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CD60/70/80/90S-7, CG60/70S-7

Operation & Maintenance Manual

XSB2399E06NA



XSB2399E06NA

Operation & Maintenance Manual

CD60S-7, CD70S-7

FDB0U, FDB0V (D34NAP/D34P Tier-4)

CD80S-7, CD90S-7

FDB0W, FDB0X (D34NAP/D34P Tier-4)

CG60S-7, CG70S-7

FGB0P, FGB0Q (PSI 4.3L Tier-3)



Forklifts

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General Hazard Information



Attach a "Do Not Operate" or similar warning tag to start switch or controls before servicing or repairing the lift truck.

Do not start or service the lift truck when a "DO NOT OPERATE" or similar warning tag is attached to the start switch or controls.

Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Know the width of your attachments so proper clearance can be maintained when operating near fences, boundary obstacles, etc.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the lift truck.

Keep the lift truck, especially the deck and steps, free of foreign material such as debris, oil tools and other items which are not part of the lift truck.

Secure all loose items such as lunch boxes, tools and other items which are not part of the lift truck.

Know the appropriate work-site hand signals and who gives them. Accept signals from one person only.

Always use the overhead guard. The overhead guard is intended to protect the lift truck operator from overhead obstructions and from falling objects.

A truck that is used for handling small objects or uneven loads must be fitted with a load backrest.

If the lift truck must be operated without the overhead guard in place due to low overhead clearance, use extreme care. Make sure there is no possibility of falling objects from any adjacent storage or work area. Make sure the load is stable and fully supported by the carriage and the load backrest extension (if equipped).

Do not raise loads any higher than necessary and never raise a load higher than 1830 mm (72 in) with the overhead guard removed.

Always use load backrest extension when the carriage or attachment does not fully support the load. The load backrest extension is intended to prevent the load or any part of the load from falling backwards into the operator's station.

When operating the lift truck, do not depend only on flashing lights or back-up alarms (if equipped) to warn pedestrians.

Always be aware of pedestrians and do not proceed until the pedestrians are aware of your presence and intended actions and have moved clear of the lift truck and/or load.

Do not drive lift truck up to anyone standing in front of an object.
Obey all traffic rules and warning signs.

Keep hands, feet and head inside the operator station. Do not hold onto the overhead guard while operating the lift truck. Do not climb on any part of the mast or overhead guard or permit others to do so.

Do not allow unauthorized personnel to ride on the forks or any other part of the lift truck, at any time. When working in a building or dock, observe floor load limits and overhead clearances.

NOTICE

Inhaling Freon gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting Freon can cause bodily harm or death. Do not smoke when servicing air conditioners or wherever Freon gas may be present.

LPG Truck contains 0.6kg of HFC-134a, of which the CO2 equivalent value is 0.858 tons.

Diesel Truck contains 0.7kg of HFC-134a, of which the CO2 equivalent value is 1.001 tons.

The GWP of HFC-134a is 1,430.

This is only for the trucks with air-conditioner option. The above capacity information written on the film is attached to the truck.

Never put maintenance fluids into glass containers. Use all cleaning solutions with care.

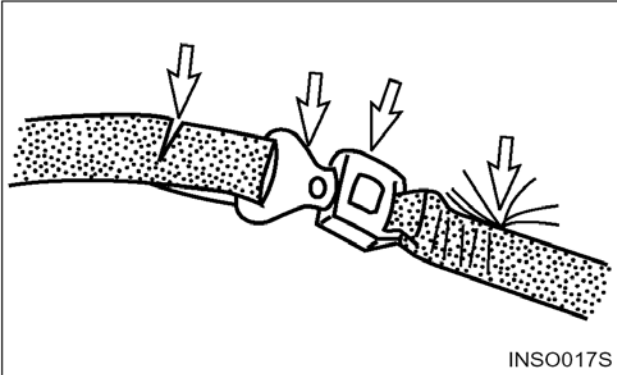
Do not use steam, solvent, or high pressure to clean electrical components.

Report all needed repairs.
When you handle DEF/ad-Blue, wear protective equipment and observe Precautions for Handling.

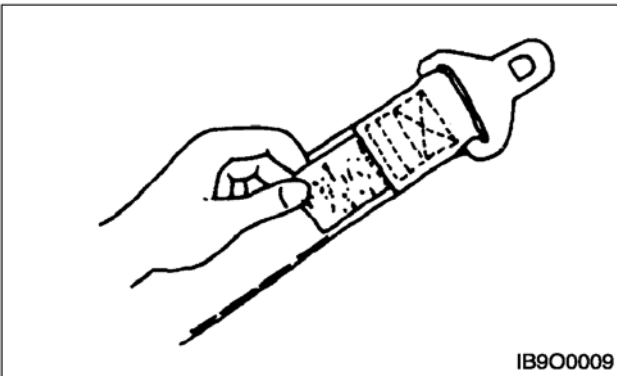
Seat Belt

The Operator Restraint System, Prevents the operator from the operator's compartment in the event of forward or side tip over. The system is designed to keep the operator on the seat and in the operator's compartment in the event of tip over.

Inspection



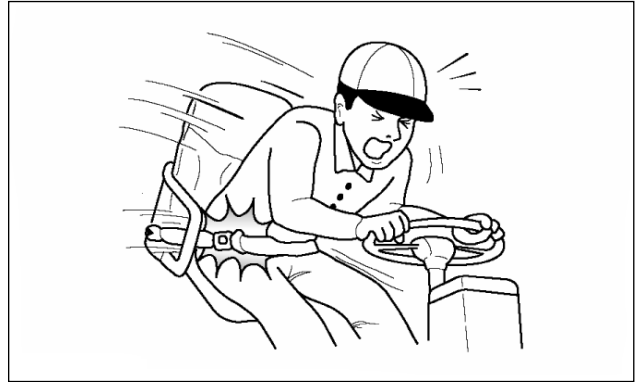
1. If the seat belt is torn, if pulling motion is interrupted during extension of the belt, or if the belt cannot be inserted into the buckle properly, replace the seat belt assembly.



2. Belt Maintenance – Every 500 service hours. Check that the belt fastening works properly and that winding device is free from run lock when jerked. Check that the belt is suitably fastened to the seat. Check that the seat is correctly secured to the hood and the chassis. On visual inspection, fastenings must be intact, otherwise, contact the safety manager.

⚠ WARNING

Your CROWN truck comes equipped with a CROWN operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another CROWN operator restraint system.



3. In the event of tip over, the seat and restraint system should be inspected for damage and replaced, if necessary.

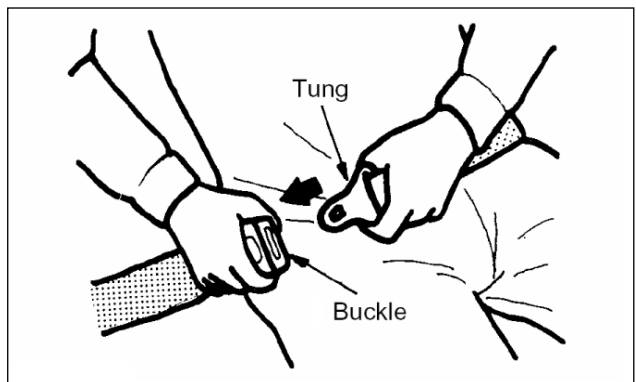
NOTE: Operator restraints shall be examined at the regular truck service intervals. It is recommended that they be replaced if any of the following conditions are found:

- Cut or frayed strap
- Worn or damaged hardware including anchor points
- Buckle or retractor malfunction
- Loosen stitching

⚠ WARNING

The seat belt may cause the operator to bend at the waist. If you are pregnant or have suffered from some abdominal disease, consult a doctor before you use the seat belt.

Fasten the Seat Belt



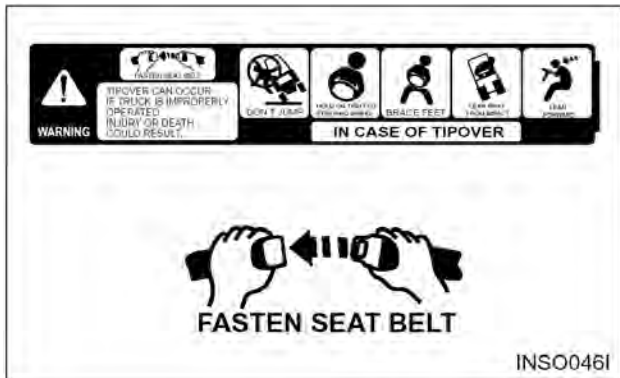
1. Grip the plate (connector) of the belt and pull the belt from the retractor. Then insert the plate into the slot of the buckle until a snap is heard. Pull on the belt to confirm it is latched.
2. Make sure the belt is not twisted.

⚠ WARNING

How to Survive in a Tip over (If Operator Restraint System Equipped)

WARNING

In the event of a tip over, the risk of serious injury or death will be reduced if the operator is using the operator restraint system and follows the instructions provided.



Always use operator restraint system.



Don't jump.



Hold on tight.



Brace your feet and keep them within the operator's compartment.

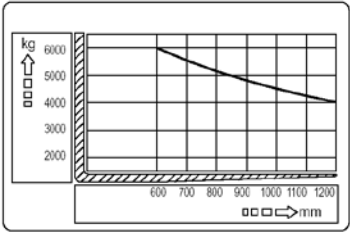
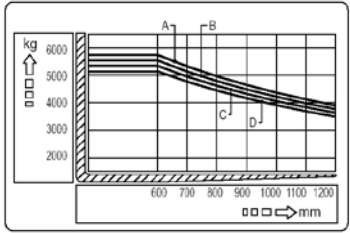
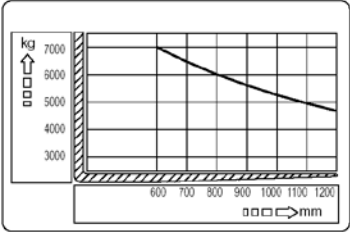
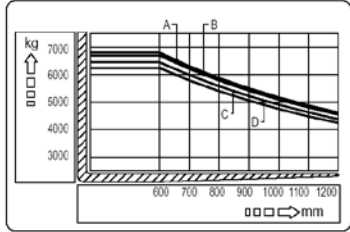


Lean away from the direction of fall.



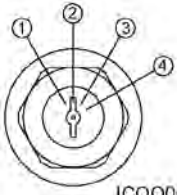
Lean forward.

Capacity Chart - Without Side Shifter (Not used in Australia)

MODEL	STD	FFT
CG60S-7		 <p data-bbox="1007 633 1262 745"> A. FFT 4550mm MAST B. FFT 5000mm MAST C. FFT 5600mm MAST D. FFT 6050mm MAST </p>
CG70S-7		 <p data-bbox="1007 1021 1262 1133"> A. FFT 4550mm MAST B. FFT 5000mm MAST C. FFT 5600mm MAST D. FFT 6050mm MAST </p>

Instrument Panel

1. Engine Ignition Start Switch



The key switch is a four position switch. Position (1) is ACCESSORY ON. Position (2) is OFF. Position (3) is ON or RUN and accessory ON.

Position (4) is START, which engages the starter.

After the key has been turned to the START position, the key must be returned to the OFF position before it can be turned to the START position again.

2. Engine Coolant Gauge



Indicates engine coolant temperature. If the pointer moves into the red band while operating the lift truck, the engine is overheated. Pull over the lift truck and stop the engine. Inspect the cooling system for any problem. The

pointer will be in the red band when the coolant temperature reaches approximately 110 °C on all engines.

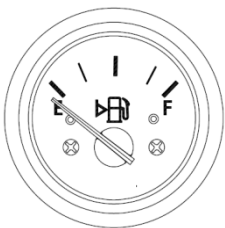
3. Transmission Oil Temperature Gauge



Indicates transmission oil temperature. If the pointer moves into the red band while operating the lift truck, the transmission is overheated. Pull over the lift truck and stop the engine.

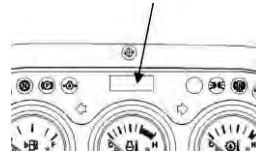
Check the system for a malfunction. The pointer will be in the red band when the transmission oil temperature reaches approximately 125 °C.

4. Fuel Level Gauge



Indicates current level of fuel in the fuel tank. Replenish fuel when the Level Gauge approaches the "E" marking during operation.

5. Hour Counter



Indicates the total number of hours the engine and the lift truck have operated. The hour meter will operate when the ignition switch is in the ON position, whether the engine is running or not.

The hour meter is used to determine lubrication and maintenance intervals.

6. Speedometer

Indicates the truck travelling speed (km/h).



7. Turn Signal Lever (Optional)



This is the lever to indicate the turning direction of the lift truck. As this lever is maneuvered, the signal lamp blinks.

R	Turn to the right
N	Neutral
L	Turn to the left

8. Horn Switch

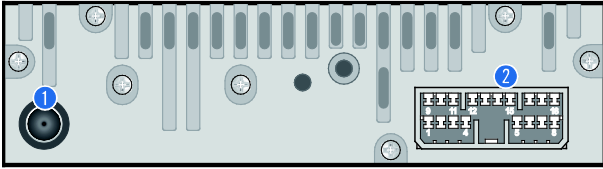
To give alarm to fellow worker(s) around and in the path of your truck, press the rubber at the centre of the hand wheel.



⚠ WARNING

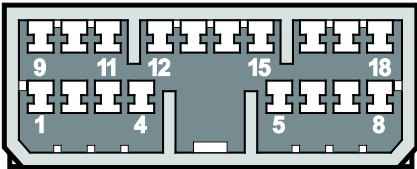
Don't run the truck while the alarm is sounding. It is dangerous to do so, since poor effect is expected.

Rear view/Connectors



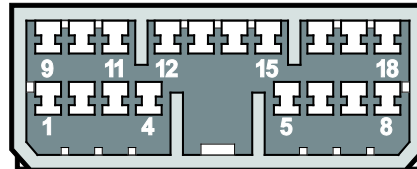
- 1. **Antenna** jack: To plug the FM antenna cable.
- 2. **I/O** connector: To plug the I/O cable.

<ARA-5080WF: 18 Pin>



- 1. Front R (+)
- 2. Rear R (+)
- 3. Illumination (+)
- 4. ACC (+)
- 5. Battery (B+)
- 6. N.C
- 7. Rear L (+)
- 8. Front L (+)
- 9. Front R (-)
- 10. Rear R (-)
- 11. N.C / Illumination (-)
- 12. N.C
- 13. REM GND
- 14. GND
- 15. 5V Output
- 16. REM Data
- 17. Rear L (-)
- 18. Front L (-)

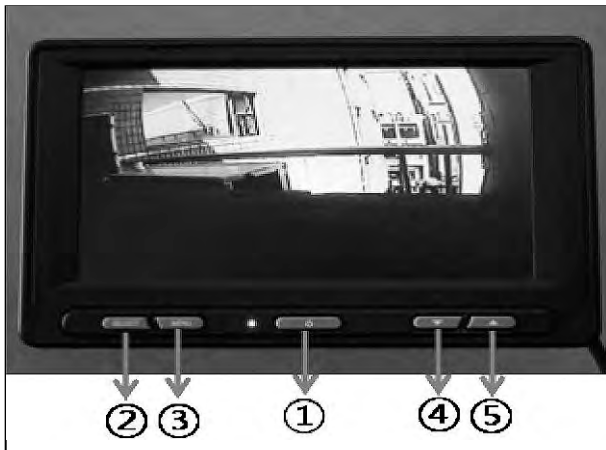
<ARA-5081WF: 18 Pin>



- 1. Tel Mute
- 2. Rear R (+)
- 3. Illumination (+)
- 4. ACC (+)
- 5. Battery (B+)
- 6. DMB GND
- 7. Rear L (+)
- 8. DMB L-CH
- 9. H/F GND
- 10. Rear R (-)
- 11. DMB Det
- 12. DMB Mute
- 13. REM GND
- 14. GND
- 15. 5V Output
- 16. REM Data
- 17. Rear L (-)
- 18. DMB R-CH

Rear View Camera (optional)

a. Front display (basic operation menu)



1. 'POWER' button
- Turns power on and off
2. 'SELECT' button
- Switches camera and AV input image
3. 'MENU' button
- Press shortly to adjust image
- Press 3 seconds to enter set up menu
4. '▲' button
- Increases speaker volume
5. '▼' button
- Reduces speaker volume

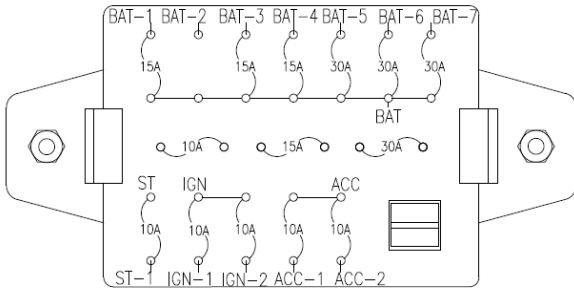
b. Operating Method

► Color tone control

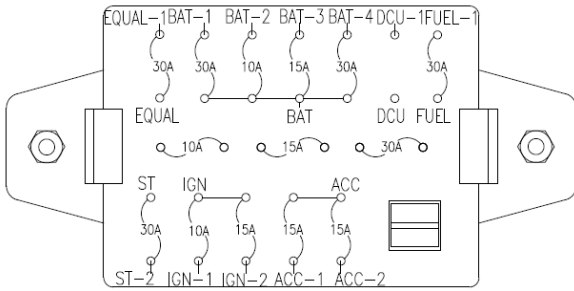


1. Press MENU button for 0.5~1 second.
2. Select brightness, value of color, color tone and color depth using SELECT button.
3. Adjust each title using UP and DOWN buttons.
 - The basic level is set up at 25.

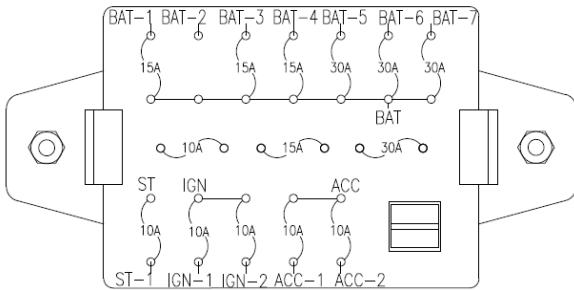
2. CD60/70/80/90S-7 (2 SPEED)



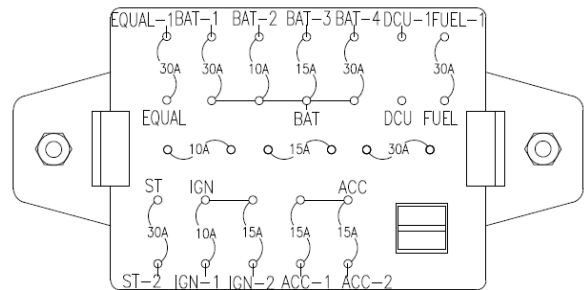
FUSE BOX-1 TERMINAL CONNECTION



FUSE BOX-2 TERMINAL CONNECTION



FUSE BOX-1 TERMINAL CONNECTION



FUSE BOX-2 TERMINAL CONNECTION

No.	Description	Rated Capacity
1	START RELAY	10A
2	OSS CONTROLLER(IGN) PARKING BRAKE CONTROLLER	10A
3	LCD DISPLAY, TCU F/R LEVER	10A
4	HAZARD SWITCH, CABIN RELAY	10A
5	GAUGE LAMP, ENGINE CHECK LAMP, CHARGE LAMP, PREHEAT LAMP	10A
6	HORN	15A
7		
8	COMBI LAMP, REAR LAMP	15A
9	WORKING LAMP	15A
10	FRONT WIPER	30A
11	MAIN POWER (KEY SW-BAT)	30A
12	CABIN POWER (AUDIO,REAR WIPER)	30A

No.	Description	Rated Capacity
1	CIGAR LIGHTER, WIPER TIMER	30A
2	ECU KEY POWER, FUEL HEATER RELAY	10A
3	ISO 3691 VALVE, TCU AUTO NEUTRAL, PARKING	15A
4	CAMERA OPTION (ACC)	15A
5	STOP LAMP, AIRCON/HEATER RELAY, CD PLAYER	15A
6	ECU POWER	30A
7	AIRCON/HEATER	30A
8	OSS CONTROLLER (BAT)	10A
9	OPTION (BAT)	15A
10	POWER PACK (OPTION)	30A
11		
12	FUEL HEATER	30A

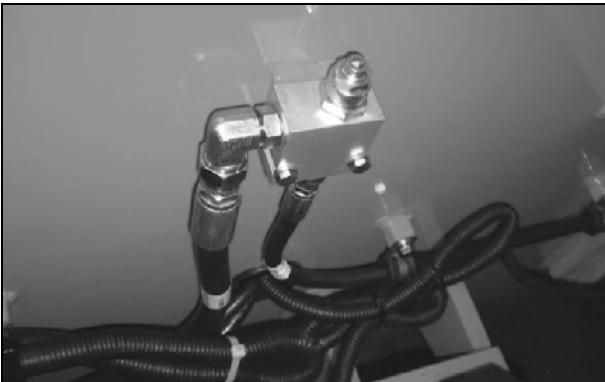
Emergency Lowering Device

WARNING

If the carriage fails to descend when the lift lever is pushed forward, it can be lowered using the emergency lowering valve in the control box. Do not stay beneath or near the carriage when using the emergency lowering valve, otherwise, you may get severely injured.

Observe the following procedure when using the emergency lowering valve.

1. Stop the engine and open the door of the control box on the right side of the operator.
2. Turn the nut and adjusting screw of the emergency lowering valve by 2 turns counterclockwise. The carriage will descend slowly.
3. When the carriage is on the ground, tighten the adjusting screw and nut to prevent further settlement by the valve.
4. Close the control box door.



Parking Brake Lever

NOTICE

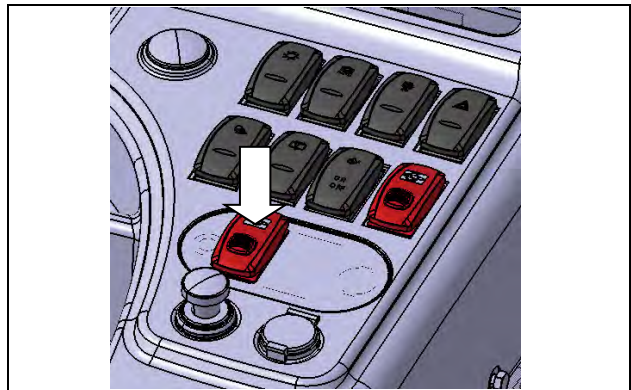
Do not engage the parking brake while the lift truck is moving unless an emergency exists. The use of the parking brake as a service foot brake in regular operation will cause severe damage to the parking brake system.

Mechanical Parking Brake (If Installed)



The parking brake lever is located at the left side of the steering wheel.

Electronic Parking Brake (If Installed)



How to Operate

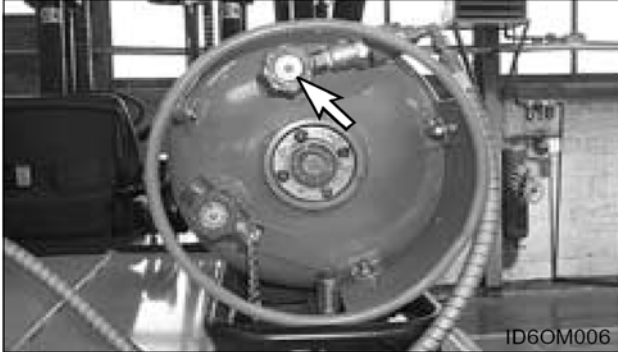
How to Release the Parking Brake

1. Sit on the operator's seat and check that the lever is in neutral.
2. With the brake pedal pressed, start the ignition.
3. Check that the instrument panel's parking brake lamp is on.
4. Press the parking brake switch, which is located on the right side of the seat. Then, check that the parking brake lamp turns off and the buzzer sounds three times.
5. Put the direction control lever in forward or reverse.
6. Release the brake pedal and operate the vehicle.

LP Engine

WARNING

LP fuel is flammable and can cause personal injury. Inspect LP fuel lines and fitting for leaks. Inspect tank for secure mounting.



1. Open the tank fuel valve by slowly turning the valve counterclockwise. Observe the LP gauge (if equipped).
2. Turn the ignition switch to the START position. Release it when the engine starts.
3. If the engine does not start, Do not press on the accelerator pedal. Turn the starter switch to OFF position, the repeat step 2 and depress the accelerator pedal slightly during cranking.
4. Allow the engine to warm up slowly.

Starting From a 12/24 Volt External Source

WARNING

Sparks occurring near the battery could cause vapors to explode.

Always connect the external power source ground cable to a point away from and below the battery, and well clear of fuel system components.



Typical Example

Diesel Engine Truck



Typical Example

LP Engine Truck

NOTICE

Do not reverse battery cables. It can cause damage to the alternator.

Always connect the external power source cables in parallel with the lift truck battery cables:

POSITIVE(+) to POSITIVE(+) and NEGATIVE(-) to NEGATIVE(-).

Attach ground cable last, remove first.





All lift trucks equipped with CROWN built internal combustion engines are NEGATIVE(-) ground.



Operation Section

DTC	Description	LAMP	TRQ	Limpome Mode	Engine STOP in 5minutes
	low (warning escalation)				
P2BC3	SCR Inducement Fault	-	-		
P2BC4	SCR Inducement Fault - UREA(DEF) tank level empty	-	-		
P2BD0	SCR Inducement Fault	FLASH	80%		
U0140	J1939 CAN Pedal Fault	FLASH	-		
U0140	Timeout of CM1 (Service DeSOx Switch)	FLASH	-		

DTC	Description	Inducement
U0025	SAE J1939 Error (Inlet Nox sensor)	
U0026	SAE J1939 Error (Inlet Nox sensor)	
U0027	SAE J1939 Error (Inlet Nox sensor)	
U0028	SAE J1939 Error (Inlet Nox sensor)	
U0029	SAE J1939 Error (Inlet Nox sensor)	
U002A	SAE J1939 Error (Inlet Nox sensor)	
U002B	SAE J1939 Error (outlet Nox sensor)	
U002C	SAE J1939 Error (outlet Nox sensor)	
U002D	SAE J1939 Error (outlet Nox sensor)	
U002E	SAE J1939 Error (outlet Nox sensor)	
U002F	SAE J1939 Error (outlet Nox sensor)	
U0030	SAE J1939 Error (outlet Nox sensor)	
U0031	SAE J1939 Error (outlet Nox sensor)	
U010E	CAN A Bus-off	
U011A	Timeout of AT1I1 (Inlet Nox sensor)	
U011B	Timeout of AT1IGC1 (Inlet Nox sensor)	
U011C	Timeout of AT1IGC2 (Inlet Nox sensor)	
U0147	Timeout of EEC3 (ECU)	
U0162	Timeout of ET1	
U0169	Timeout of AMB	
U016D	Timeout of AT1O1 (Outlet Nox sensor)	
U016E	Timeout of AT1OGC1 (Outlet Nox sensor)	
U016F	Timeout of AT1OGC2 (Outlet Nox sensor)	
U0170	Timeout of IC1	
U0196	Timeout of PROSCR1 (ECU)	
U0200	Timeout of PROSCR3 (ECU)	
U0216	SAE J1939 Error (inlet Nox sensor)	
U0219	SAE J1939 Error (inlet Nox sensor)	
U021A	Timeout AT1T1I (DEF Tank)	
U0223	SAE J1939 Error (inlet Nox sensor)	
U0224	SAE J1939 Error (inlet Nox sensor)	
U0225	SAE J1939 Error (outlet Nox sensor)	
U0226	SAE J1939 Error (outlet Nox sensor)	
U0227	SAE J1939 Error (outlet Nox sensor)	
U0229	SAE J1939 Error (outlet Nox sensor)	
U0233	SAE J1939 Error (outlet Nox sensor)	
U0235	SAE J1939 Error (outlet Nox sensor)	
U0300	Variant Dataset Error	

Interruption of Dosing for Europe

Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	≥ 90% of counter value for severe inducement (20hrs)	Green ON	Off	Off	Off	0%	NA
Level1	Dosing Interruption detected		Green ON	On	Off	Off	0%	NA
Level2	10~20hrs		Green ON	On	On	At starting & Every 20min	25%	NA
Level3	over 20hrs		Green ON	Blinking	Blinking	Every 10min	50%	60% (about 1500rpm)

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	≥ 90% of counter value for severe inducement (20hrs)	NA	NA
Level1	Dosing Interruption detected		At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT Engine Power will be Reduced
Level2	10~20hrs		Every 10min	SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT Engine Power is Reduced By 25%
Level3	over 20hrs		Continuous	SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT Engine Power is Reduced By 50%

HESITATION, SAG, STUMBLE

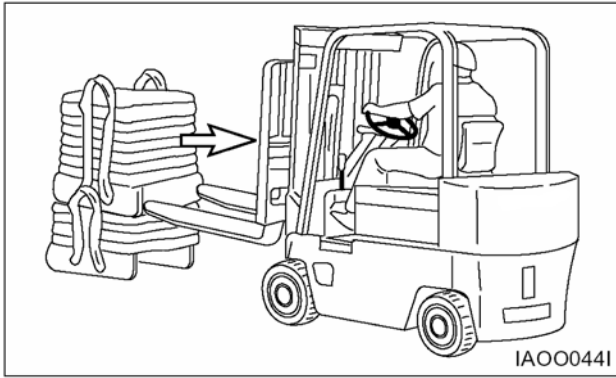
Checks	Action
<p>DEFINITION: <i>The engine has a momentary lack of response when putting it under load. The condition can occur at any engine speed. The condition may cause the engine to stall if it's severe enough.</i></p>	
Preliminary Checks	None
Fuel System Checks	<ul style="list-style-type: none"> • Check the fuel pressure. Refer to <i>LPG Fuel System Diagnosis</i>. • Check for low fuel pressure during a moderate or full throttle acceleration. If the fuel pressure drops below specification, there is possibly a faulty low pressure regulator or a restriction in the fuel system. • Check the TMAP sensor response and accuracy. • Check Shut-Off electrical connection. • Check the mixer air valve for sticking or binding. • Check the mixer assembly for proper installation and leakage. Check the EPR.
Ignition System Checks	<p>Note: LPG being a gaseous fuel requires higher secondary ignition system voltages for the equivalent gasoline operating conditions. If a problem is reported on LPG and not gasoline, do not discount the possibility of a LPG only ignition system failure and test the system accordingly.</p> <ul style="list-style-type: none"> • Check for the proper ignition voltage output with <i>J 26792</i> or the equivalent. Verify that the spark plugs are the correct type and properly gapped. • Check for faulty spark plug wires. • Check for fouled spark plugs.
Additional Check	<ul style="list-style-type: none"> • Check for manifold vacuum or air induction system leaks. • Check the alternator output voltage.

DIAGNOSTIC TROUBLE CODE (DTC) CHART – SORTED BY DTC # (2 of 4)

Description	DTC Set 2		Description	DTC Set 2	
	SPN-2	FMI-2		SPN-2	FMI-2
DTC 601: Microprocessor failure - FLASH	628	13	DTC 1175: MegaJector voltage supply low	520260	4
DTC 604: Microprocessor failure - RAM	630	12	DTC 1176: MegaJector internal actuator fault detection	520260	12
DTC 606: Microprocessor failure - COP	629	31	DTC 1177: MegaJector internal circuitry fault detection	520260	12
DTC 615: Start relay coil open	1321	5	DTC 1178: MegaJector internal comm fault detection	520260	12
DTC 616: Start relay ground short	1321	4	DTC 1182: Fuel impurity level high	520401	0
DTC 617: Start relay coil short to power	1321	3	DTC 1183: MegaJector autozero / lockoff failure	520803	31
DTC 627: Fuel pump relay coil open	1348	5	DTC 1311: Cylinder 1 misfire detected	1323	11
DTC 628: Fuel-pump high-side open or short to ground	1347	5	DTC 1312: Cylinder 2 misfire detected	1324	11
DTC 628: Fuel pump relay control ground short	1348	4	DTC 1313: Cylinder 3 misfire detected	1325	11
DTC 629: Fuel-pump high-side short to power	1347	6	DTC 1314: Cylinder 4 misfire detected	1326	11
DTC 629: Fuel pump relay coil short to power	1348	3	DTC 1315: Cylinder 5 misfire detected	1327	11
DTC 642: Sensor supply voltage 1 low	1079	4	DTC 1316: Cylinder 6 misfire detected	1328	11
DTC 643: Sensor supply voltage 1 high	1079	3	DTC 1317: Cylinder 7 misfire detected	1329	11
DTC 650: MIL open	1213	5	DTC 1318: Cylinder 8 misfire detected	1330	11
DTC 652: Sensor supply voltage 2 low	1080	4	DTC 1411: EMWT1 voltage high	441	3
DTC 653: Sensor supply voltage 2 high	1080	3	DTC 1412: EMWT2 voltage high	442	3
DTC 685: Power relay coil open	1485	5	DTC 1413: EMWT1 voltage low	441	4
DTC 686: Power relay ground short	1485	4	DTC 1414: EMWT2 voltage low	442	4
DTC 687: Power relay coil short to power	1485	3	DTC 1415: EMWT1 higher than expected stage 1	441	15
DTC 916: Shift actuator feedback out-of-range	520226	3	DTC 1416: EMWT2 higher than expected stage 1	442	15
DTC 919: Shift unable to reach desired gear	520226	7	DTC 1417: EMWT1 higher than expected stage 2	441	0
DTC 920: Shift actuator or drive circuit failed	520226	31	DTC 1418: EMWT2 higher than expected stage 2	442	0
DTC 1111: RPM above fuel rev limit level	515	16	DTC 1419: ERWT1 voltage high	443	3
DTC 1112: RPM above spark rev limit level	515	0	DTC 1420: ERWT2 voltage high	444	3
DTC 1121: FPP1/2 simultaneous voltages out-of-range (redundancy lo)	91	31	DTC 1421: ERWT1 voltage low	443	4

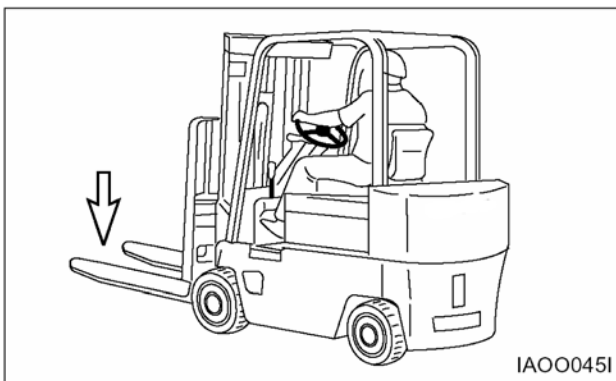
Operation Section

DTC 8907: UEGO return voltage shorted low	3056	4	DTC 1517: AUX analog Pull-Up 3 high voltage	520218	3
DTC 8910: UEGO sense cell voltage high	3217	3	DTC 1518: AUX analog Pull-Up 3 low voltage	520218	4
DTC 8911: UEGO sense cell voltage low	3217	4	DTC 1541: AUX analog Pull-Up/Down 1 high voltage	520219	3
DTC 8908: UEGO pump voltage shorted high	3218	3	DTC 1542: AUX analog Pull-Up/Down 1 low voltage	520219	4
DTC 8909: UEGO pump voltage shorted low	3218	4	DTC 1543: AUX analog Pull-Up/Down 2 high voltage	520220	3
DTC 8904: UEGO cal resistor voltage high	3221	3	DTC 1544: AUX analog Pull-Up/Down 2 low voltage	520220	4
DTC 8905: UEGO cal resistor voltage low	3221	4	DTC 1545: AUX analog Pull-Up/Down 3 high voltage	520221	3
DTC 8901: UEGO microprocessor internal fault	3221	31	DTC 1546: AUX analog Pull-Up/Down 3 low voltage	520221	4
DTC 8916: UEGO sense cell impedance high	3222	0	DTC 1551: AUX digital 1 high voltage	520222	3
DTC 8902: UEGO heater supply high voltage	3222	3	DTC 1552: AUX digital 1 low voltage	520222	4
DTC 8903: UEGO heater supply low voltage	3222	4	DTC 1553: AUX digital 2 high voltage	520223	3
DTC 8914: UEGO sense cell slow to warm up	3222	10	DTC 1554: AUX digital 2 low voltage	520223	4
DTC 8917: UEGO pump cell impedance high	3225	0	DTC 1555: AUX digital 3 high voltage	520224	3
DTC 8918: UEGO pump cell impedance low	3225	1	DTC 1555: Water Intrusion Detection	520224	3
DTC 8912: UEGO pump voltage at high drive limit	3225	3	DTC 1556: AUX digital 3 low voltage	520224	4
DTC 8913: UEGO pump voltage at low drive limit	3225	4	DTC 916: Shift actuator feedback out-of-range	520226	3
DTC 8915: UEGO pump cell slow to warm up	3225	10	DTC 919: Shift unable to reach desired gear	520226	7
DTC 171: Adaptive-learn gasoline bank1 high	520200	0	DTC 920: Shift actuator or drive circuit failed	520226	31
DTC 172: Adaptive-learn gasoline bank1 low	520200	1	DTC 1639: PWM5 open / ground short	520230	5
DTC 174: Adaptive-learn gasoline bank2 high	520201	0	DTC 1640: PWM5 short to power	520230	6



Typical Example

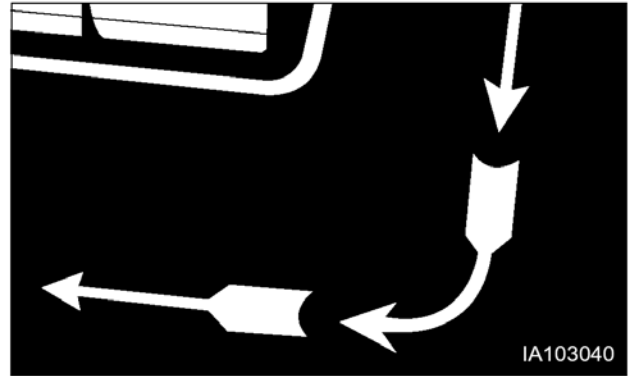
3. Deposit the load and BACK away carefully to disengage the forks.



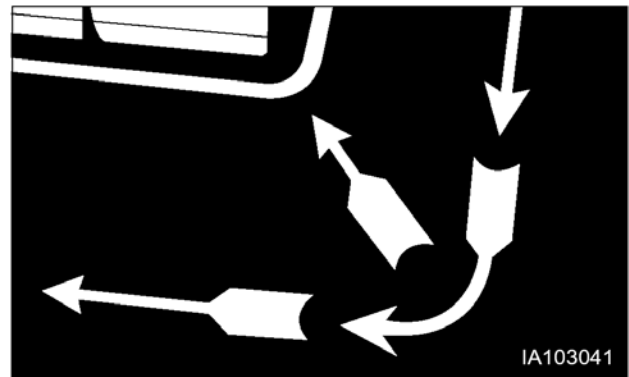
Typical Example

4. Lower the carriage and forks to the travel position or to the park position.

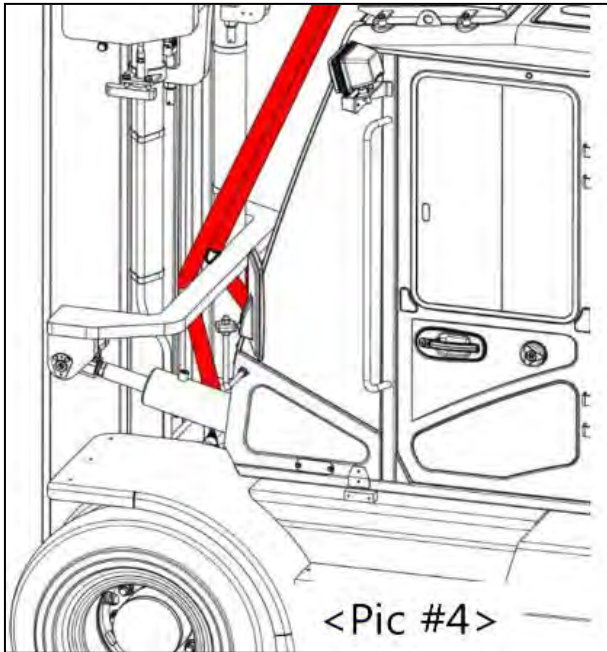
Turning



1. When turning sharp corners, keep close to the inside corner. Begin the turn when the inside drive wheel meets the corner.

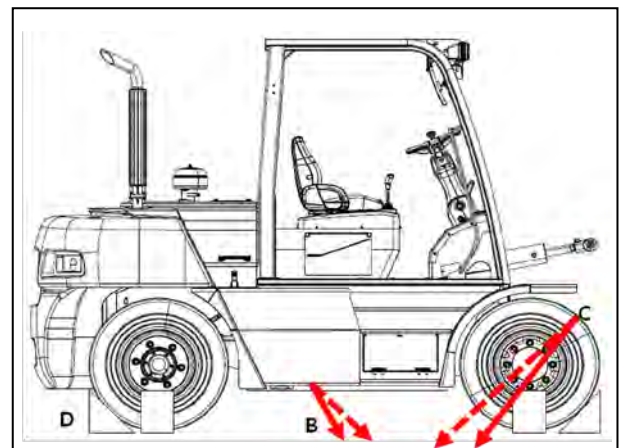
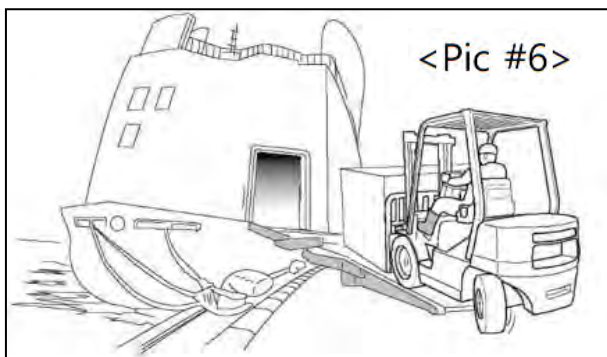
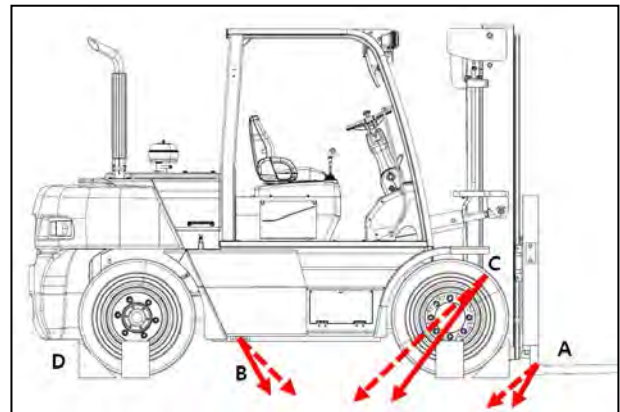
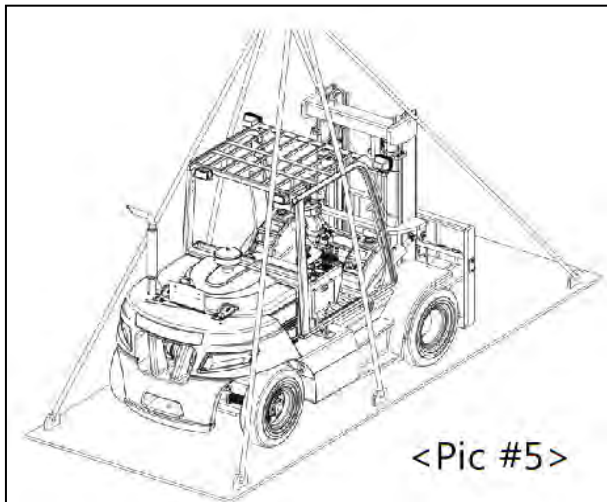


2. In narrow aisles, keep away from the stockpile when turning into the aisle. Allow for counterweight swing.



How to Fix Forklift to a Carrier

1. The rope/chain must have sufficient length for fixing.
2. Park the vehicle on a level ground.
3. Set the mast vertically. Lower the fork or attachment to the lowest position.
4. Set all the operating devices to Neutral Position. Turn OFF the start switch.
5. Apply the parking brake. Stop the tyres with blocks (D).
6. If the vehicle has a mast, connect fixing rope/chain to the fork (A) and fix the vehicle using the reinforcing bar (B) of the lower frame. If without mast, fix with the drive axle wheel (C).



Torque Specifications



Metric Hardware - This lift truck is almost totally metric design. Specifications are given in metric and U.S. Customary measurement.

Metric hardware must be replaced with metric hardware. Check parts books for proper replacement.

NOTE: Use only metric tools on most hardware for proper fit. Other tools could slip and possibly cause injury.

Torques for Standard Hose Clamps - Worm Drive Band Type

NOTICE

The following chart gives the torques for initial installation of hose clamps on new hose and for reassembly or retightening of hose clamps on existing hose.

Clamp Width	Initial Installation Torque On New Hose	
	N·m ¹	lb·in
16 mm (.625 in)	7.5 ± 0.5	65 ± 5
13.5 mm (.531 in)	4.5 ± 0.5	40 ± 5
8 mm (.312 in)	0.9 ± 0.2	8 ± 2
Clamp Width	Reassembly or Retightening Torque On Existing Hose	
	N·m ¹	lb·in
16 mm (.625 in)	4.5 ± 0.5	40 ± 5
13.5 mm (.531 in)	3.0 ± 0.5	25 ± 5
8 mm (.312 in)	0.7 ± 0.2	6 ± 2

¹1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torques for Standard Bolts, Nuts and Taper lock Studs

NOTICE

The following charts give general torques for bolts, nuts and taper lock studs or SAE Grade 5 or better quality.

Torques for Bolts and Nuts With Standard Threads

Thread Size Inch	Standard Nut and Bolt Torque	
	N·m	lb·ft
1/4	12 ± 4	9 ± 3
5/16	25 ± 7	18 ± 5
3/8	45 ± 7	33 ± 5
7/16	70 ± 15	50 ± 11
1/2	100 ± 15	75 ± 11
9/16	150 ± 20	110 ± 15
5/8	200 ± 25	150 ± 18
3/4	360 ± 50	270 ± 37
7/8	570 ± 80	420 ± 60
1	875 ± 100	640 ± 75
1 1/8	1100 ± 150	820 ± 110
1 1/4	1350 ± 175	1000 ± 130
1 3/8	1600 ± 200	1180 ± 150
1 1/2	2000 ± 275	1480 ± 200

¹1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities

LUBRICANT VISCOSITIES FOR AMBIENT (OUTSIDE) TEMPERATURES					
Compartment or System	Oil Viscosities	°C		°F	
		Min	Max	Min	Max
Engine Crankcase (Diesel) API CJ4, ACEA E9	SAE 5W30	-30	+30	-22	86
	SAE10W30	-20	+30	-4	86
	SAE5W40	-30	+40	-22	104
	SAE10W40	-20	+40	-4	104
	SAE15W40	-15	+40	5	104
	SAE15W50	-15	+50	5	122
SAE20W50	-10	+50	14	122	
Engine Crankcase (LP) and Lift Chains API SJ	SAE 5W30	-30	+30	-22	+86
Auto Shift Transmission API GL4	UTTO (API GL4)	-20	+50	-4	+122
Power Shift Transmission DEXRON III	DEXRON III	-20	+50	-4	+122
Hydraulic and Power Steering System ISO 6743/4 HM	ISO VG32	-20	+30	-4	+86
	ISO VG46	-10	+40	+14	+104
	ISO VG68	0	+50	+32	+122
Drive Axle Housing Disc Brake (OCDB) API GL4	UTTO (API GL4)	-20	+50	-4	+122

The SAE grade number indicates the viscosity of oil. A proper SAE grade number should be selected according to ambient temperature.

Refill Capacities

Refill Capacities (Approximate)		D5/6/7 TON 3speed	D8/9 TON 3speed	G5/6/7 TON 2speed
Compartment or System		Liters		
Engine Crankcase w/Filter	D34P D34NAP	12.6		4.3
Cooling System w/Coolant Reservoir tank	D34P D34NAP	12.7		19.0
Fuel Tank - Diesel		137	250	-
DEF / Ad-Blue Tank	D34P	15	30	-
Auto Shift Trans mission	ZF 3WG94	21		-
Power Shift Trans mission	PT50	13		13
Hydraulic Power Steering System		117 Proper quantity		117 Proper quantity
Drive Axle	Disc Brake	14		14

NOTE: The refill volume varies by the residual oil volume. Check the level gauge and refer to the related instruction on the oil replacement.

NOTE: Dieseling may occur, causing damage to the engine if oil is refilled excessively. Refill the oil half way between MIN and MAX using the dipstick.

SCR Cleaning – DeSOx (Diesel)

SCR Cleaning - DeSOx Display Pop-up

In order that the SCR system may maintain its exhaust cleaning efficiency at a proper level, it should be periodically initialized—“SCR cleaning.”

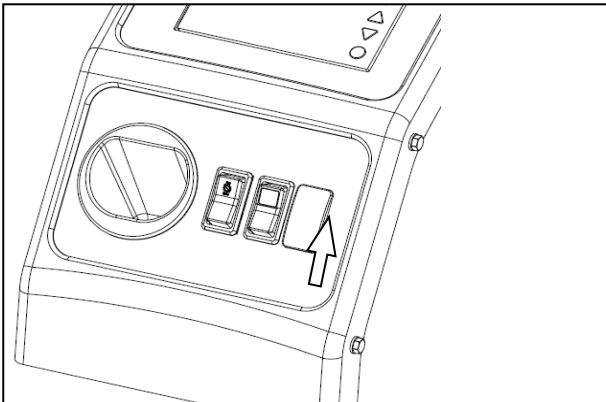
NOTICE

Keep monitoring the vehicle condition via the SCREEN display.

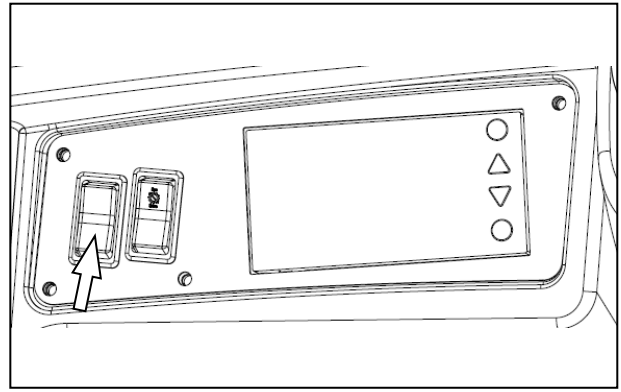
- At a workplace which is near inflammables or, heavily populated, or an indoor space, disable the SCR cleaning function.
- Be careful of the high temperature of the exhaust tube or other parts during SCR cleaning.
- Do not operate the vehicle (e.g. pushing the accelerator pedal) during SCR cleaning.
- Do not switch off the ignition during SCR cleaning. The SCR system might be damaged.



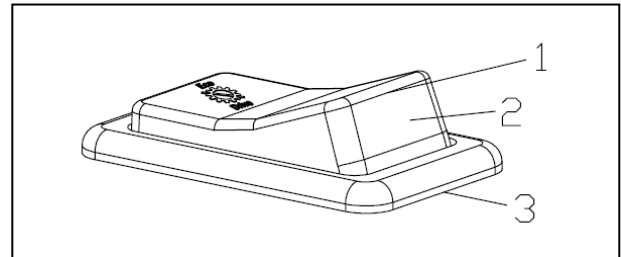
DOC & SCR Position



Overhead Guard



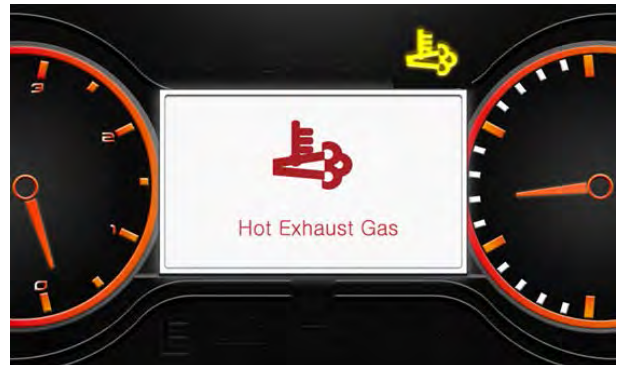
Cabin



SCR Cleaning switch

Automatic SCR Cleaning

The ECU attempts to start SCR cleaning during working—“automatic SCR cleaning”—at a proper moment after determining the moment. Once automatic SCR cleaning starts, the high temperature indicator lamp lights up with a popup appearing for the operator to notice it.



Display that notifies the operator of automatic SCR cleaning

If automatic SCR cleaning is failed due to a low exhaust temperature, you should perform it after the vehicle stops. Therefore, it is recommended to keep the vehicle working as far as possible in order to ensure automatic SCR cleaning is fully completed. While automatic SCR cleaning is being carried out, exhaust emissions above 500 °C may cause fires or burns.



Typical Example

3. Start and run the engine to stabilise the coolant level in the filter neck. If low, add coolant until it reaches the top of the filter neck. Install the radiator cap. Observe coolant level in the expansion bottle. If necessary, add coolant to bring the coolant to the appropriate line on the expansion bottle.
4. Stop the engine.
5. Inspect the cooling system for leaks, hose cracks or loose connections.

⚠ WARNING

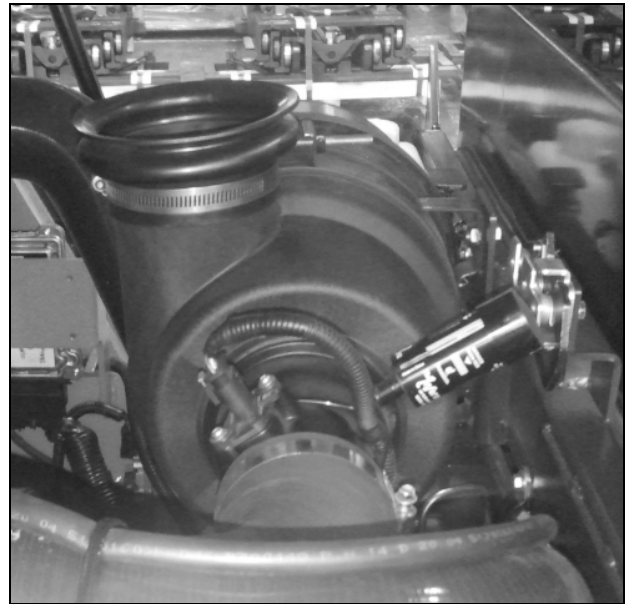
Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

Maximum air pressure must be less than 205 kPa (30 psi) for cleaning purposes.

6. Blow any dust and lint from the radiator fins.

Air Cleaner Indicator - Check Service Indicator



Typical Example

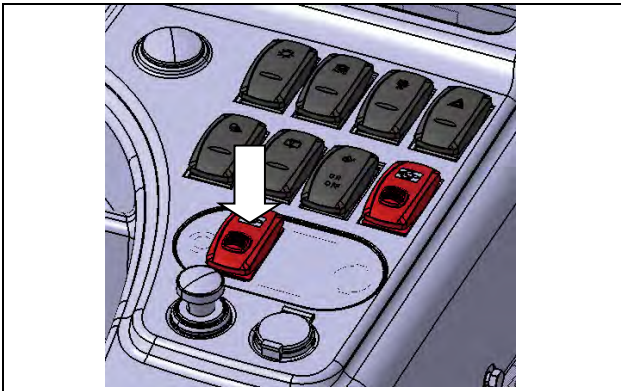
Diesel Engine Truck

1. Observe the air cleaner service indicator.
2. Service the air cleaner when the RED band in the service indicator, locks in the visible position. See topic, "Air Intake System - Check, Clean" in "Every 500 Service Hours or 3 Months".

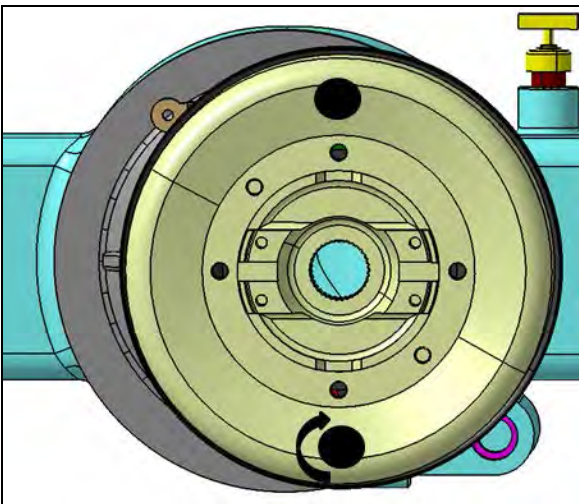
NOTE: Service the element more frequently, as required, in severe dust or lint conditions. Also, service it more frequently where the operator is required to wear a respirator.

3. Close hood and seat assembly.

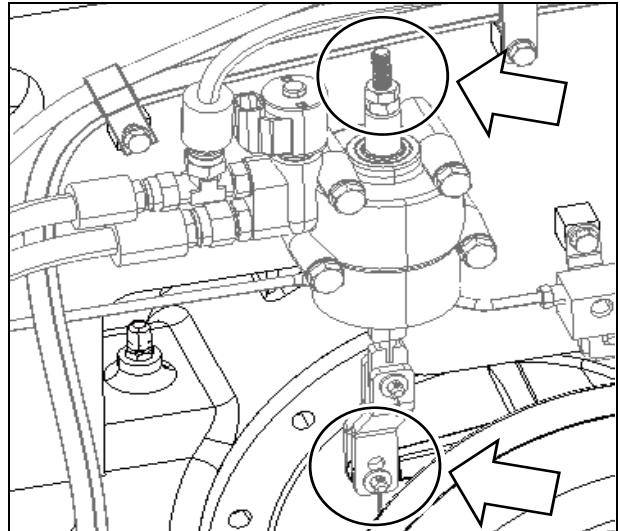
Electronic Parking Brake (If Installed)



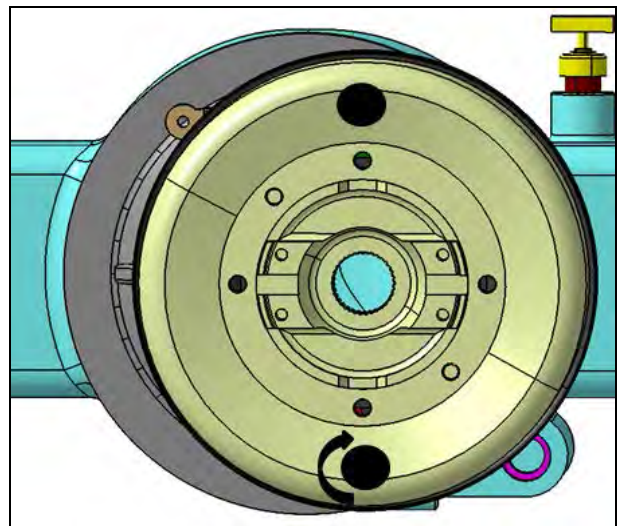
1. Park the vehicle with the parking brake drum's rubber cap positioned at 6 o'clock and then turn off the ignition.



2. Secure the wheels firmly with blocks.
3. Tilt the cabin open.
4. Completely loosen two nuts (1) of the hydraulic actuator located at the fore part of the vehicle.
5. Check that the parking brake lever is completely put down to the horizontal position.



6. Remove the 6-o'clock-positioned rubber cap from the parking brake drum.
7. Screw up the adjuster as far as possible.
8. Screw down the adjuster exactly by two clicks.
9. Install the rubber cap on the parking brake drum.
10. Put a nut on the hydraulic actuator and tighten it up to a height of 23-25 mm.
11. Put the other nut and tighten it firmly.
12. Close down the cabin.
13. Turn on the ignition and press the parking brake switch to check if the parking brake works normally.
14. Test the parking brake.



Every 1000 Service Hours or 6 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Air Intake System - Change

Changing Primary Element

See topic, "Air Intake System - Check, Clean" in "Every 500 Service Hours or 3 Months".

Changing Secondary Element

Replace the secondary element after the primary element has been cleaned three times or yearly.

1. Remove the primary air cleaner element. See topic "Servicing Filter Element". Clean the inside of the air cleaner housing and cover.



2. Remove the secondary element. Inspect the gasket between the air cleaner housing and the engine inlet. Replace the gasket if it is damaged.

NOTICE

Always replace the secondary element. Do not attempt to reuse it by cleaning.

3. Install a new secondary element. Install a new or cleaned primary element. Install the cover. Tighten the latches.
4. Start the engine and observe the air cleaner service indicator. If the indicator shows RED after installing a new secondary element and a cleaned primary (outer) element, replace the cleaned primary filter with a new element.
5. Stop the engine. Close the hood and seat assembly.

Carburetor (LP - Gas Engine Only) - Adjust, Clean

If the engine is hard to start or the exhaust is smoking, the carburetor may need cleaning and adjusting.

Before adjusting the carburetor make sure the engine is at normal operating temperature. Park the lift truck with the forks lowered, parking brake applied, transmission in neutral and the engine stopped.

For the complete procedure and specifications for your specific engine, see the "Service Manual".

Cooling System - Clean, Change

WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the filter cap is cool enough to touch with your bare hand.

Remove the filter cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

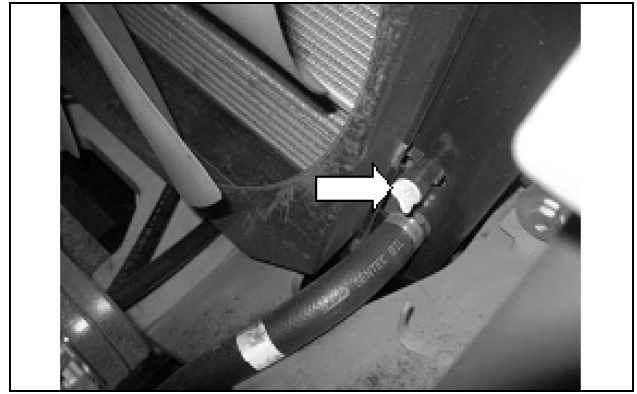
Use all cleaning solutions with care.

The lift truck must be level, the forks lowered, the parking brake engaged, the transmission in NEUTRAL and the engine stopped and cool.



Typical Example

1. Turn the radiator cap slowly to relieve the pressure, then remove the cap.
2. Remove the block drain plug.



Typical Example

3. Open radiator drain valve. Allow the coolant to drain. Drain the recovery bottle.
4. Close radiator drain valve and install block drain plug. Fill the cooling system with 1 kg (2 lb) sodium bisulphate per 40 liters (10 gallons) of water. Most commercial cooling system cleaners can be used.
5. Start and run the engine for 30 minutes.
6. Stop the engine and drain the cleaning solution.
7. Flush the system with clean water, until draining water is clear.
8. Close the drain valve and install the block drain plug. Fill the system with neutralizing solution, 250 g (1/2 lb) sodium carbonate per 40 liters (10 gallons) of water.
9. Start and run the engine for 10 minutes.
10. Stop the engine and drain the neutralizing solution.
11. Flush the system with clean water until draining water is clear.
12. Close the drain valve and install the block drain plug. Add coolant to the top of the filter neck.
13. Start and run the engine to stabilise the coolant level. See topic, "Coolant level - Check" in "Every 10 Service Hours or Daily".

1-1-2 Warning label definition

This manual uses the following three types of warning labels: “DANGER,” “WARNING,” and “CAUTION.”

Each label is designed to indicate to the reader the severity of a potential hazard, its nature, its consequence, and a precaution for preventing it. You will find these labels throughout the manual. Ensure that you pay careful attention to them as they have been included for your safety.

DANGER

The label **Danger** indicates a hazardous situation that *will* lead to death or severe injury if not prevented.

WARNING

The label **Warning** indicates a hazardous situation that *may* lead to death or severe injury if not prevented.

CAUTION

The label **Caution** indicates a hazardous situation that may lead to minor injury if not prevented.

- Ensure the vehicle is unloaded and unoccupied, the forks are lowered, all hydraulic controls are in the neutral position, and the key is switched to OFF. Attach a "Do Not Operate" or similar warning tag to the start switch or controls before servicing or repairing the forklift.
- Make sure that the tools are in good condition.

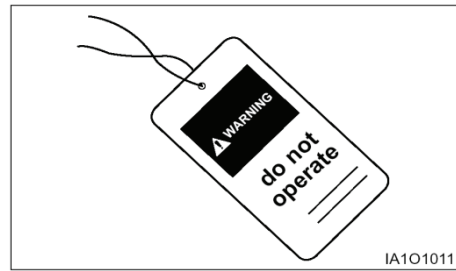


Fig. 1-8

Mounting and dismounting

- Clean any mud or debris from steps, walkways or work platforms before you mount the vehicle.
- Face the vehicle when using steps, ladders or walkways to mount or dismount it.
- Use the steps and grab the handles to mount or dismount the vehicle. When you are not able to use the steps, use ladders, scaffolds, or work platforms to perform the repair operations safely.

Heavy lifting

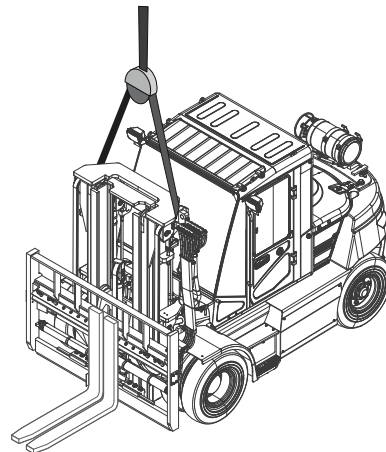
- Check the weight of each component before removing it. Some of the components on this vehicle are extremely heavy and could cause severe injury.
- Use proper lifting procedures when removing any components.
- To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lb) or more. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly. Lifting eye bolts are not to be side loaded during a lifting operation.



Fig. 1-9

Asbestos

- Components in DOOSAN products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates and some gaskets.
 - The asbestos used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust which contains asbestos is not generated.



0119K

Fig. 1-10



Every 2,500 service hours or 15 months

Items	Inspection criteria and method
Battery system	<ul style="list-style-type: none">• Clean and inspect the outer surface of the battery.
Fuel lock-off	<ul style="list-style-type: none">• Test the operation of the fuel lock-off.
TMAP sensor	<ul style="list-style-type: none">• Check the TMAP sensor for leaks.
Air intake system	<ul style="list-style-type: none">• Visually inspect the intake manifold, throttle ass'y, and manifold adapters, for looseness and leaks. Repair as necessary.
PCV valve and breather element	<ul style="list-style-type: none">• Replace the PCV valve and breather element.
O2 sensor	<ul style="list-style-type: none">• When indicated by MIL, replace the O2 sensor on the exhaust tube and muffler ass'y.

- Pay attention to the following when you install bearings.
 - Neither hit the outer race with a hammer to install it, nor hit the inner race to insert the outer race. Hammering like this will cause damage to the track of the bearing.
 - When you insert the inner race of a bearing with a reasonable tolerance, use a jig as shown in Fig. 1-22 and put pressure on the inner race. When you perform thermal insertion with a press-fitting tolerance, heat the bearing up to 120 °C (248 °F). Note, however, that excessive heating may lower the hardness of the surface of bearing.
 - When you insert a non-split bearing with an inner race and outer race at a reasonable tolerance, use a jig as shown in Fig. 1-23 and press in both the inner and outer races at the same time.

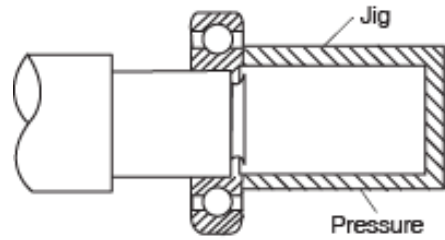


Fig. 1-21

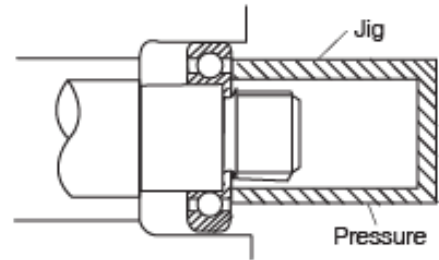


Fig. 1-22

Handling retaining rings

- When you remove or install a retaining ring, use a pair of right ring pliers and be careful not to put too much stress on the retaining ring.
- After you have installed the retaining ring, check if it is correctly inserted into the groove.

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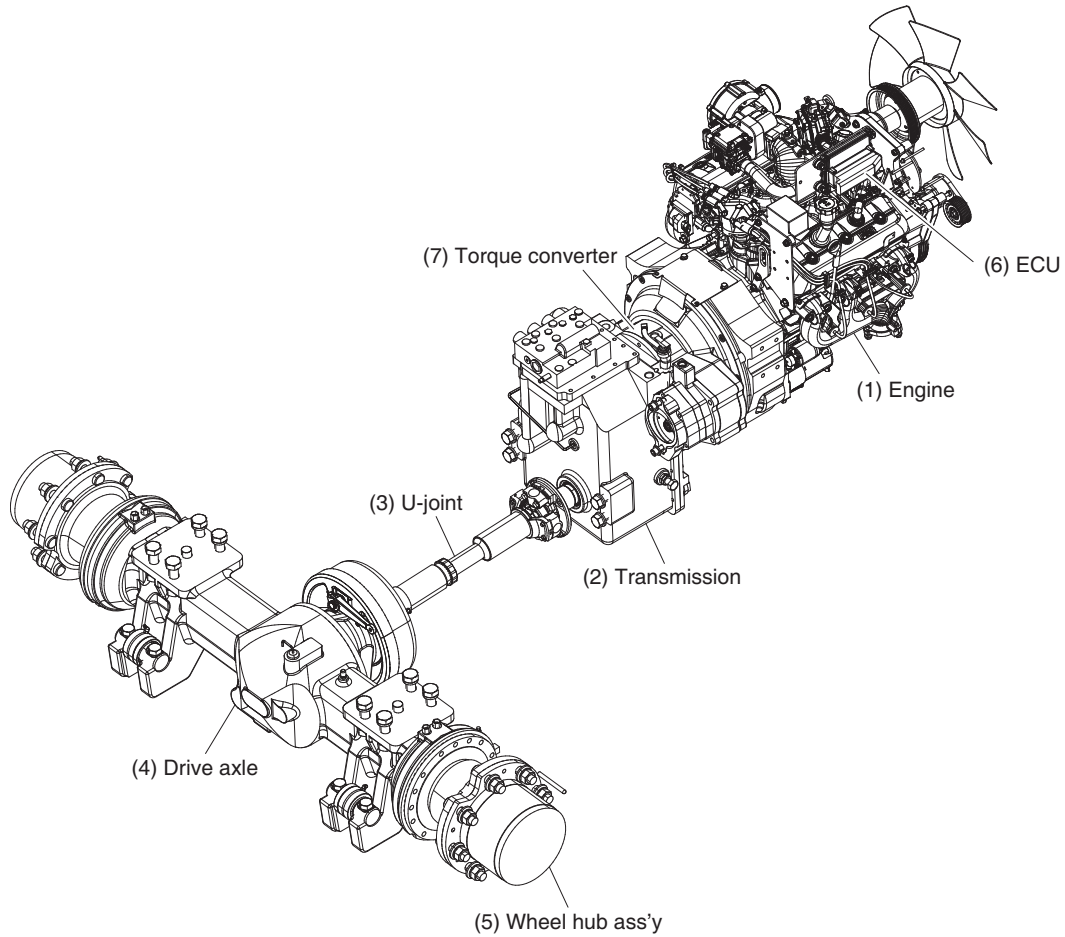


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2-1 Overview and specifications

2-1-1 Powertrain components



0122-1E

Fig. 2-1

2-3 Transmission body

2-3-1 Exterior and specifications

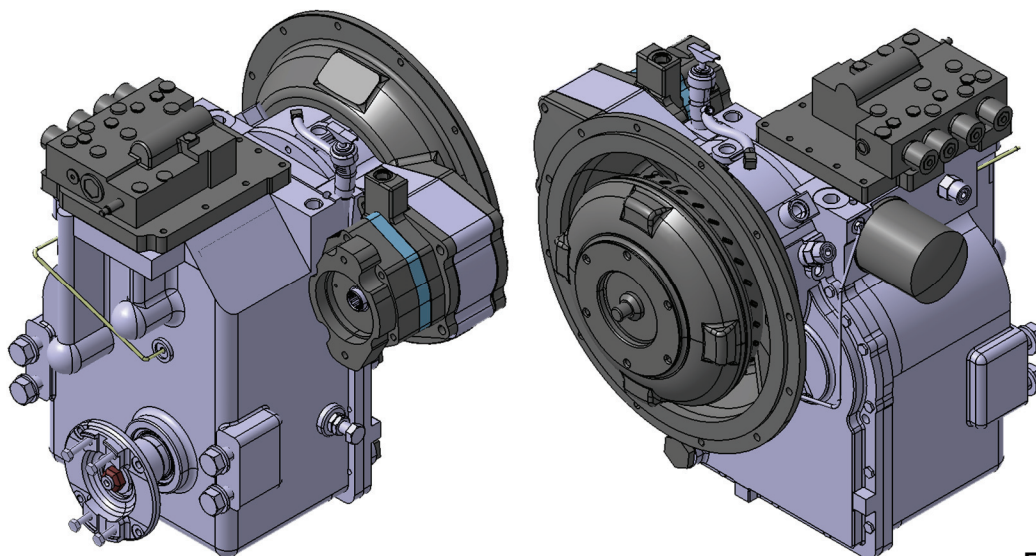


Fig. 2-7

Items		Spec.
Gearbox	Gear speeds	2 speeds FWD and REV
	Control valve	Solenoid inching valves included
	PTO system	included
	Weight	222 kg (489.427 lb)
Hydraulic system	Pump type	Outer mounted
	PTO pump's maximum rated flow	26.4 cc/rev
	Main relief pressure	750–1,500 kPa (109–218 psi)
	Torque converter pressure (input)	420–720 kPa (61–104 psi) at 2,500 rpm
Input power	Clutch pressure	750–1,500 kPa (109–218 psi)
	Voltage	12 Vdc (max. 14.5)
	Current	1.4 A at 20 °C (68 °F)
	Resistance	10±0.3 Ω at 25 °C (77 °F)

Pump, filter, torque converter and oil cooling systems

The oil for the operation and lubrication of the transmission is made available by the pump. The oil pump is outer mounted on the PTO.

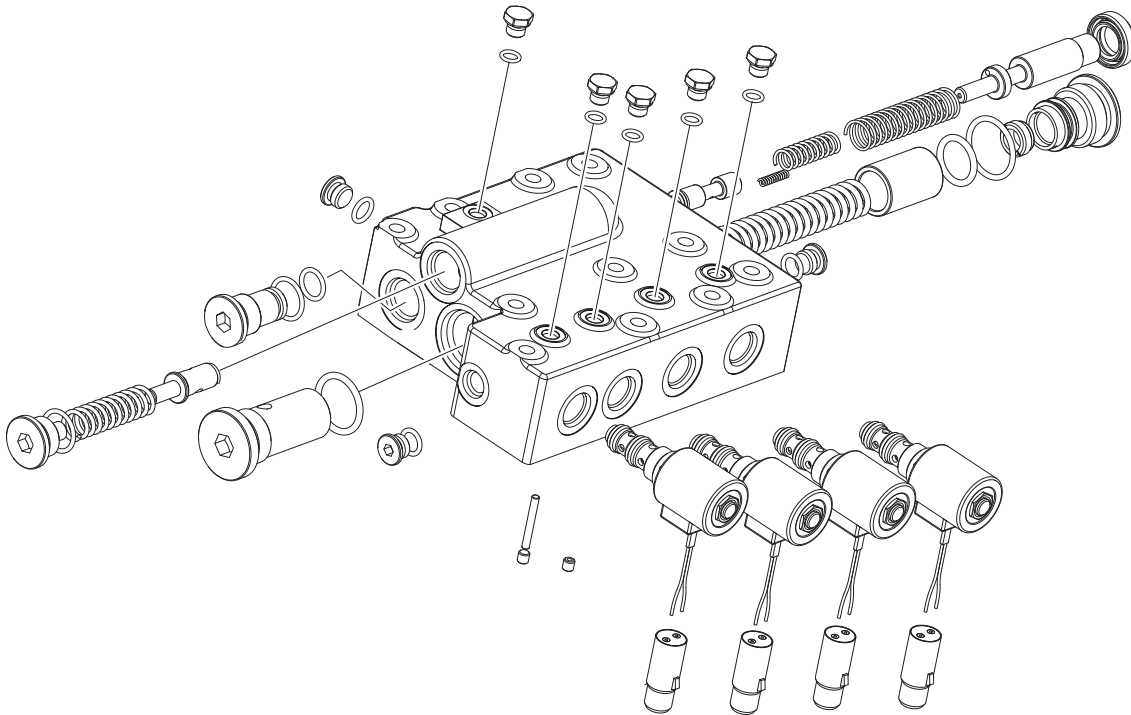
The oil sump is located at the bottom of the transmission housing. Oil from the sump flows through the strainer into oil pump (2) and then is filtered through oil filter (3). If there is a restriction in oil filter (3) or if the oil is cold and thick, a bypass valve in the filter will open. The difference in pressure at which the bypass valve will open is 3.5 ± 0.5 bar (350 ± 500 kPa, 51–7.3 psi). From oil filter (3), the oil flows on to relief valve (15). Relief valve (15) keeps the pressure inside the transmission control valve to avoid an excessive pressure drop or rise, and it also supplies oil to torque converter (16). The oil that has passed through torque converter (16) and transmission oil cooler (17) lubricates the disc clutches in the housing and then returns into oil sump (1).

Transmission hydraulic control system

Pump oil that is not drained through relief valve (15) flows in inching valve (4). When the inching pedal is not pressed, pump oil is stored in accumulator (5). And once the pedal is pressed, the oil in accumulator (5) is drained. Oil discharged from accumulator (5) is sent to one of the four clutches (11 to 14) as commanded from the F/R switch.

2-3-8 Transmission disassembly/assembly

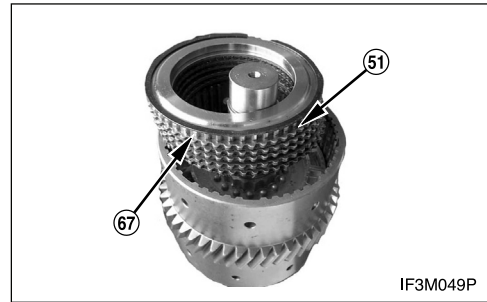
Tools needed	10 mm open ended spanner
	13 mm hexagonal socket
	17mm hexagonal socket
	Allen head wrench
	Jack bolts
	M10 Eye bolts

A. Transmission control valve disassembly

0146k

Fig. 2-30

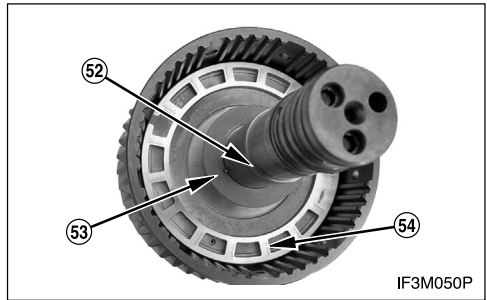
- 20. Disassemble pressure plate, 7 clutch discs (51), 8 clutch plates, and band plate (67) from the cylinder.



IF3M049P

Fig. 2-56

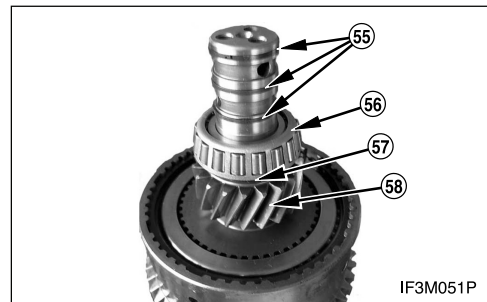
- 21. Push down the retainer (53) with pressure. Isolate snap ring (52) with a screw driver. Remove the tension force on the assembly slowly.
- 22. Disassemble retainer (53) and spring assembly from cylinder.
- 23. Disassemble piston (54) using compressed air. Disassemble O-ring from shaft.



IF3M050P

Fig. 2-57

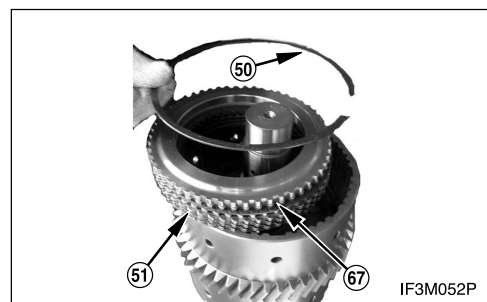
- 24. Isolate sealing from the low speed forward clutch assembly. Remove bearing (56), thrust washer (57), gear (58), needle bearing, and spacer.



IF3M051P

Fig. 2-58

- 25. Remove snap ring (50), then remove compression plate, 7 clutch discs, 8 clutch plates, and band plate from the cylinder.



IF3M052P

Fig. 2-59

- Assemble shaft assembly (including taper bearing cone and cup)
- Install shaft assembly on the transmission case.

⚠ CAUTION

Since depth gauge and block gauge are used, the height of the bearing cup must be higher than the transmission case surface.

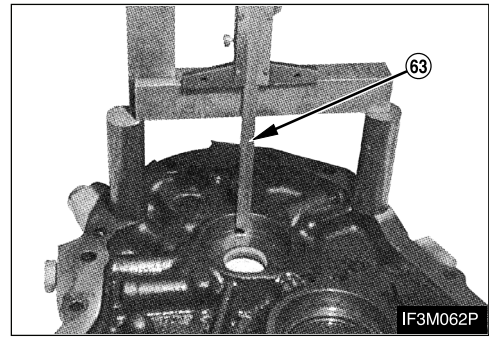


Fig. 2-87

- Select the shim of which thickness(0~0.05mm) fits with the shaft.
- Assemble cover on the transmission case.
- Set the transmission assembly vertically.
- Check the shim adjustment on the input and counter shafts. The input shaft of the transmission must be able to rotate freely.
- If the input or output shaft does not rotate freely, remove 0.025~0.05mm shim.

⚠ CAUTION

Do not tilt the cover while assembling. Otherwise, the seal ring on the input power shaft may be damaged.

2-5-2 Check List from Operation Noise

Problem	Probable causes
Noise in NEUTRAL only.	Worn one-way clutch in torque converter.
	Low oil level (pump cavitation).
	Worn bearing next to pump.
Pump noise not normal.	A loud sound at short time periods gives an indication that foreign material is in the transmission hydraulic system.
	A constant loud noise is an indication of pump failure.
Noise in the Transmission that is not normal.	Transmission components have wear or damage. <ul style="list-style-type: none"> ➤ Damaged gears. ➤ Worn teeth or clutch plates and/or clutch discs. ➤ Slipping clutch plates and disc noise. ➤ Other component parts have wear or damage.
	Modulating valve assembly makes noise.
Constant noise in the Drive axle.	Lubricant not to the specific level.
	Wrong type of lubricant.
	Wheel bearings out of adjustment or have a defect.
	Bevel gears not in adjustment for correct tooth contact.
	Teeth of bevel gear have damage or wear.
	Loose or worn pinion bearings.
	Loose or worn shaft bearings.
Noise at different intervals.	Bolts on drive gear not tightened correctly.
	Drive gear has a defect (warped).
	Loose or worn differential bearings.
	Bevel gear bearing failure.

7-2 Service brake ass'y

7-2-1 Exterior and specifications

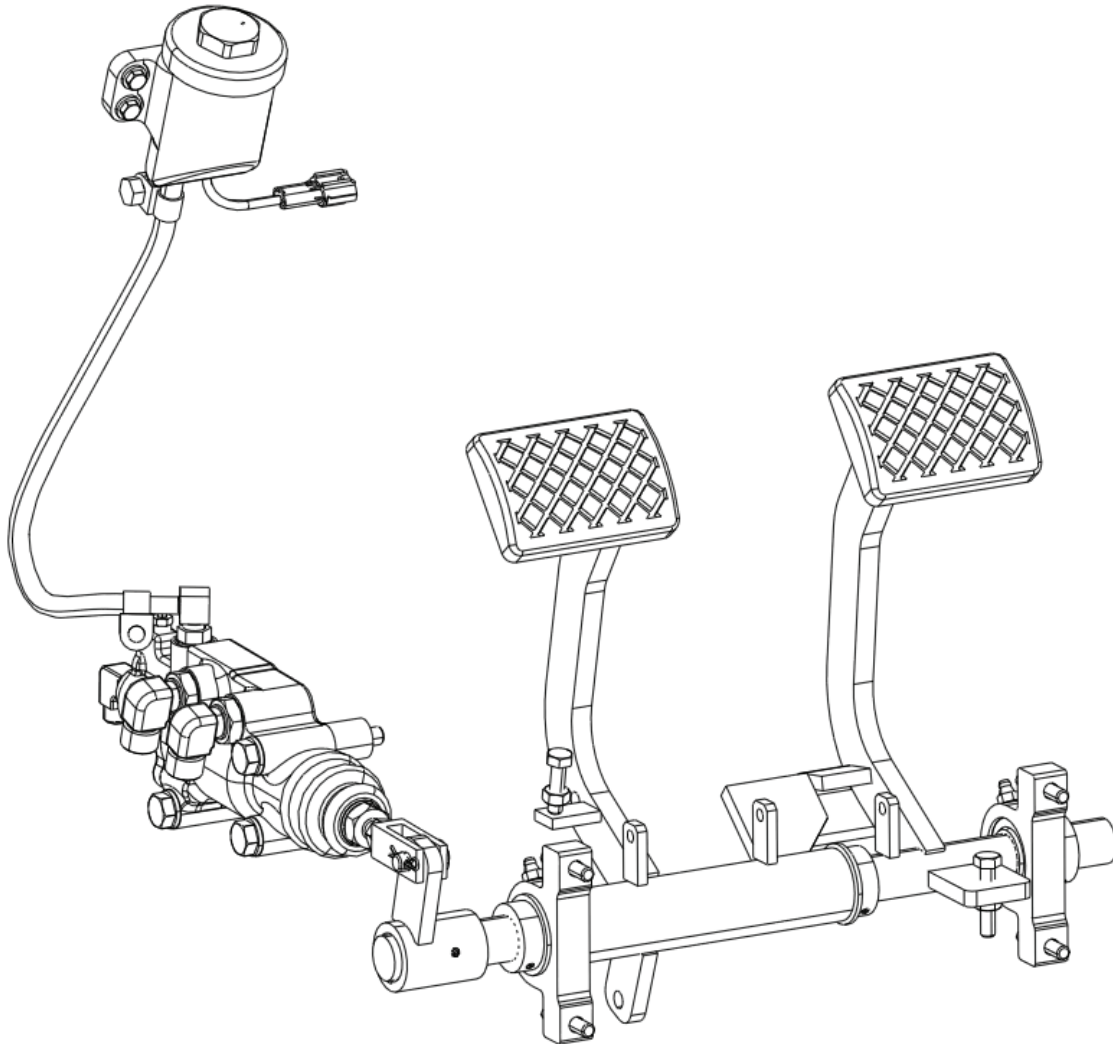
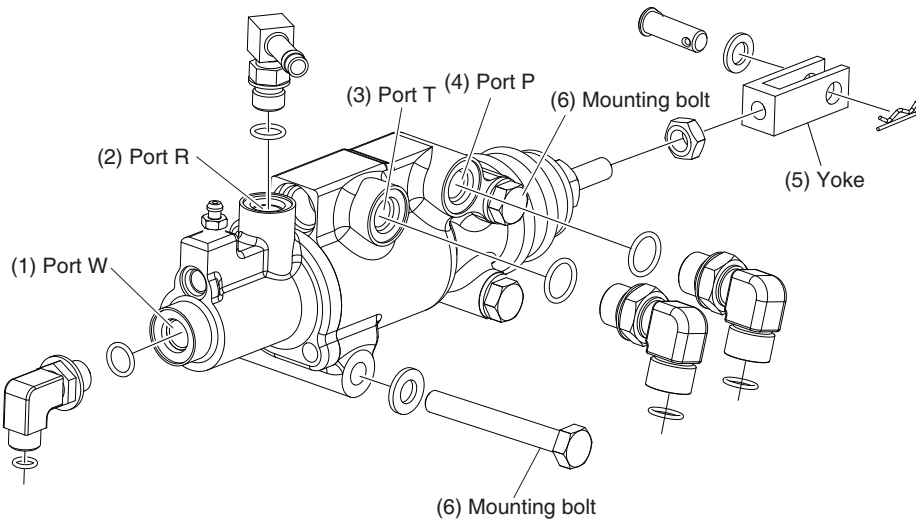


Fig. 7-3

B. Master cylinder removal/installation



0206E

Fig. 7-14

⚠ DANGER

Pressurized hydraulic oil will cause severe burns, and infection that may even result in amputation.

Make sure the pressure is released from the system before you perform the following procedure.

Preliminary steps

1. Open the floor plate.
2. Drain the reservoir
3. Prepare an oil pan

7-4-3 Parking brake

No.	Problem	Probable causes
1	Brakes will not make application.	The parking brake ass'y is not correctly adjusted. The parking brake control cable is not correctly adjusted. The brake band is worn.

Mounting Gp - Air Conditioner (620204-07158)

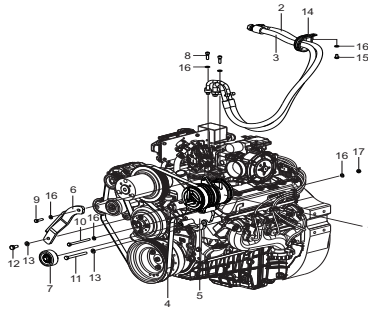


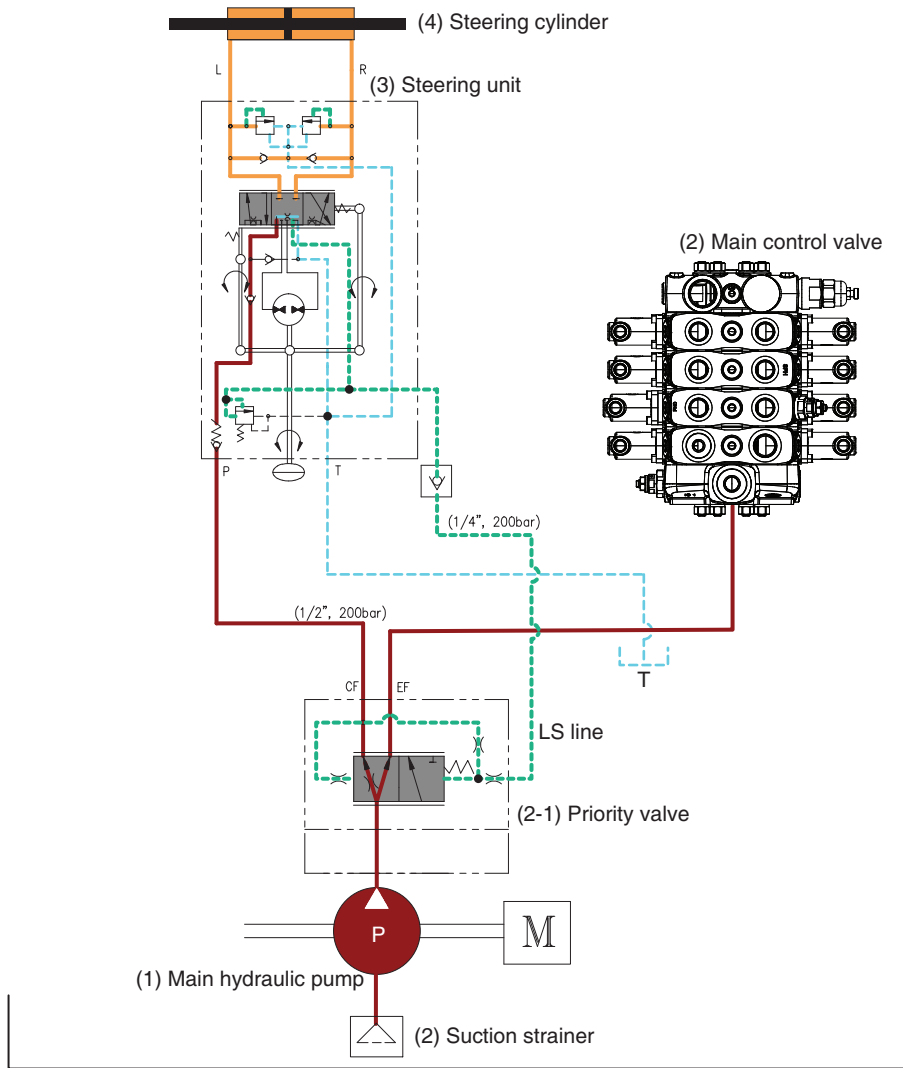
Fig. 8-7

Item no.	Part no.	Q'ty	Part name
1	440205-00028	1	COMPRESSOR,AIR CONDITIONER
2	420102-00783	1	HOSE,SUCTION
3	420102-00784	1	HOSE,DISCHARGE
4	130202-00143	1	BELT,FAN
5	110402-00146	1	BRACKET ASSY,COMPRESSOR
6	250127-01261	1	PLATE ASSY,MOUNTING
7	130710-00012	1	PULLEY ASSY,IDLE
8	S2209061	2	BOLT;SOCKET M8X1.25X25
9	S0509263	1	BOLT
10	S0557363	1	BOLT
11	DS0002167	1	BOLT
12	S0511963	1	BOLT
13	D917096	2	WASHER,HARD
14	120402-00178	1	CLIP,CLAMPING
15	S0508463	1	BOLT
16	D917092	6	WASHER,HARD
17	S4012533	1	NUT



Description	DTC Set 2		Description	DTC Set 2	
	SPN-2	FMI-2		SPN-2	FMI-2
DTC 1643: Buzzer control short to power	920	3	DTC 8904: UEGO cal resistor voltage high	3221	3
DTC 1644: MIL control ground short	1213	4	DTC 8905: UEGO cal resistor voltage low	3221	4
DTC 1645: MIL control short to power	1213	3	DTC 8906: UEGO return voltage shorted high	3056	3
DTC 1651: J1939 ETC message receipt loss while in-gear	91	9	DTC 8907: UEGO return voltage shorted low	3056	4
DTC 1661: PWM6 open / ground short	925	5	DTC 8908: UEGO pump voltage shorted high	3218	3
DTC 2618: Tach output ground short	645	4	DTC 8909: UEGO pump voltage shorted low	3218	4
DTC 2619: Tach output short to power	645	3	DTC 8910: UEGO sense cell voltage high	3217	3
DTC 2322: Spark coil 8 primary shorted	1275	6	DTC 8911: UEGO sense cell voltage low	3217	4
DTC 2324: Spark coil 9 primary open or short to ground	1276	5	DTC 8912: UEGO pump voltage at high drive limit	3225	3
DTC 2325: Spark coil 9 primary shorted	1276	6	DTC 8913: UEGO pump voltage at low drive limit	3225	4
DTC 2327: Spark coil 10 primary open or short to ground	1277	5	DTC 8914: UEGO sense cell slow to warm up	3222	10
DTC 2328: Spark coil 10 primary shorted	1277	6	DTC 8915: UEGO pump cell slow to warm up	3225	10
DTC 2428: EGT temperature high	173	0	DTC 8916: UEGO sense cell impedance high	3222	0
DTC 8901: UEGO microprocessor internal fault	3221	31	DTC 8917: UEGO pump cell impedance high	3225	0
DTC 8902: UEGO heater supply high voltage	3222	3	DTC 8918: UEGO pump cell impedance low	3225	1
DTC 8903: UEGO heater supply low voltage	3222	4			

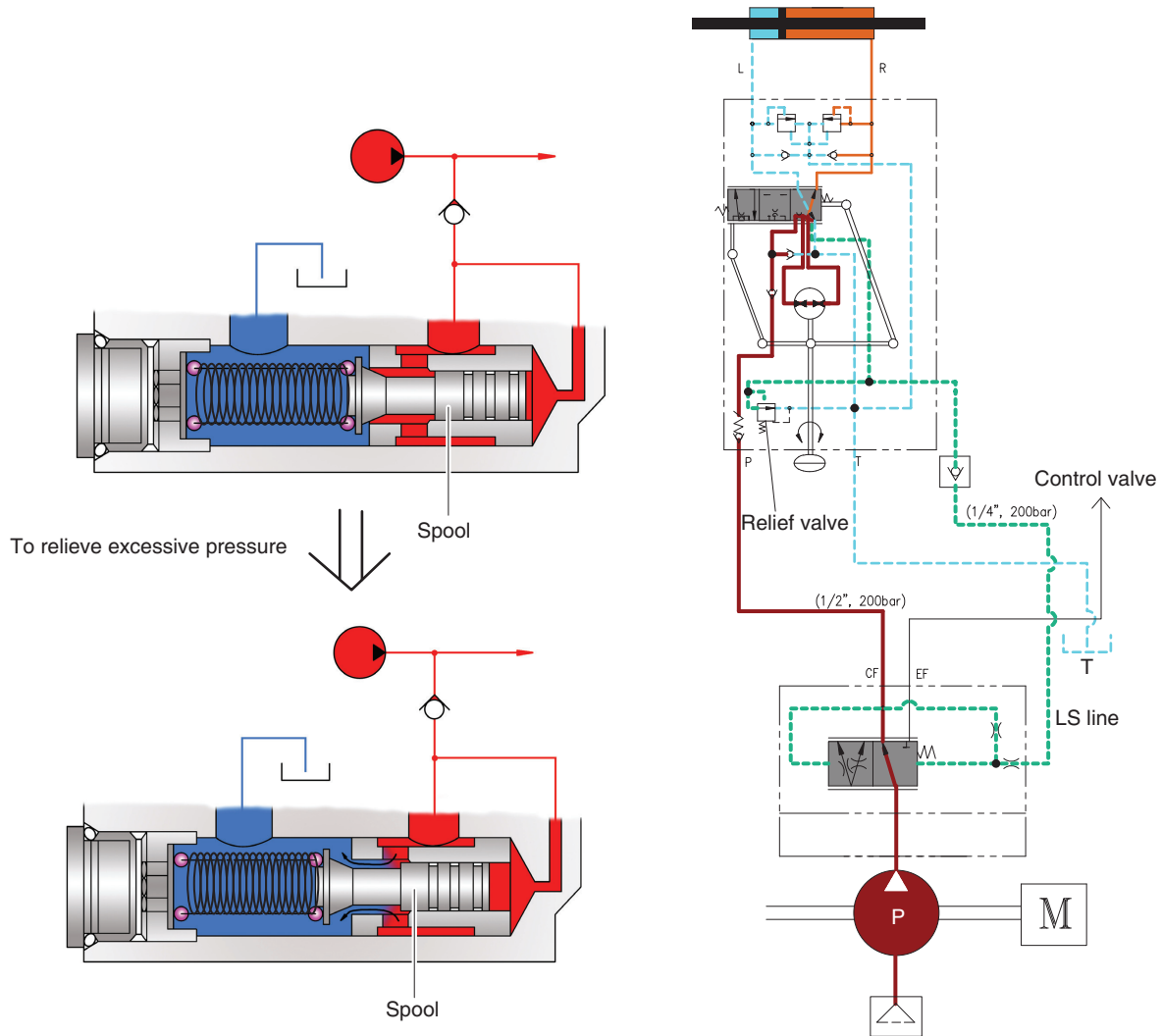
6-1-2 Oil flow



0215E

Fig. 6-2

E. Pressure relief



0303E

Fig. 6-15

Once the hydraulic oil fed to the steering cylinder reaches the set pressure, a relief function is triggered to lower the pressure to ensure safety.

As shown in Fig. 6-15, when the pumped oil pressure exceeds the force of the spring, the spool is pushed against the spring to allow the pressurized oil to exit the steering unit to the hydraulic tank until its pressure falls below the spring's pressure setting.

6-3 Steering operation group

6-3-1 Exterior and specifications

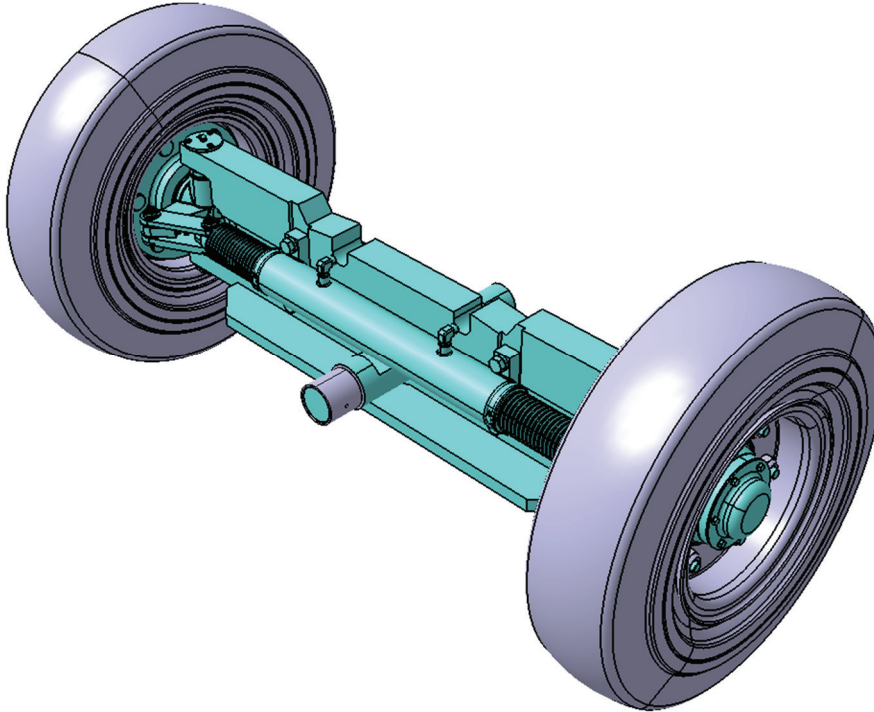
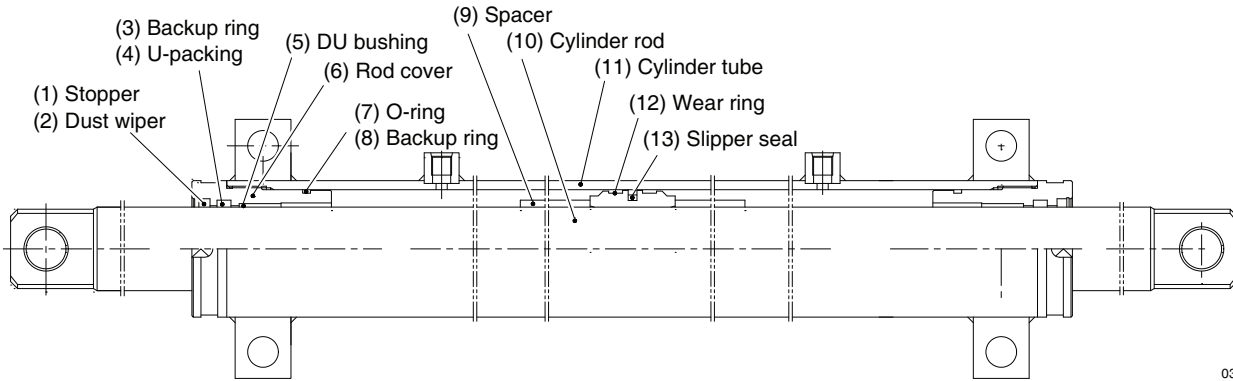


Fig. 6-23

Components	Items	Spec.
Steer axle	Cramp angle	75°±1°
Steering cylinder	Use pressure	15,495 kPa (2,247 psi)
	Test pressure	23,242 kPa (3,371 psi)
	Allowable stroke	150±1.5 mm (5.906±0.059 in) to the left and right respectively

6-3-8 Steering cylinder disassembly/assembly

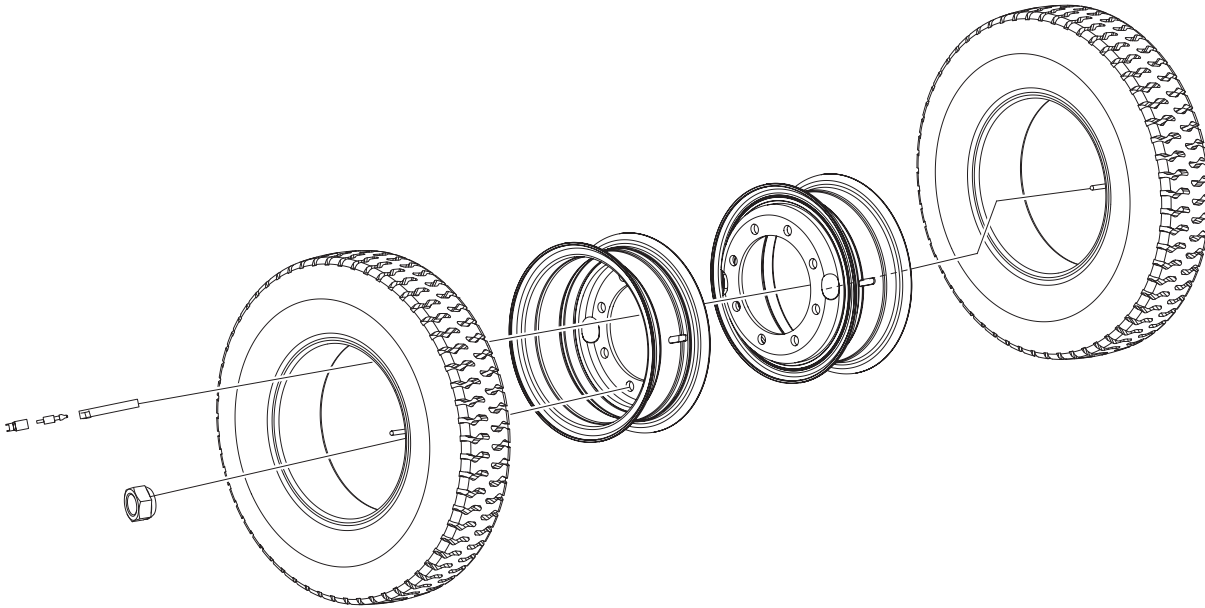


0347E

Fig. 6-33

1. Mark the position of rod covers (6) on cylinder tube (11) as a reference for installation.
 - Installation sealant: Loctite #262
 - Installation torque: 40–45 N·m (30–33 lb·ft)
2. Remove stopper (1) and dust wiper (2).
3. Remove U-packing (4) and backup ring (3).
4. Remove O-ring (7) and backup ring (8).
5. Remove DU bushing (5).
6. Remove cylinder rod (10) from cylinder tube (11).
7. Remove slipper seal (13), wear ring (12), and spacer (9) from cylinder rod (10).
8. Follow the steps above in the opposite order to assemble the steering cylinder.

3-3-2 Drive wheel removal/installation



0126K

Fig. 3-8

Tools needed	Floor jack
---------------------	------------

1. Use a floor jack to raise the front part of the vehicle until the tires are off the ground, and then support it with blocks.
2. Remove nuts (2) and drive tire-wheel ass'y (1).
 - Installation torque: 600 ± 90 N·m (443 ± 66 lb·ft)
3. Follow the steps above in the opposite order to install the drive wheel.

4. Press a heated ring gear carrier in the ring gear carrier completely.

After cooling this ass'y enough, mount it to the wheel hub.

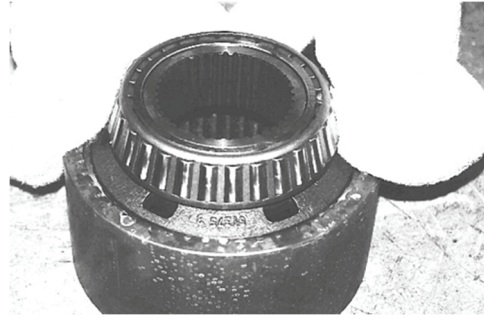


Fig. 3-34

5. Install the torque plate on the ring gear-wheel hub ass'y, and then secure it to the spindle approximately.

Put Loctite #5127 on the spindle's mounting surface with the housing.



Fig. 3-35

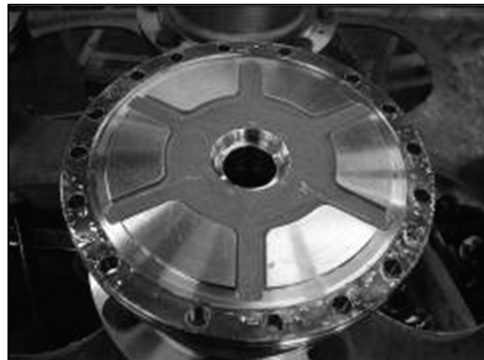


Fig. 3-36

9. Put the differential case on a clean place.



Fig. 3-62

10. Loosen the four head bolts (12) and remove the brake drum from the brake ass'y.

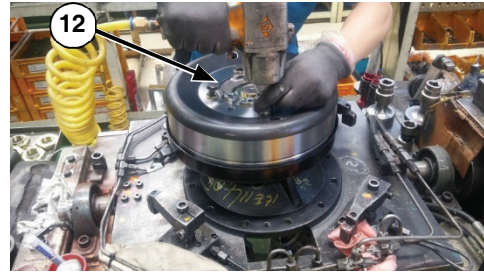


Fig. 3-63

- 11. Loosen nuts (13) and remove yoke (14).
- 12. Loosen the four head bolts (15) and remove the brake ass'y from the differential carrier housing.
- 13. Remove the differential pinion shaft (17) by carefully tapping it using a plastic hammer.

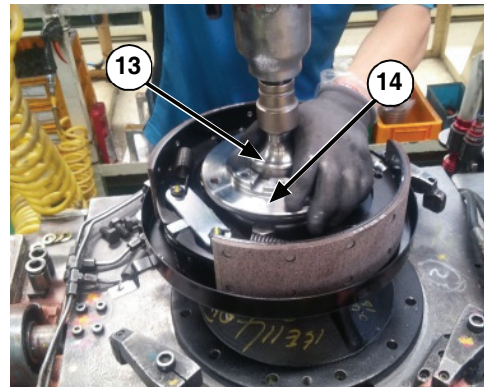


Fig. 3-64

CAUTION

Be careful not to damage the bevel gear shaft.

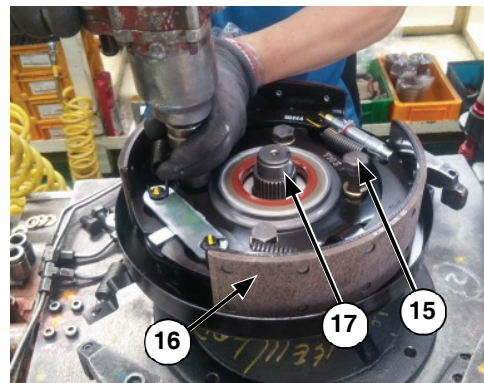


Fig. 3-65

Parking brake adjustment

1. You can adjust the parking brake as follows:
 - Remove the rubber plug from adjusting hole (3).
 - Turn the adjuster in the direction of the pinion shaft until its pad contacts the jig.
 - And then turn the adjuster back four clicks in the opposite direction
(The lining gap then becomes 0.1–0.25 mm [0.004–0.010 in]).
 - Move the lever to rotate the jig until a proper friction is obtained.

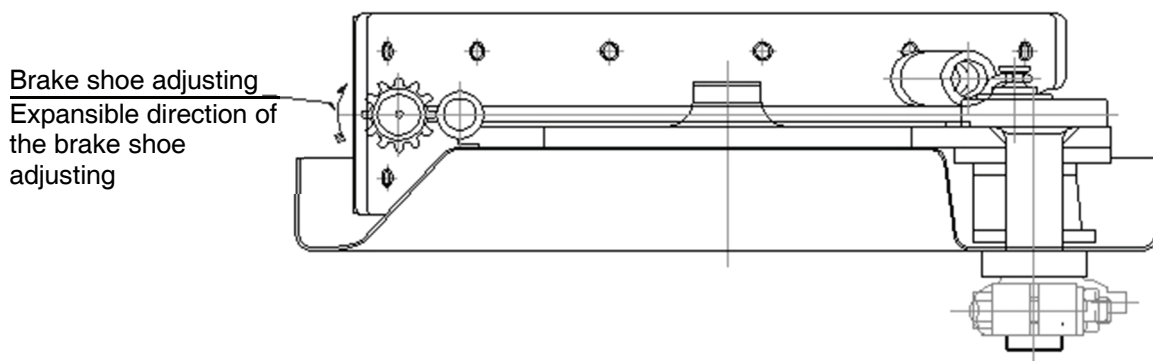
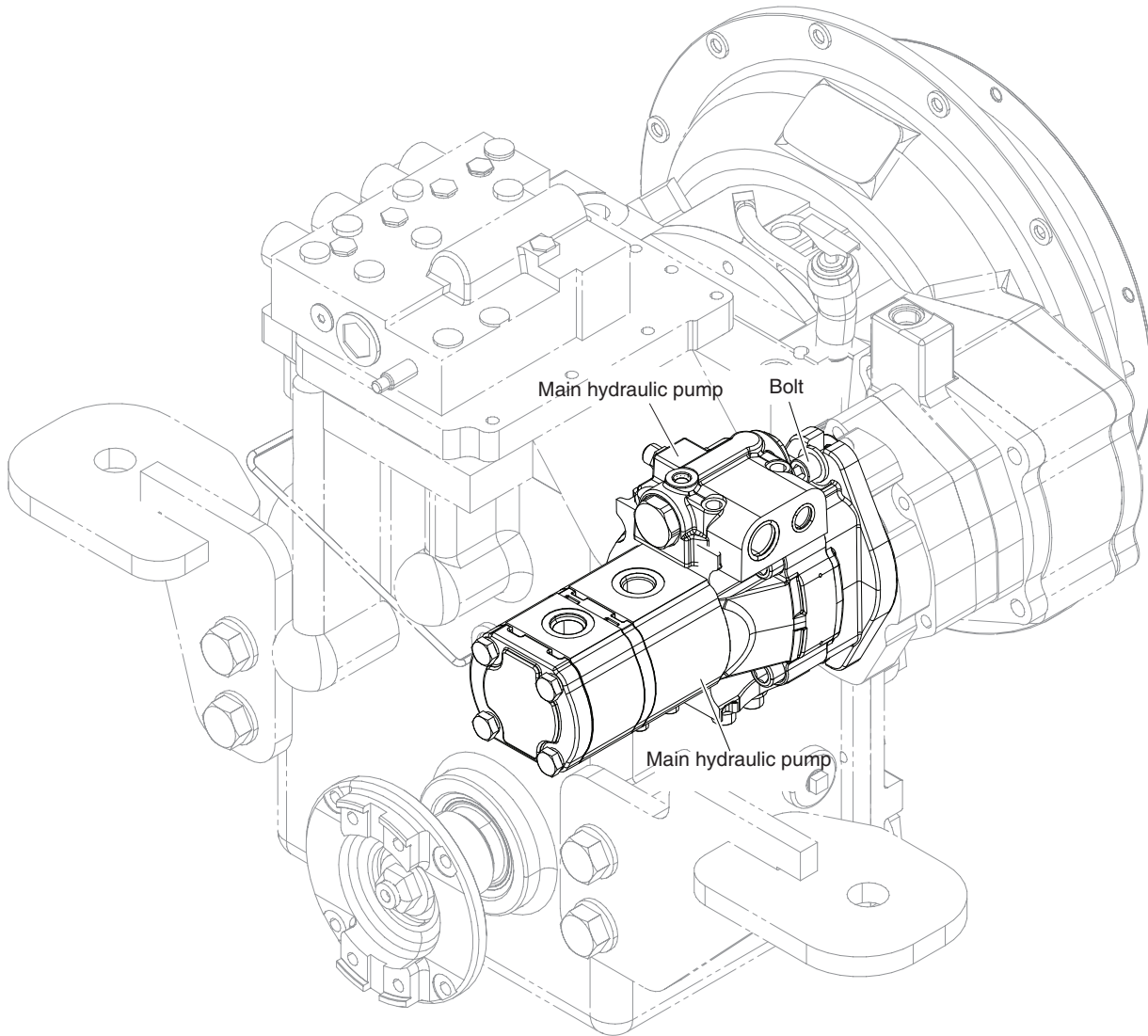


Fig. 3-85

4-2-3 Removal and installation



0133E

Fig. 4-5

⚠ DANGER

Pressurized hydraulic oil will cause severe burns, and infection that may even result in amputation.

Make sure the pressure is released from the system before you perform the following procedure.

4-4-3 Suction strainer, return filter, and air breather replacement

⚠ DANGER

Pressurized hydraulic oil will cause severe burns, and infection that may even result in amputation.

Turn the engine off and cool the hydraulic tank cap enough to touch it by hand. Open the cap to slowly discharge the pressure.

Preliminary steps

1. Operate the vehicle for some minutes to heat the hydraulic oil.
2. Park the vehicle on a level ground with the forks lowered, parking brake engaged, transmission in NEUTRAL and the engine stopped.

Procedure

1. Unbolt and remove the hydraulic tank cover.
2. Replace the return filter.
3. Replace the suction strainer.
4. Install and bolt down the hydraulic tank cover.
5. Replace the air breather.
6. Start up the engine and operate the hydraulic controls, and the steering system, through a few cycles to fill the lines. Look for oil leaks.
7. Stop the engine and check the oil level.
 - With all cylinders retracted, maintain the oil level to the FULL mark on the dip stick/filter cap ass'y.



Fig. 4-13

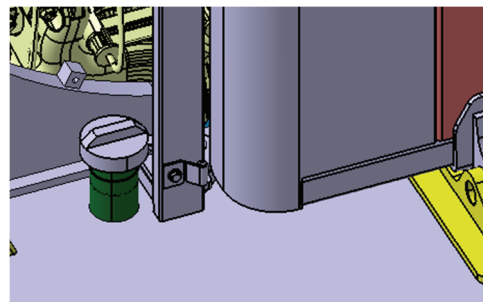


Fig. 4-14

Use of pressure oil to convey operator's demands

The remote control valve receives the operator's demands for actuator operations from the levers, and transmits them to main control valve spools (4) with a pilot pressure signal. Since only a 3,000 kPa (435 psi) pressure is enough for shifting spools (4), the oil supplied from pump (3) is decreased in pressure through reducing valve (2) before it reaches the remote control valve. The remote control valve uses this 3,000 kPa (435 psi) inflow to send to each spool (4) as a pilot pressure signal.

Detailed signaling process

Each section of the remote control valve has two ports, which are connected to one section of the main control valve by pilot pressure signal lines. Consequently, moving a lever triggers the remote control valve to signal the spool (3) of the corresponding section with 3,000 kPa (435 psi) pilot pressure, so that the signaled spool (3) shifts and accordingly the connected actuator works.

Safety unloading

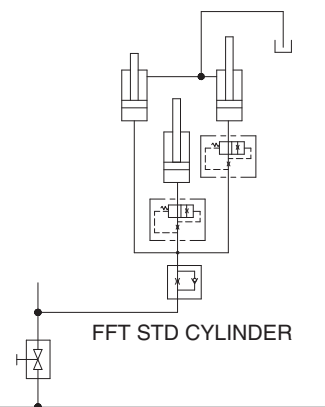
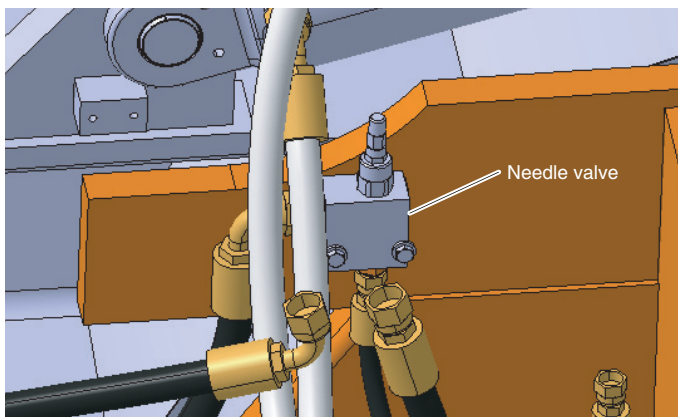
For safety, the levers are disabled when the operator leaves the driver's seat more than 3 seconds or the start key is off. This is done by deactivating unloading solenoid valve (1) to cut off the pressure oil supply from the pump. The levers will remain unavailable until the operator returns to the seat properly, or the key switch is turned on.

How it works

Moving the lift lever to the lowering position causes the remote control valve to send oil to the main control valve's V1 port, shifting the lift spool to the lowering position. The oil that has flown in the lift cylinders during the lift operation now returns to the control valve by the gravitational force and then travels through the spool into the tank. The pump oil flowing in each section block also returns to the tank.

As the hydraulic oil that has supported the pistons of the lift cylinders flows out, the mast is lowered. Through its built-in orifice, the flow regulator never allows a large amount of oil to exit the lift cylinders at once, preventing a sudden drop of the mast.

If the line from the control valve to a lift cylinder is broken, the protector valve will be shifted to make the oil in the cylinder pass through its orifice, preventing a sudden drop of the mast.



0155K

Fig. 5-16

Limitation of lowering and manual lowering

When the operator leaves, the solenoid valve of the reducing valve is off, blocking the oil passage from the pump to the remote control valve. As a result, the mast does not lower even if you move the lever.

In this situation, if you were to manually lower the mast, you should use needle valve. Once the needle valve opens, the hydraulic oil that has supported the pistons of the lift cylinders flows out, lowering the mast.

NOTICE: When you use the needle valve, make sure to follow the appropriate procedure in Section 5-3-4.

2. Disconnect the connections, adaptors or plugs and then plug and cap those that are connected to hydraulic hoses.
 - Have the oil pan ready to catch any oil that will come out
3. Unbolt the main control valve from its back while holding it, and then remove it.
4. Follow the steps above in the opposite order to install the main control valve.
5. Refill the tank with hydraulic oil according to the specifications given in Section 1-6.

5-4-3 Forks service

A. Forks inspection

Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months.

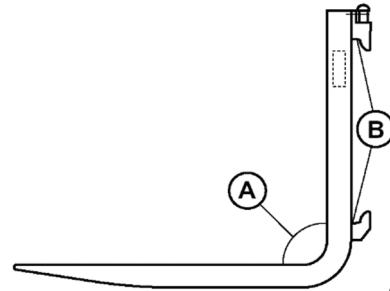
1. Inspect the forks carefully for cracks. Special attention should be given to the heel section (A), all weld areas and mounting brackets (B). Inspect the top and bottom hooks on forks used on hook type carriages and tubes on shaft mounted forks.

- Forks with cracks should be removed from service.
- "Wet Test" magnetic particle inspection is generally preferred due to its sensitivity and the ease of interpreting the results. Portable equipment is usually recommended so it can be moved to the lift truck.

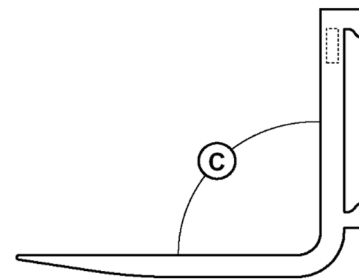
2. Check the angle between the upper face of the blade and the front face of the shank. The fork should be withdrawn from service if angle (C) exceeds 93 degrees or deviates by more than 3 degrees from an original angle other than 90 degrees, as may be found in some special application forks.

3. Check the straightness of the upper face of blade (D) and the front face of shank (E) with a straight edge.

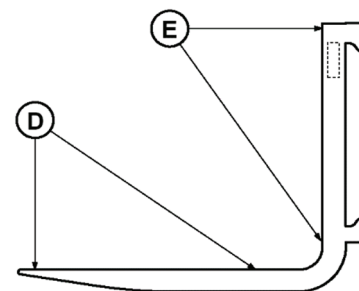
- The fork should be withdrawn from service if the deviation from straightness exceeds 0.5 percent of the length of the blade and/or the height of the shank respectively 5 mm/1000 mm (0.20"/39").



IAOM0941
Fig. 5-42



IA104093
Fig. 5-43



IA104094
Fig. 5-44

Preliminary steps

1. Open the air breather cap on the hydraulic tank.
2. Remove the residual pressure in the hydraulic system by moving the control levers back and forth several times with the key on and the engine off while you are seated in the cabin.

DANGER

Pressurized hydraulic oil will cause severe burns, and infection that may even result in amputation.

Make sure the pressure is released from the system before you perform the following procedure.

Procedure

1. Give hoses (9) and ports a corresponding mark as a reference for assembly
2. Disconnect hoses (9) from fork mover cylinder (8).
 - Have the oil pan ready to catch any oil that will come out of the hoses and cylinder ports.
 - After removing hoses (9), plug their ends to prevent debris and foreign material from entering the hydraulic system.
3. Remove straps (1).
4. Remove bolt (6) and the washer, and then remove plate (7) and pin (5) at each end of cylinder (5).
 - Installation sealant: Loctite #242
 - After installation, inject grease into grease nipple (4).
5. Remove spacer (2) and bearing (3).
6. Remove fork mover cylinder (5).
7. Follow the steps above in the opposite order to install the fork mover cylinder.
 - Blow out all hydraulic lines before reconnecting them.
8. Refill the tank with hydraulic oil according to the specifications given in Section 1-6.

5. Check that the chains have the correct tension
(See Section 5-4-6 B).

FFT Primary lift chain removal/installation

1. Raise the carriage and put blocks underneath it.
2. Lower the carriage onto the blocks so that tension is released from the primary lift chains.
3. Dismount a primary lift chain from the joint parts A and C by consulting the above described chain removal method.
4. Follow the steps above in the opposite order to install the primary lift chain.
5. Check that the chains have the correct tension
(See Section 5-4-6 B).

FFT Secondary lift chain removal/installation

1. Raise the inner mast and put blocks underneath it.
2. Lower the inner mast onto the blocks so that tension is released from the secondary lift chains.
3. Dismount a secondary lift chain from the joint parts B and D by consulting the above described chain removal method.
4. Follow the steps above in the opposite order to install the secondary lift chain.
5. Check that the chains have the correct tension
(See Section 5-4-6 B).

3. Remove O-ring (8) and backup ring (7) from the outer diameter of rod cover ass'y (6), and remove dust wiper (4), stopper (3), and U-packing (5) from the inner.
 - At installation, install U-packing (5) with the lip facing outward.
 - Replace dust wiper (4).
4. Unscrew piston ass'y (10).
5. Remove slipper seal (2) and wear rings (1) from the outer diameter of piston ass'y (10), and remove retaining ring (13) and check valve (12) from the inner.
6. Loosen set screw (11).
 - Installation sealant: Loctite #242
7. Check the condition of the seals, and replace those that are damaged or worn.
8. Follow the steps above in the opposite order to assemble the primary lift cylinder.

NOTICE: *Once you have completely assembled the cylinder, make sure you reseal the ports with the dust caps.*

Especially, during the first 3–5 strokes to either end, the cylinder pressure should not reach the relief pressure.

2. With cylinder rod (1) secured in the vise remove rod cover ass'y (14).
 - Installation sealant: Loctite #242
 - Installation torque: 45–50 N·m (33–37 lb·ft)
3. Remove O-ring (13) from the outer diameter of rod cover ass'y (14), and remove dust wiper (10), U-packing (11) and sliding bushing (12) from the inner.
 - At installation, install U-packing (11) with the lip facing outward.
 - Replace dust wiper (10).
4. Remove piston ass'y (7).
5. Remove retaining ring (2), dust ring (3), wear ring (4), backup ring (5), and U-packing (6) from the outer diameter of piston ass'y (7), and remove snap ring (9) and cushion ring (8) from the inner.
6. Check the condition of the seals, and replace those that are damaged or worn.
7. Follow the steps above in the opposite order to assemble the secondary lift cylinder.

NOTICE: *Once you have completely assembled the cylinder, make sure you reseal the ports with the dust caps.*

Especially, during the first 3–5 strokes to either end, the cylinder pressure should not reach the relief pressure.

Tools needed	Bearing cup puller attachment Puller assembly Ratchet box wrench Bearing installer
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Preliminary steps

1. Remove the mast ass'y (see Section 5-4-11 A) and lay it with outer mast at the bottom.
2. Remove the lift chains (see Section 5-4-6 C).
3. Remove the primary and secondary lift cylinders (see Sections 5-4-8 A and 5-4-9 C) and their hydraulic hoses.

Mast disassembly/assembly

1. Fasten a hoist to the outer mast.
2. Pull out the inner and intermediate masts using another forklift as shown in Fig. 5-89.
3. Follow the steps above in the opposite order to assemble the mast.

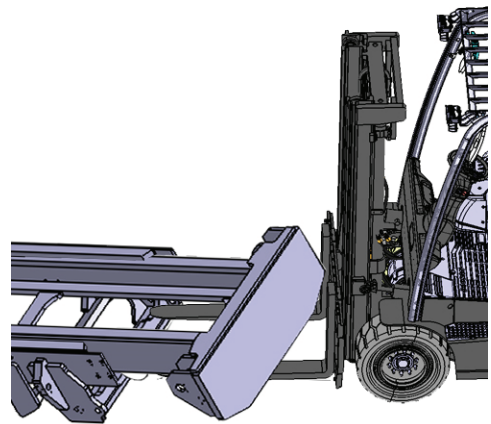


Fig. 5-89

Lower load roller lubrication/replacement

1. Remove retaining ring (16) that holds load roller ass'y (15) in place.
2. Remove roller ass'y (15) from the narrower mast.
 - If the roller ass'y is worn or damaged, replace it.
 - Before installation, grease the surface of bearings (15-1).
3. Follow the steps above in the opposite order to install the lower load roller ass'y.

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