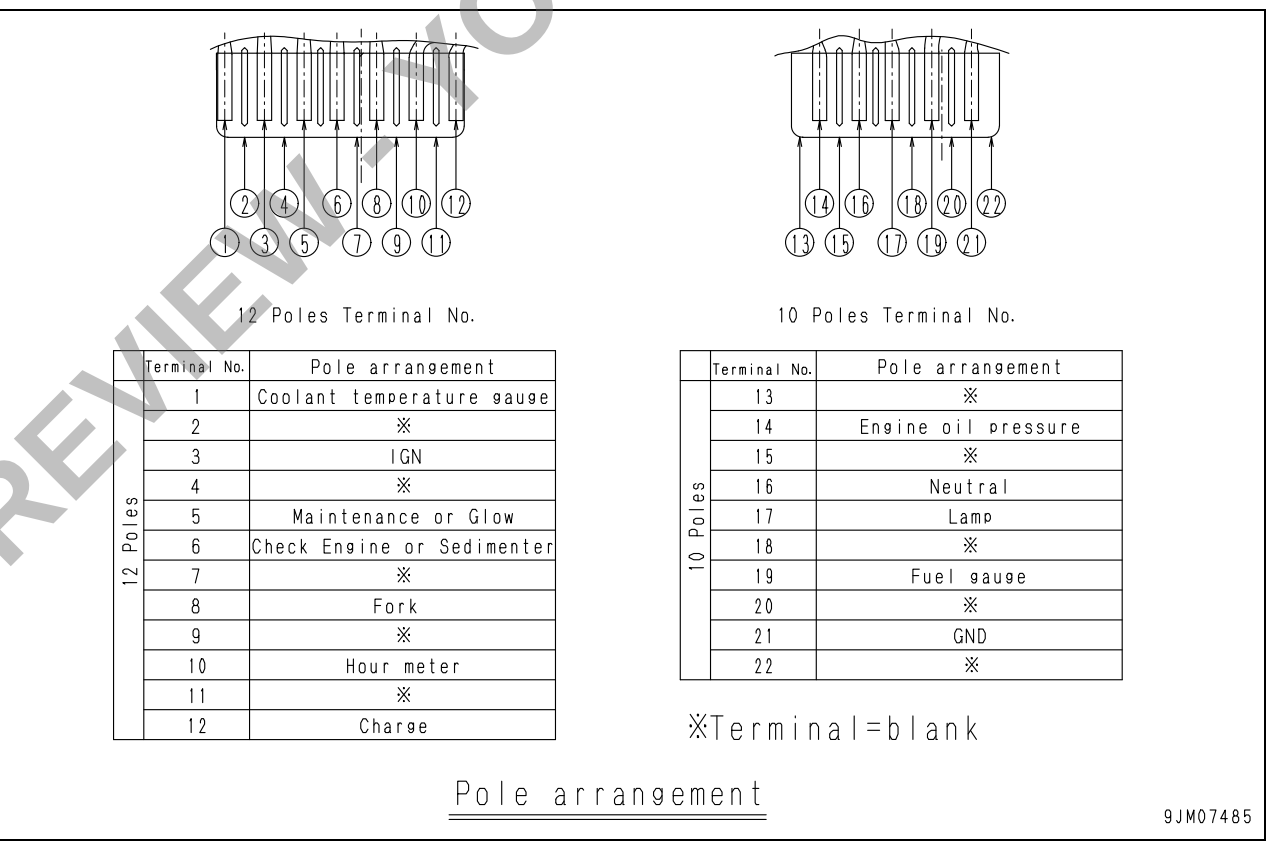
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Circuit diagram



Pole arrangement



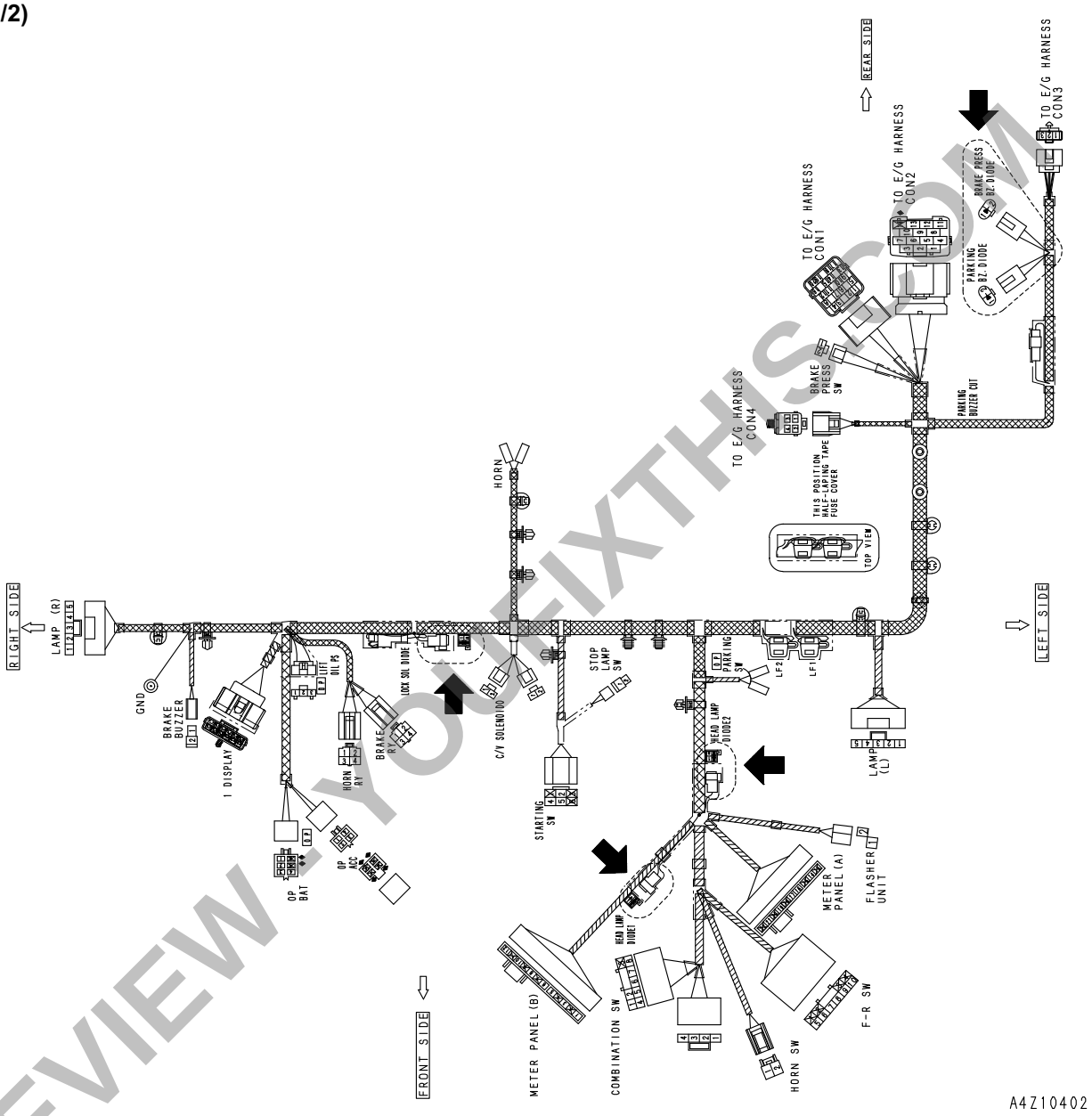
	Terminal No.	Pole arrangement
12 Poles	1	Coolant temperature gauge
	2	※
	3	IGN
	4	※
	5	Maintenance or Glow
	6	Check Engine or Sedimenter
	7	※
	8	Fork
	9	※
	10	Hour meter
	11	※
	12	Charge

	Terminal No.	Pole arrangement
10 Poles	13	※
	14	Engine oil pressure
	15	※
	16	Neutral
	17	Lamp
	18	※
	19	Fuel gauge
	20	※
	21	GND
	22	※

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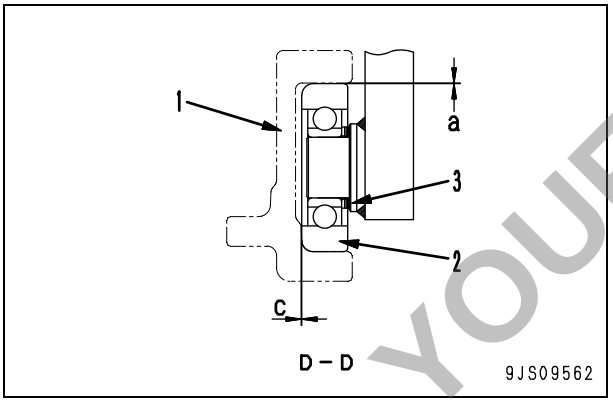
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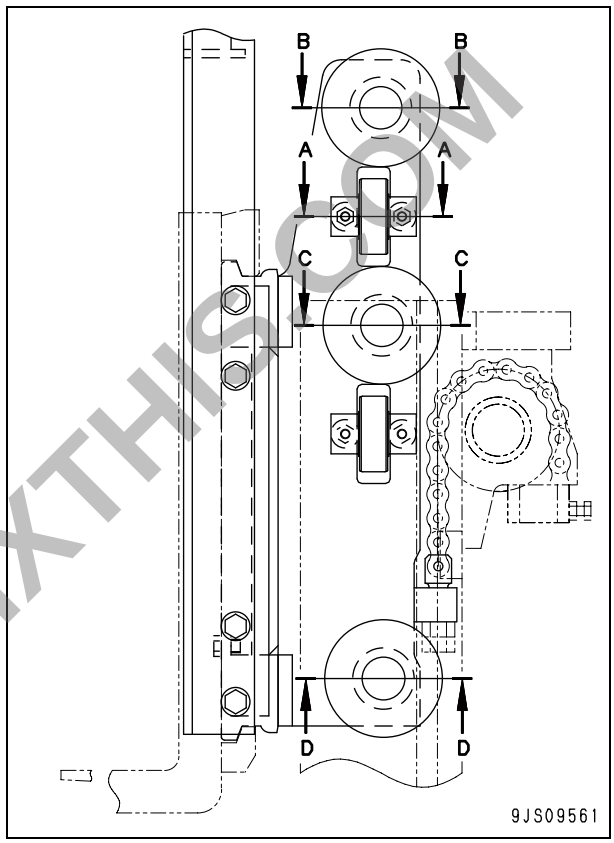
5.18 Adjustment of fork carriage - Japan manufacture

To service 100D/110D mast components, see “U.S. manufactured masts” on page 8-1.

5.18.1 Selection of lower roller and adjustment of shim

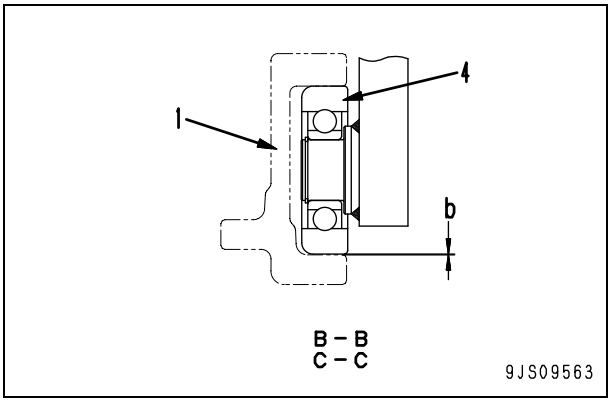
1. Select roller (2) so that clearance (a) between the rail of inner mast (1) and lower main roller (2) will be in the following range.
   - Clearance (a): **0.2 - 0.9 mm** (For 3.5 - 4.0 ton)
   - Clearance (a): **0.4 - 1.6 mm** (For 4.5 - 5.0 ton)
2. Raise the fork carriage to the maximum lifting height.
3. Insert shims (3) of the same thickness to the right and left side so that clearance (c) between the rail and roller (2) will be in the following range.
   - Clearance (c): **0 - 0.1 mm** (For 3.5 - 4.0 ton)
   - Clearance (c): **0.5 - 1.0 mm** (For 4.5 - 5.0 ton)





5.18.2 Selection of upper main roller and intermediate main roller and adjustment of shim

1. Select roller (4) so that clearance (b) between the rail of inner mast (1) and upper main roller and intermediate main roller (4) will be in the following range.
   - Clearance (b): **0.2 - 0.9 mm** (For 3.5 - 4.0 ton)
   - Clearance (b): **0.4 - 1.6 mm** (For 4.5 - 5.0 ton)
   - Standard shim thickness: **1 mm**



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6.13 Failure code [[!]: 4 flashings, [N]: Flashing, [L]: Flashing]

Lift interlock relay output abnormality (2)

Failure code	[!]: 4 flashing, [N]: Flashing, [L]: Flashing	Trouble	Lift interlock relay output abnormality (2) (ISO controller system)
Trouble description	• Lift truck cannot move work equipment or travel because of lift interlock relay output abnormality (relay or controller output transistor has short circuit).		
Controller action	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Symptoms on lift truck	• Lift truck cannot move work equipment or travel.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

		Cause	Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective lift interlock relay (Internal defect)	• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			• Prepare with starting switch OFF. • Check relay unit.		
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	2	Defective F relay (Internal defect)	• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			• Prepare with starting switch OFF. • Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Defective R relay (Internal defect)	• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal

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6.31 E-14 Fuel level is not displayed normally

Trouble description	• Fuel level is not displayed normally
Related information	• Perform following troubleshooting when there is remarkable difference between actual fuel level and displayed fuel level.

<table>
<tr><th colspan="2" rowspan="2">Possible causes and standard value in normal state</th><th>Cause</th><th colspan="4">Standard value in normal condition/Remarks on troubleshooting</th></tr>
<tr><td>1</td><td>Defective fuse F11</td><td colspan="4">If fuse is broken, circuit probably has ground fault (See cause 4).</td></tr>
<tr><td></td><td>2</td><td>Defective fuel level sensor (Internal defect)</td><td colspan="4">• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.
<table><tr><td>FUEL LEVEL SENSOR (male)</td><td>Fuel level (Float position)</td><td colspan="2">Resistance</td></tr><tr><td rowspan="3">Between (1) and (3)</td><td>FULL (Max. position)</td><td colspan="2">0 - 2 Ω</td></tr><tr><td>EMPTY (Min. position)</td><td colspan="2">140 - 160 Ω</td></tr><tr><td>Between FULL and EMPTY</td><td colspan="2">Changes continuously as float moves</td></tr></table></td></tr>
<tr><td></td><td>3</td><td>Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)</td><td colspan="4">• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.
• Disconnect connectors at both ends of circuit and measure resistance between terminals.
<table><tr><td>Check continuity between related circuit terminals shown in figure for disconnection.</td><td>Resistance</td><td>Max. 1 Ω</td></tr></table></td></tr>
<tr><td></td><td>4</td><td>Ground fault of wiring harness (Contact with GND circuit)</td><td colspan="4">• Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.
• Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.
<table><tr><td>Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.</td><td>Resistance</td><td>Min. 1 MΩ</td></tr></table></td></tr>
<tr><td></td><td>5</td><td>Hot short in wiring harness (Contact with 12 V circuit)</td><td colspan="4">• If displayed level is higher than actual level, perform following troubleshooting.
• Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting
<table><tr><td>Between FUEL LEVEL SENSOR (female) (3) - METER PANEL (A) (female) (19) wiring harness and ground</td><td>Voltage</td><td>Max. 1 V</td></tr></table></td></tr>
<tr><td></td><td>6</td><td>Defective instrument panel (Internal defect)</td><td colspan="4">If above causes are not the cause for the trouble, instrument panel may be defective. (Since trouble is in system, troubleshooting cannot be performed.)</td></tr>
</table>

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H-19 Parking brake does not work or its performance is low

Ask the operator about the following:

- **Did the brake stop working suddenly?**
  Damaged related device
- **Was abnormal sound heard at that time? From what part was it heard?**
- **Did the brake performance lower gradually?**
  Worn related device

Inspection before diagnosis

Check that the parking brake pulling effort and clearance between the drum and lining are proper.

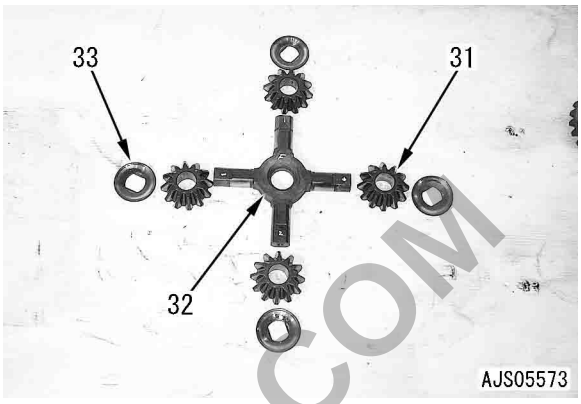
No.	Remedy ► / Diagnosis ▼	Cause: Parking brake a: Defective parking brake spring (△ ×)	b: Malfunction of parking brake piston (×)	c: Worn parking brake disc (×)
1	When engine is stopped, parking brake does not work	●	●	●
2	Measured parking brake disc thickness is below standard value			●
3	Parking brake drum is worn unevenly		●	

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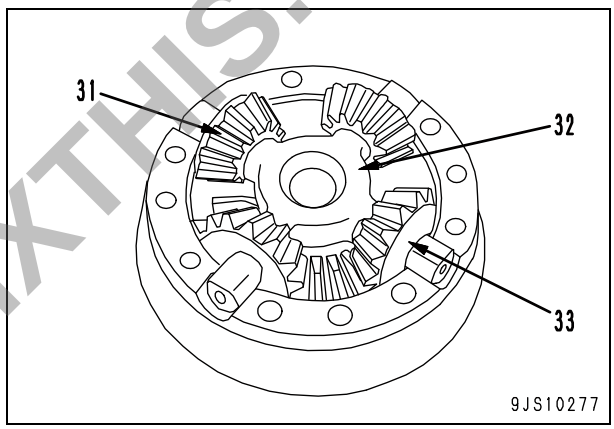
5. Differential case assembly

5.1 Install pinion (31) and spherical washer (33) to shaft (32).



5.2 Install thrust washer (29) and side gear (30) and then install the upper shaft assembly together.

★ Install thrust washer (29), while matching its claw to the groove of the case.



5.3 Install side gear (30) and thrust washer (29).

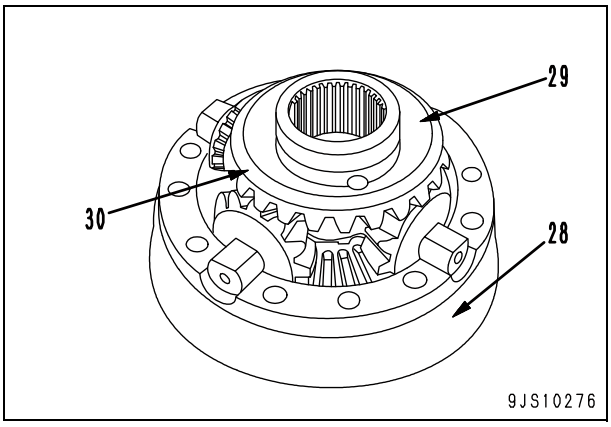
5.4 Install case (24) and tighten bolts (25).

★ Match the groove of case (24) to the claw of thrust washer (29).

torque

Mounting bolt: **59 - 74 Nm {6 - 7.5 kgfm}**

Mounting bolt: **LOCTITE #271**

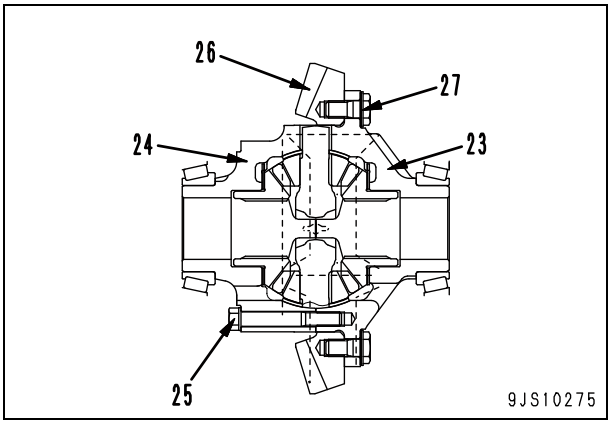


5.5 Install bevel gear (26) and tighten bolts (27).

torque

Mounting bolt: **98 - 123 Nm {10 - 12.5 kgfm}**

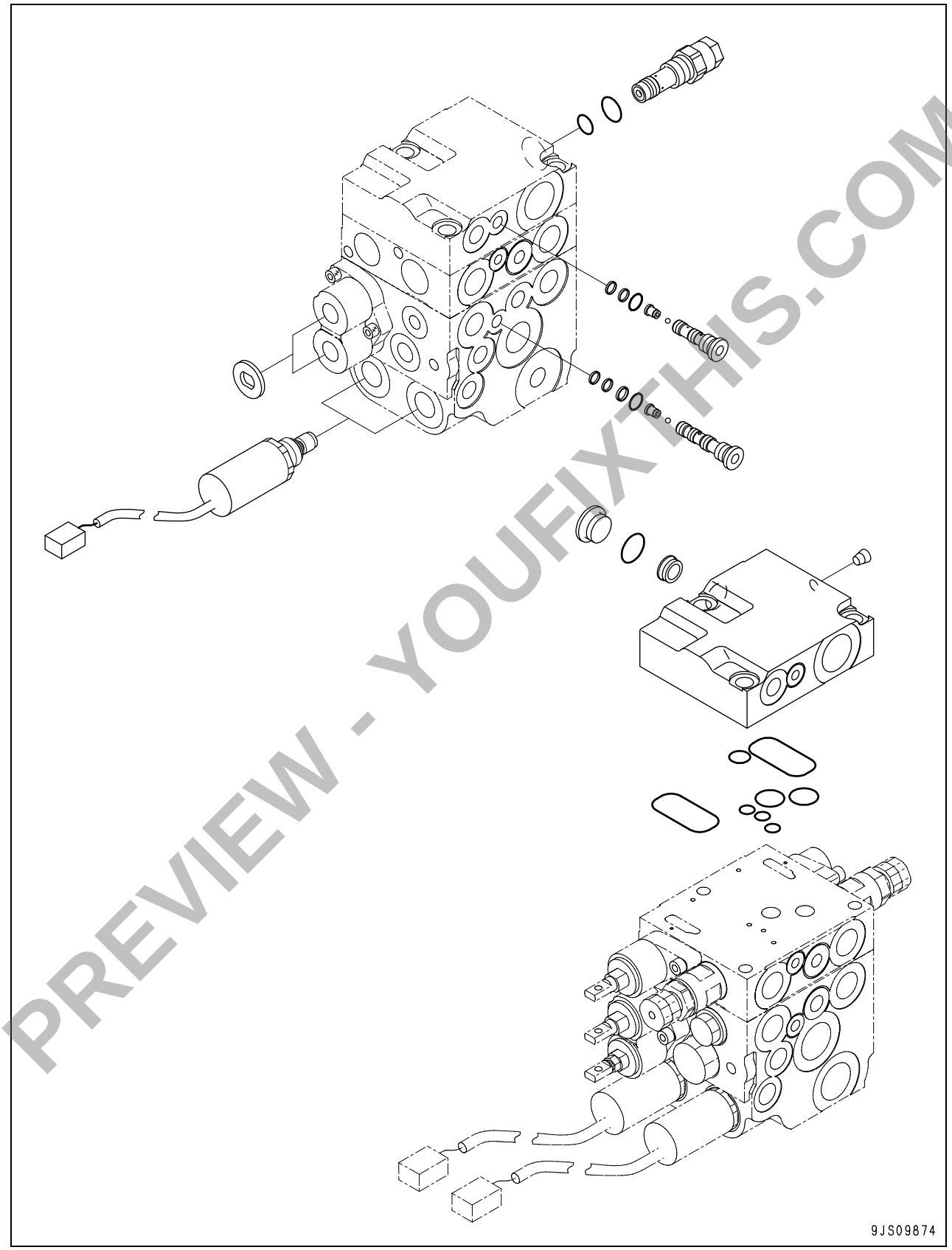
Mounting bolt: **Adhesive LT-2**



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Control valve - 3/3



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Section 5 Service

5.2-10 Piston Removal

1. Remove the plunger/piston assembly from the cylinder shell as described in Section 5.2-6.
2. Use a strap wrench and 400 grit emery cloth to secure the plunger while turning the piston with a pin type spanner wrench
3. Turn the piston until the snap wire end is visible through the hole. Use a screwdriver to start the wire end out the hole. Turn the piston to feed the wire out.
4. Pull the piston from the plunger.
5. For reassembly, reverse the above procedures except as follows:
*Install a new snap wire when installing the piston.

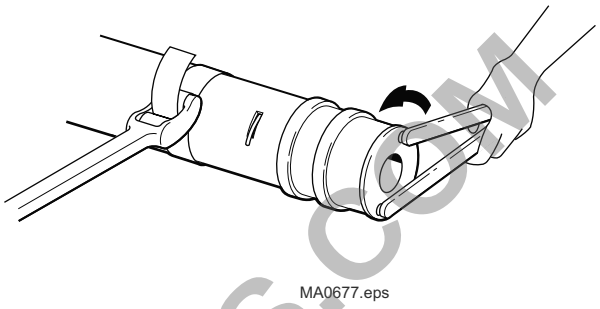


Figure 16. Piston Removal.

5.2-11 Cylinder Bleeding

WARNING: The cylinders must be bled to remove air. Air in the cylinders will compress on the first extension which could rupture the cylinders causing serious bodily injury and property damage.

After repair, the cylinders may have air trapped in them that must removed. To bleed air do the following:

1. Without a load extend the free lift cylinder and continue to extend the main lift cylinders to 90% of full stroke. Retract all cylinders completely. Repeat **three** times.

2. Extend the cylinders **without a load** at 50% full engine speed then build to full system pressure at the end of the main lift cylinder stroke. Electric trucks - limit the control valve movement to achieve 50% speed. Retract all cylinders. Repeat **four** times.

3. Cycle the mast with a half load (50% mast rated capacity) through full cylinder extension several times. The cylinders should extend smoothly. Repeat the steps if cylinder extension is not smooth.

5.3 Valve

5.3-1 Valve Cartridge Service

1. Completely lower the mast.
2. Remove the truck supply hose from the valve cartridge. See Figure 17. Plug the hose.
3. Remove the valve cartridge from the valve. Note the stamped part no. on the cartridge for ordering a replacement.

WARNING: Replacing the valve cartridge with a different part no. cartridge may cause the mast to malfunction.

4. For reassembly, reverse the above procedures.

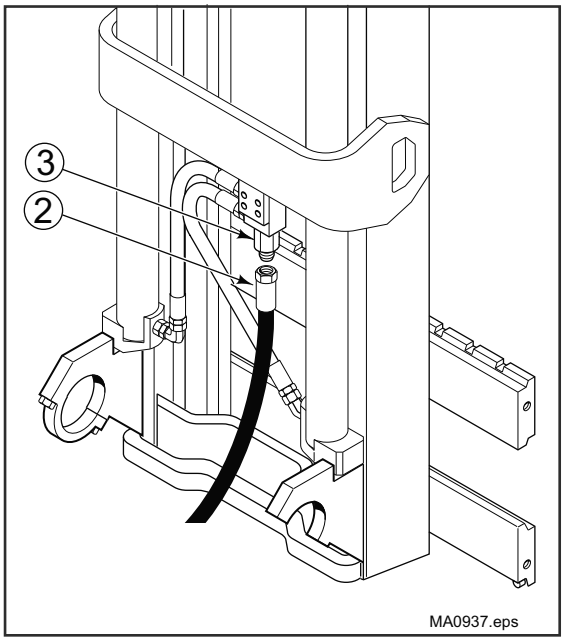


Figure 17. Valve Cartridge Service.

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Section 5 Service

5.2-6 Free Lift Cylinder Removal- Mast on Floor

1. Remove the mast from the truck as described in Section 5.1.

2. Lay the mast down as shown.

3. Roll the carriage toward the center of the cylinder to slacken the chains and internal reeving hoses (if equipped).

4. Disconnect the hose from the cylinder 45° fitting. Cap the fitting and plug the hose.

5. Remove the snap ring fastening the crosshead to the cylinder rod.

6. Pull the crosshead with chains and hoses (if equipped) off the cylinder rod.

7. Remove the cylinder retainer capscrews.

8. Remove the cylinder from the mast.

9. For reassembly, reverse the above procedures.

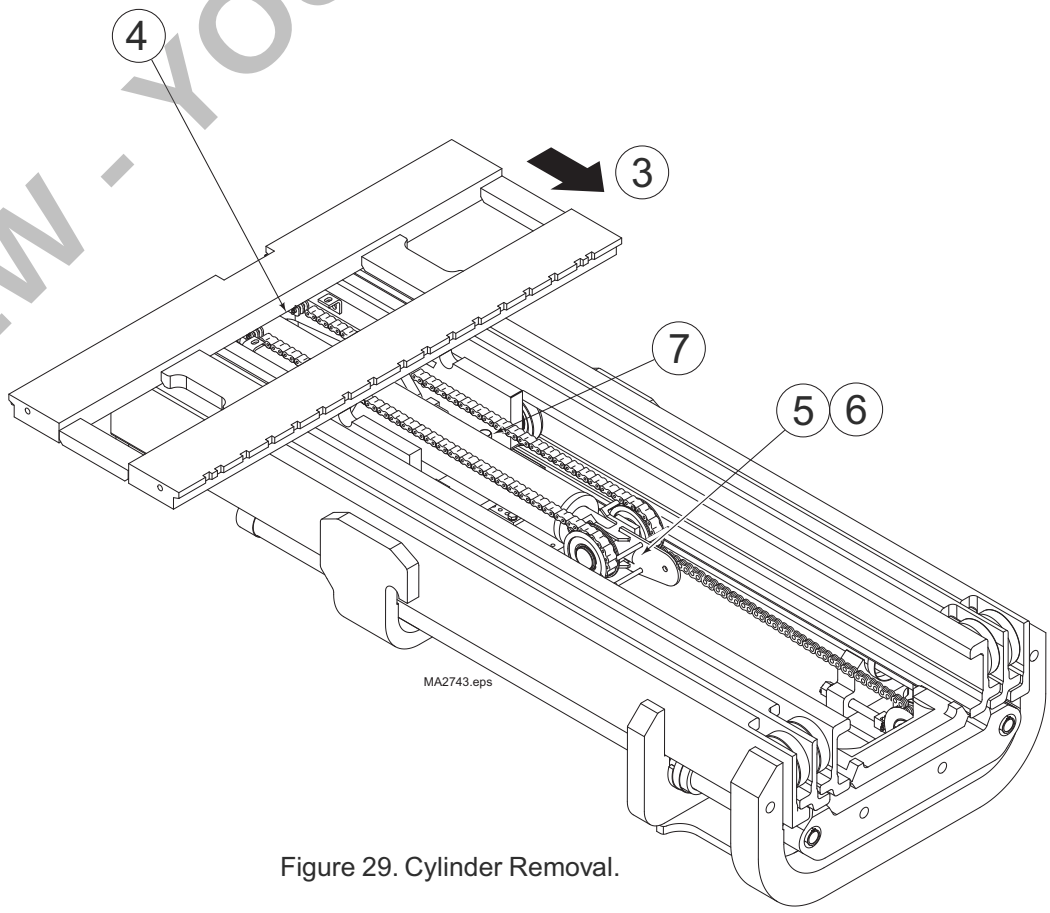


Figure 29. Cylinder Removal.

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TROUBLESHOOTING

3.1 General Procedures

3.1-1 Truck System Requirements

- Truck hydraulic pressure should be within the range shown in Specifications, Section 5.1. **PRESSURE TO THE SIDESHIFTER MUST NOT EXCEED 3500 psi (245 bar).**
- Truck hydraulic flow should be within the volume range shown in Specifications, Section 5.1 .
- Hydraulic fluid supplied to the Sideshifter must meet the requirements shown in Specifications, Section 5.1.

WARNING: Before servicing any hydraulic component, relieve pressure in the Attachment system. Turn the truck off and move the truck auxiliary control handle several times in both directions.

After completing any service procedure, always test the Attachment through several cycles. First test the Attachment empty to bleed any air trapped in the system to the truck tank. Then test the Attachment with a load to be sure it operates correctly before returning to the job.

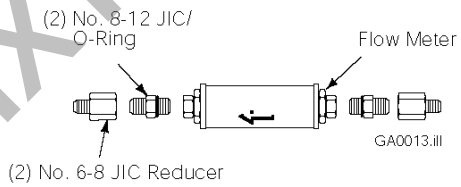
Stay clear of the load while testing. Do not raise the load more than 4 in. (10 cm) off the floor while testing.

3.1-2 Tools Required

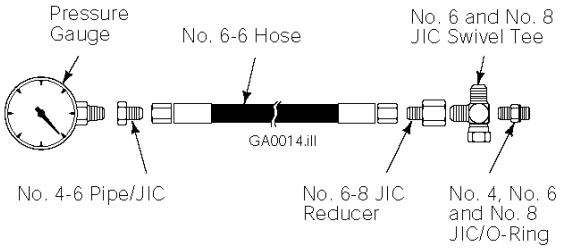
In addition to a normal selection of hand tools, the following are required:

- 20 GPM (80 L/min) inline flow meter. (Cascade Flow Meter Kit, part no. 671477).
- 3000 psi (200 bar) pressure gauge. (Cascade Pressure Gauge Kit, part no. 671212).
- Assorted fittings, lines, drain hoses and quick-couplers as required.

Flow Meter Kit 671477



Pressure Gauge Kit 671212



3.1-3 Troubleshooting Chart

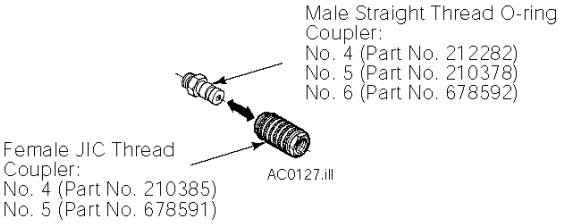
Determine All The Facts – It is important to gather all the facts about the problem before beginning any service procedures. The first step is to talk to the equipment operator. Ask for a complete description of the malfunction. Guidelines below can then be used as a starting point to begin troubleshooting.

Sideshift Circuit

- Attachment will not sideshift.
- Attachment sideshifts slowly.

To correct these problems, see Section 3.3.

Diagnostic Quick-Disconnects



NOTE: Diagnostics Kit 394382 includes all of the above.

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