CEBM014201

Shop Manual

SK1026-5N

SKID STEER LOADER

SERIAL NUMBERS **SK1026-5N A80001** and UP

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HOISTING INSTRUCTIONS

Hoisting

WARNING! Heavy parts (25 kg or more) must be lifted with a hoist etc. In the DISASSEMBLY AND ASSEMBLY section, every part weighing 25 kg or more is indicated clearly with the symbol.



- If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:

1. Check for removal of all bolts fastening the part to the relative parts.
2. Check for existence of another part causing interface with the part to be removed.

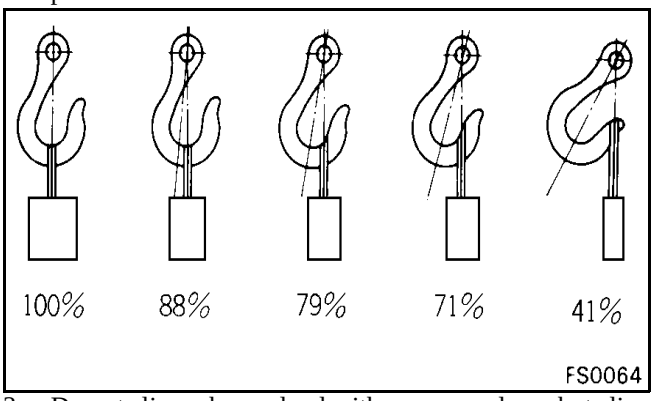
Wire Ropes

1. Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes (Standard "Z" or "S" twist ropes without galvanizing)		
Rope diameter	Allowable load	
mm	kN	tons
10	9.8	1.0
11.2	13.7	1.4
12.5	15.7	1.6
14	21.6	2.2
16	27.5	2.8
18	35.3	3.6
20	43.1	4.4
22.4	54.9	5.6
30	98.1	10.0
40	176.5	18.0
50	274.6	28.0
60	392.2	40.0

★ The allowable load value is estimated to be 1/6 or 1/7 of the breaking strength of the rope used.

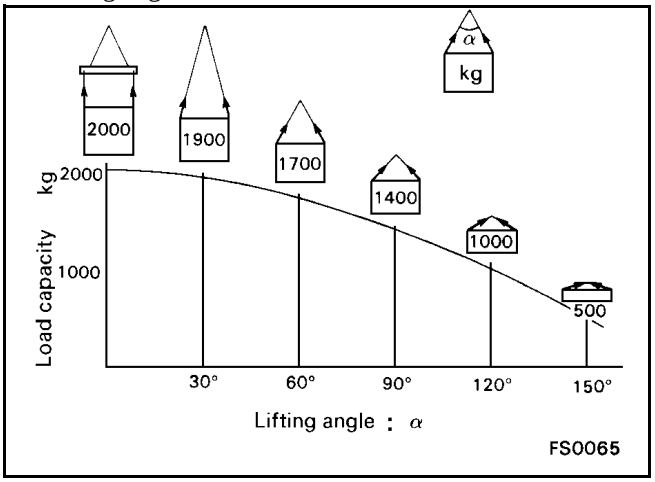
2. Sling wire ropes from the middle portion of the hook. Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



3. Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

WARNING! Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident

4. Do not sling a heavy load with ropes forming a wide hanging angle from the hook. When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles. When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subject to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



CONVERSION TABLES

Method of Using the Conversion Table

The Conversion Table in this section is provided to enable simple conversion of figures. For details of the method of using the Conversion Table, see the example given below.

EXAMPLE

- Method of using the Conversion Table to convert from millimeters to inches.

1. Convert 55 mm into inches.
   A. Locate the number 50 in the vertical column at the left side, take this as ①, then draw a horizontal line from ①.

   B. Locate the number 5 in the row across the top, take this as ②, then draw a perpendicular line down from ②.

   C. Take the point where the two lines cross as ③. This point ③ gives the value when converting from millimeters to inches. Therefore, 55 millimeters = 2.165 inches.

2. Convert 550 mm into inches.
   A. The number 550 does not appear in the table, so divide by 10 (move the decimal one place to the left) to convert it to 55 mm.

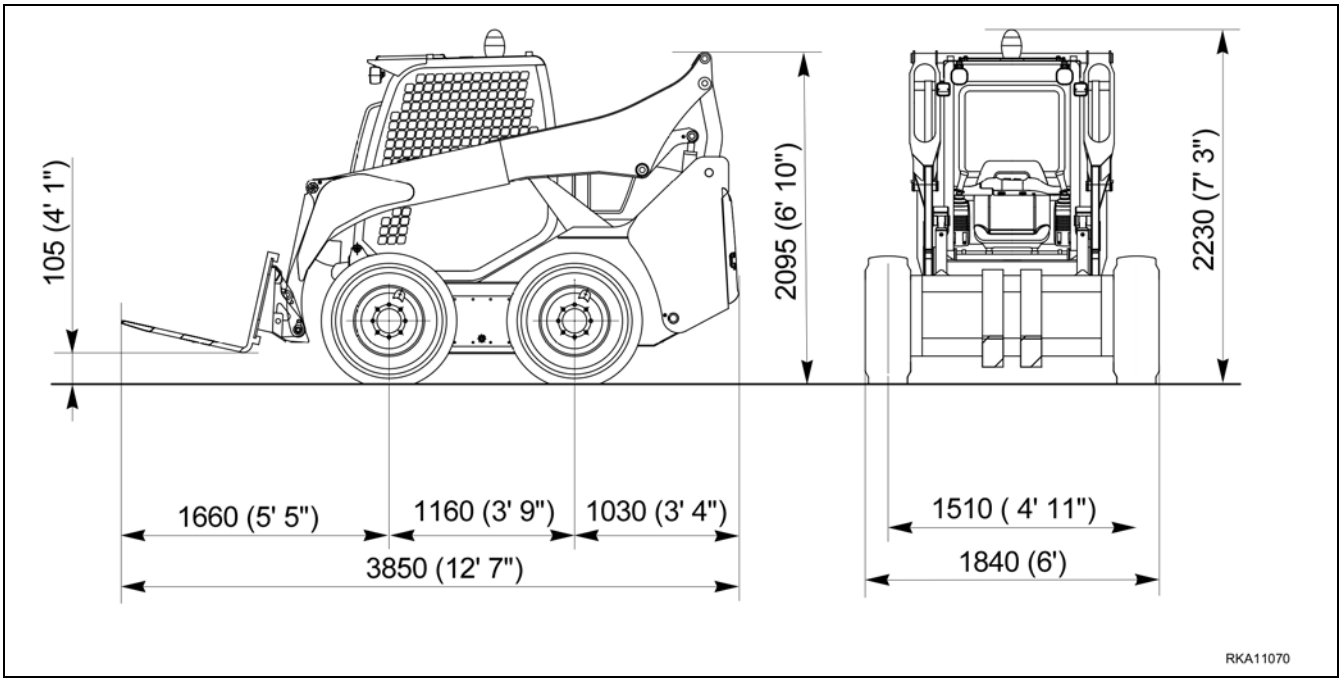
   B. Carry out the same procedure as above to convert 55 mm to 2.165 inches.

   C. The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal one place to the right) to return to the original value. This gives 550 mm = 21.65 inches.

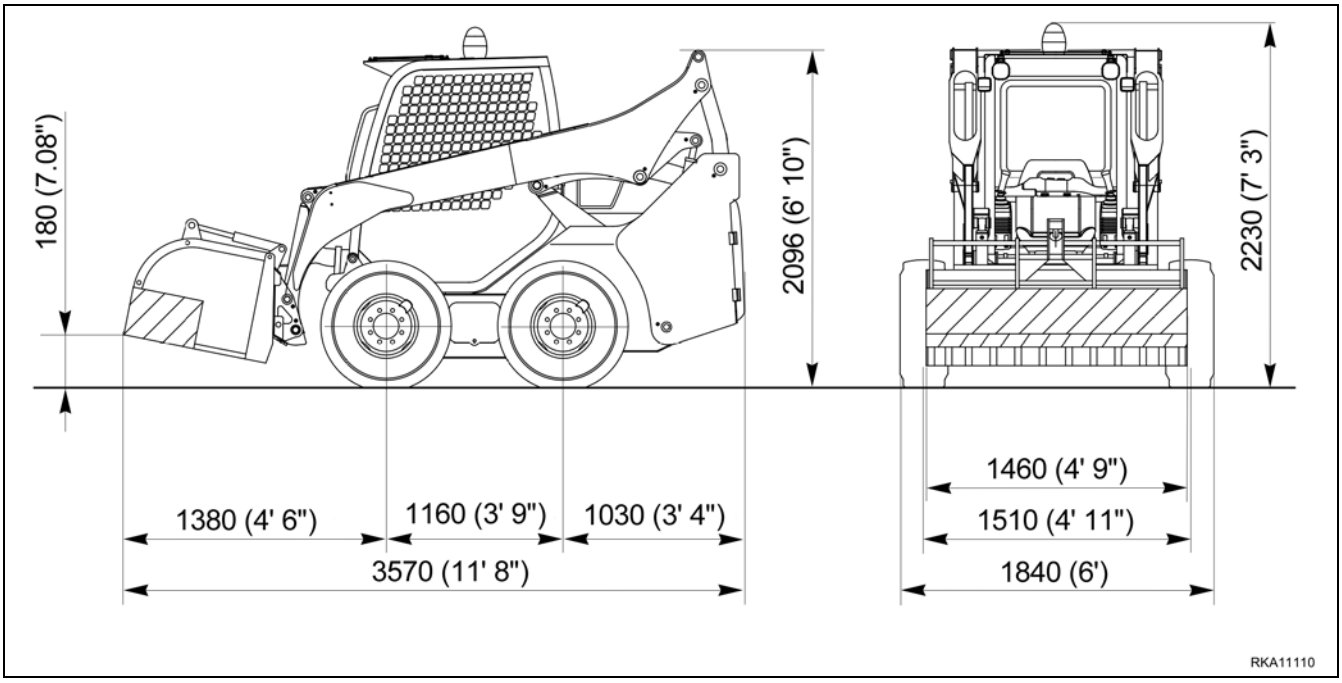
Millimeters to inches — 1 mm = 0.03937 in

	0	1	2	3	4	5 ②	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50 ①	1.969	2.008	2.047	2.087	2.126	2.165 ③	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Machine Overall Dimensions with Pallet Forks



Machine Overall Dimensions with Grapple Fork



MEMORANDUM

Description

The final drive motor consists of:

1. 2-speed hydraulic motor
2. Selector valve
3. Reduction gearing

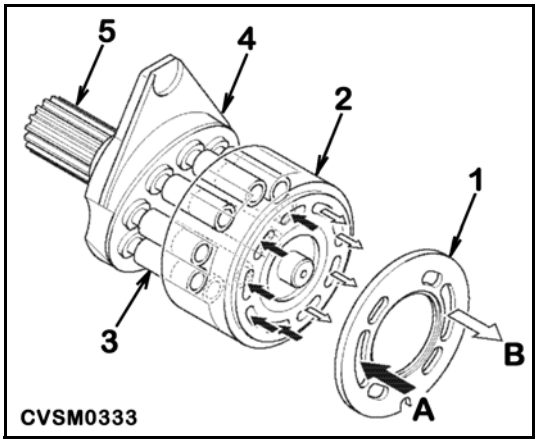
Hydraulic Motor

Function

The hydraulic motor is of the axial piston type, and converts hydraulic energy supplied by the pump into rotary motion.

Operation

- The hydraulic oil arriving from the selector valve is sent on to the valve plate (1). When the oil is sent to port “A” of the valve, it flows into the corresponding port on the cylinder block (2) and presses against the pistons (3).
- This pressure is converted into rotary motion by a swash plate (4) and transmitted to shaft (5). The shaft and cylinder block have been integrated into one piece by means of splined teeth.
- The return oil is sent to the pump through port “B”.
- Rotation in the opposite direction is achieved by sending the oil to port “B” instead of to port “A”.



iii. Center line **X** of rocker cam (4) maintains swash plate angle α in relation to the axial direction of cylinder block (9), and flat surface **A** moves as a cam in relation to shoe (7). In this way, piston (8) slides on the inside of cylinder block (9), so a difference between volumes **E** and **F** is created inside cylinder block (9). Suction and discharge is carried out by this difference **E**-**F**. In other words, when cylinder block (9) rotates and the volume of chamber **E** becomes smaller, the oil is discharged during that stroke. On the other hand, the volume of chamber **F** becomes larger, and as the volume becomes bigger, oil is sucked in. If the direction of swash plate angle is changed, the relation between discharge and suction of port **PA**, **PB** reverse (Fig. 3).

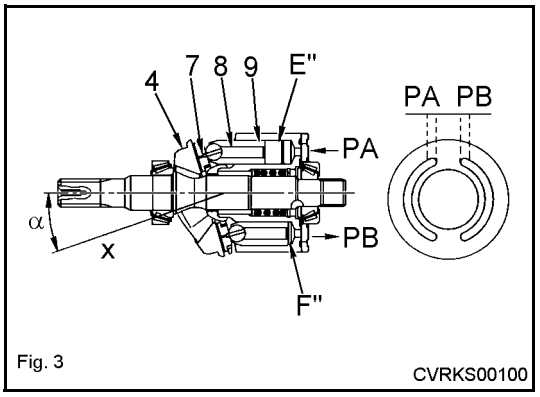
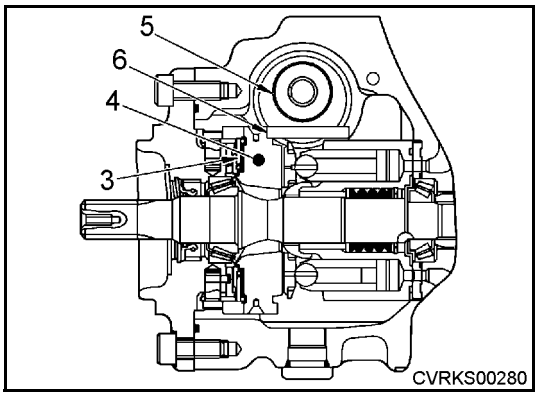


Fig. 3
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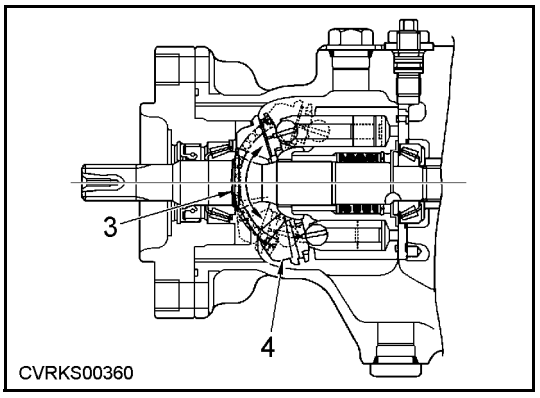
Control of Fluid Flow

- If swash plate angle α becomes larger, the difference between volumes **E** and **F** becomes larger and discharge amount **Q** increases.
- Swash plate angle α is changed by control piston (5).
- Control piston (5) moves in a reciprocal movement ($\leftrightarrow$) according to the signal pressure from pilot line (PPC and AS valves). This straight line movement is transmitted through slider (6) to rocker cam (4), which is supported by the cylindrical surface to cradle, slides in a rotating movement in direction ($\circlearrowleft$).



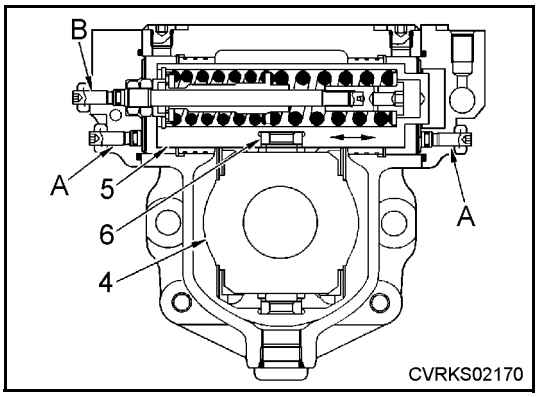
CVRKS00280

- On this pump, maximum swash plate angle is $\pm 15.8^{o}$.



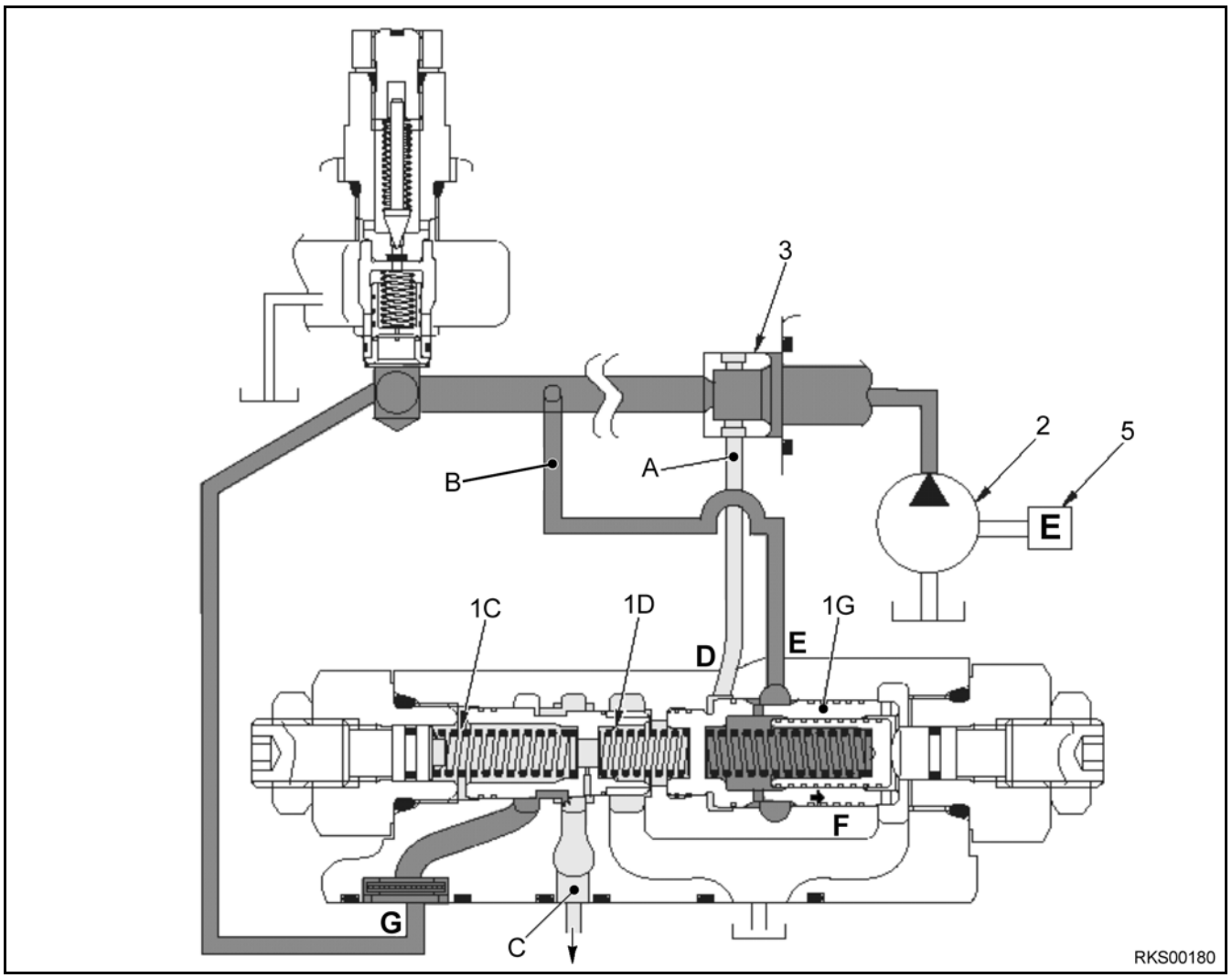
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- Screw **A** restricts to the maximum stroke of control piston (i.e. maximum displacement of each pump). When screw **A** is tightened, maximum displacement decreases, and when screw **A** is loosened, maximum displacement increases. This screw should be adjusted when the machine does not travel straight or machine maximum speed is little bit wrong.
- Screw **B** is the fine adjuster of neutral position of control piston (5). That adjustment prevents machine from creep.



CVRKS02170

Operation



- The oil from the charge pump (2) flows through a orifice (3) installed in the main piston pump. Oil always flows to pump charge circuit.
- Charge pump (2) is a fixed capacity pump, so that discharge flow is proportionate to engine speed. When oil from the charge pump (2) passes through the orifice, differential pressure is generated at port **A** and port **B**. This differential pressure actuates the differential pressure sensing valve (**1G**) and produces hydraulic force **F**.
- Because of the hydraulic force **F**, the differential pressure sensing valve (**1G**) is moved > direction. That causes a change in spring (**1D**) load. In port **C**, the AS valve output pressure that is balanced with spring (**1C**) and (**1D**) load is generated by reducing charge pressure from port **G**. So the AS valve output pressure corresponds with charge flow that changes with engine (5) revolution.

Torque Values	
a.	11.3 ±1.5 N•m (100 ±13 lbf in)
b.	31.9 ±2.5 N•m (24 ±2 lbf ft)
c.	23.5 ±3.9 N•m (17 ±3 lbf ft)

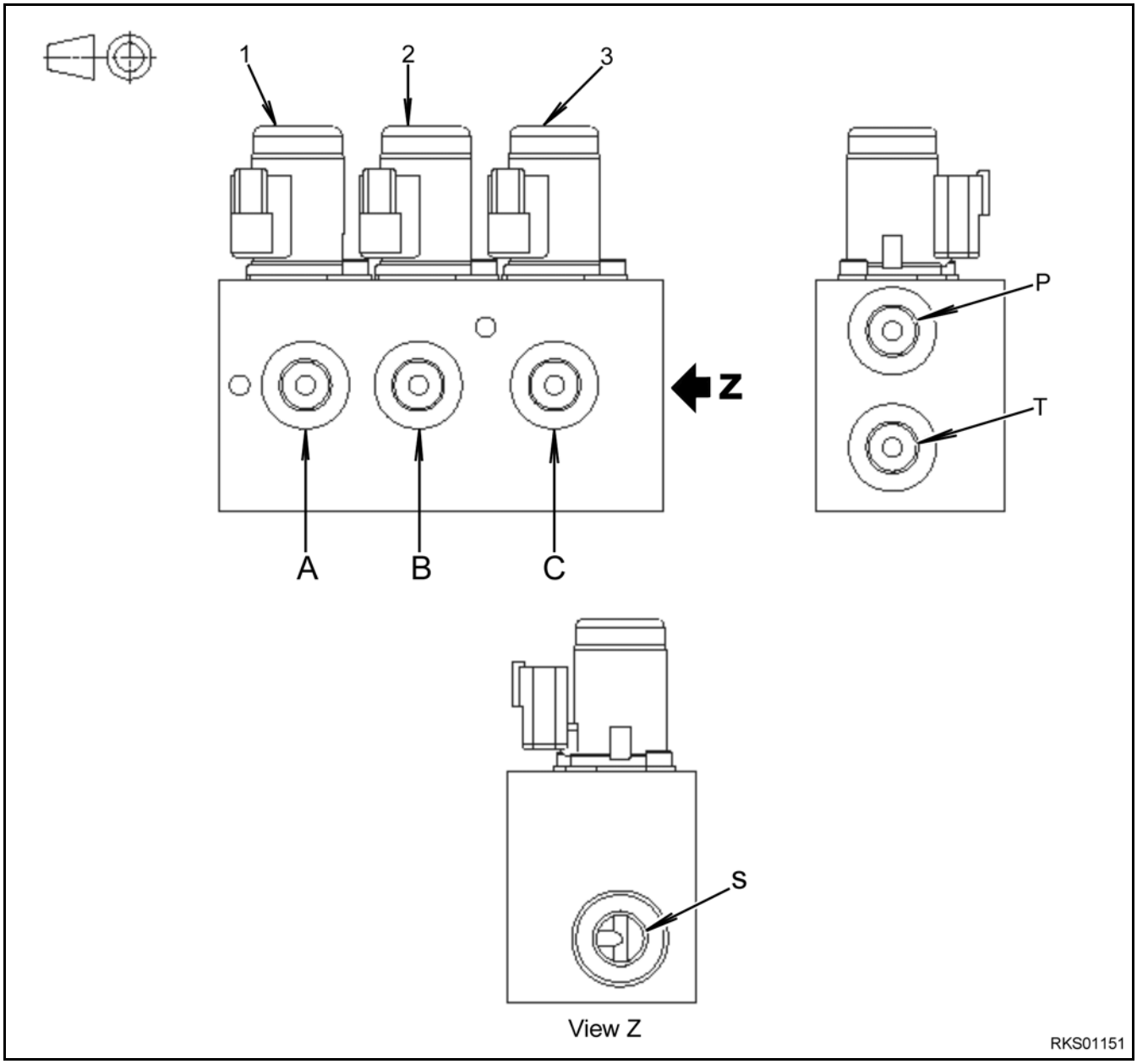
No.	Check Item	Criteria					Remedy
		Standard Size			Repair Limit		
		Free Height (Outside ∅)	Installed Length	Installed Load	Free Height	Installed Load	
1.	Spring of unload valve	32.9 x 18.2 mm (1.30 x 0.72 in)	18 mm (0.71 in)	74.0 N (16.6 lbf)	-	59.2 N (13.3 lbf)	Replace springs if there is damage or deformation
2.	Spring of unload valve	18.7 x 9.3 mm (0.74 x 0.37 in)	16 mm (0.63 in)	3.4 N (0.8 lbf)	-	2.7 N (0.6 lbf)	
3.	Spring of pressure compensation valve	15.4 x 6 mm (0.61 x 0.24 in)	13 mm (0.51 in)	2.5 N (0.6 lbf)	-	2.0 N (0.5 lbf)	
4.	Spring of pressure compensation valve	20 x 8.4 mm (0.79 x 0.33 in)	12 mm (0.47 in)	6.9 N (1.6 lbf)	-	5.5 N (1.2 lbf)	
5.	Spring of combination circulating valve	37.5 x 16.6 mm (1.48 x 0.65 in)	22.5 mm (0.89 in)	177.5 N (39.9 lbf)	-	142.0 N (31.9 lbf)	
6.	Spring of leveling circulating valve	37.5 x 15.4 mm (1.48 x 0.61 in)	22.5 mm (0.89 in)	66.7 N (15.0 lbf)	-	53.4 N (12.0 lbf)	
7.	Spring of series - parallel circuit switching valve	38.3 x 15.2 mm (1.51 x 0.60 in)	24 mm (0.95 in)	161.8 N (36.4 lbf)	-	129.5 N (29.1lbf)	
8.	Spring of flow divider	30.2 x 9.4 mm (1.19 x 0.37 in)	23 mm (0.91 in)	2.9 N (0.7 lbf)	-	2.4 N (0.5 lbf)	

Torque Value	
a.	53.0 ±5.9 N•m (39 ±4 lbf ft)
b.	139.7 ±22.1 N•m (103 ±16 lbf ft)
c.	22.1 ±2.5 N•m (16 ±2 lbf ft)
d.	8.3 ±1.5 N•m (74 ±13 lbf in)

SOLENOID VALVE

Valve Group ST1

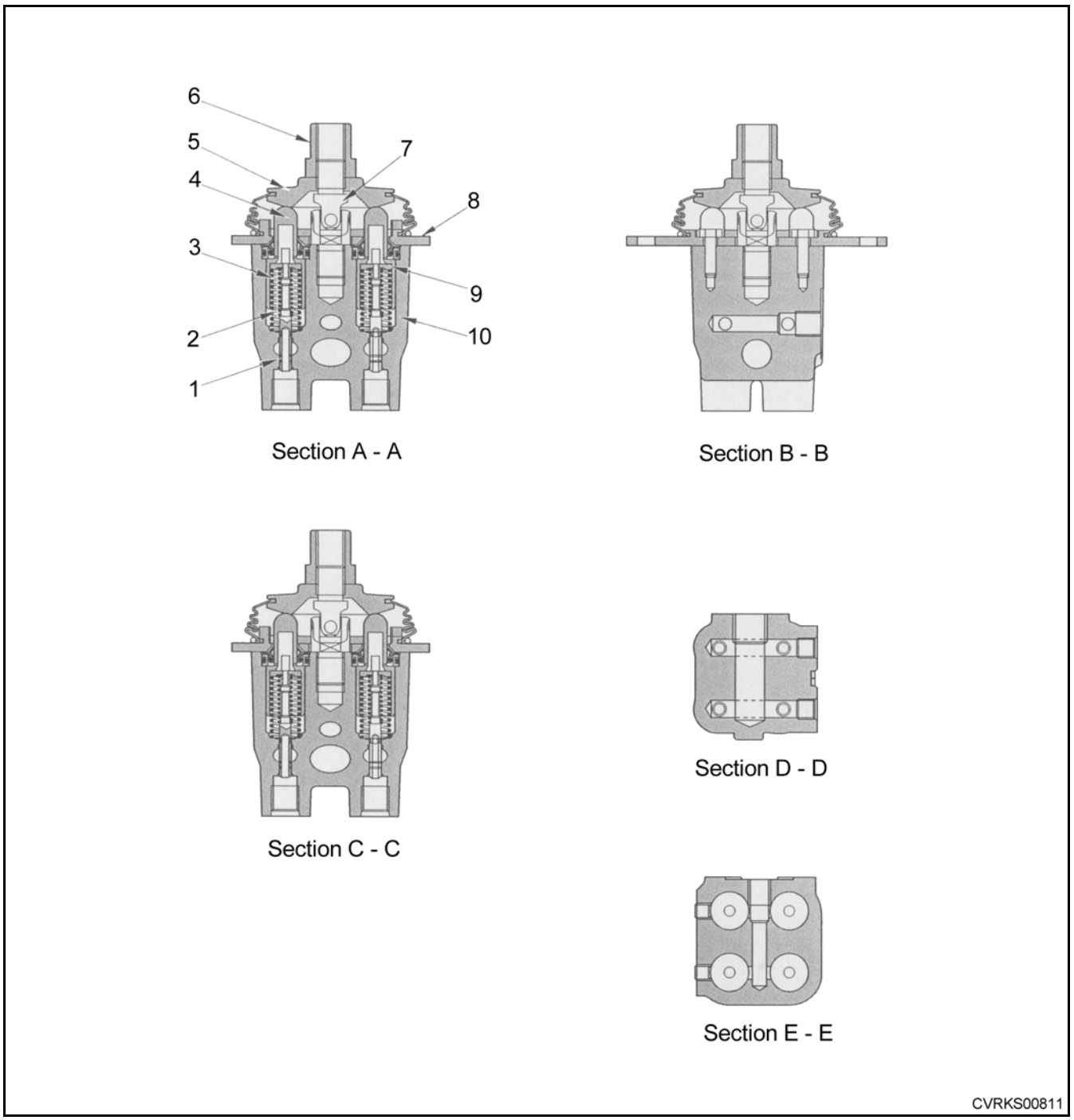
Servo control - Parking Brake - 2nd. Speed



Function

1. 2nd. speed
2. Servo control
3. Parking brake

A Port - To travel motors (**PP1** port)
B Port - To PPC valve
C Port - To travel motors (**PP2** port)
P Port - From hydraulic pump (**E1** port)
T Port - To hydraulic tank
S Port - To accumulator



1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Disc
6. Nut
7. Joint
8. Cover
9. Stopper
10. Body

Function

1. Neutral
   Ports **P1** and **P2** of the PPC valve are connected to drain chamber **D** through fine control hole **f** in spool (Fig. 1).

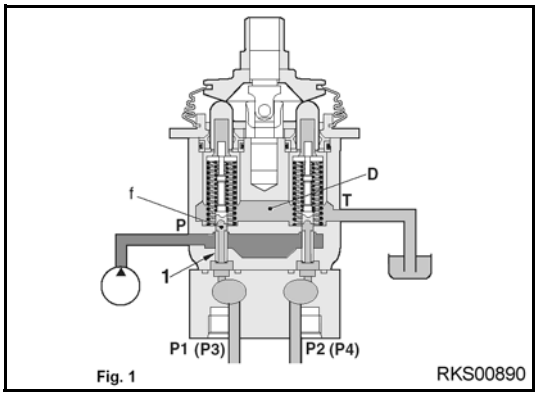


Fig. 1 RKS00890

2. During Fine Control
   (Neutral ⇀ Fine Control)
   When piston (4) starts to be pushed by disc (5), retainer (9) is pushed; spool (1) is also pushed by metering spring (2), and moves down. When this happens, fine control hole **f** is shut off from drain chamber **D**, and at almost the same time, it is connected to pump pressure chamber **PP**, so pilot pressure oil from the control pump passes through fine control hole **f** and goes to port **P1**. When the pressure at port **P1** becomes higher, spool (1) is pushed back and fine control hole **f** is shut off from pump pressure chamber **PP**.

   At almost the same time, it is connected to drain chamber **D** to release the pressure at port **P1**. When this happens, spool (1) moves up or down so that the force of metering spring (2) is balanced with the pressure at port **P1**. The relationship in the position of spool (1) and body (10) (fine control hole **f** is at a point midway between drain hole **D** and pump pressure chamber **PP**) does not change even if the pressure at port P1 becomes max. Therefore, metering spring (2) is compressed proportionally to the amount of movement of the control lever, so the pressure at port **P1** also rises in proportion to the travel of the control lever (Fig. 2).

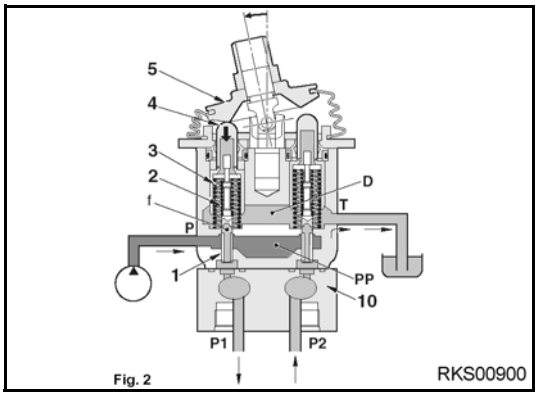


Fig. 2 RKS00900

3. During Fine Control (When The Lever Is Returned)
   (fine control ⇀ neutral)
   When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**. When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released. If the pressure at port **P1** drops too far, spool (1) is pushed down by metering spring (2), and fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pump pressure is supplied until the pressure at port **P1** recovers to a pressure that corresponds to the lever position (Fig. 3).

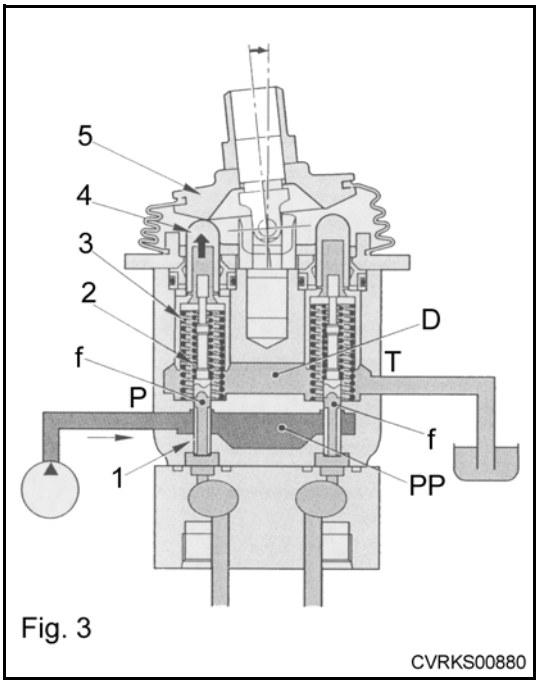
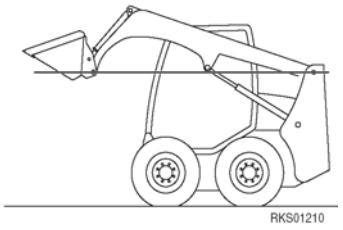
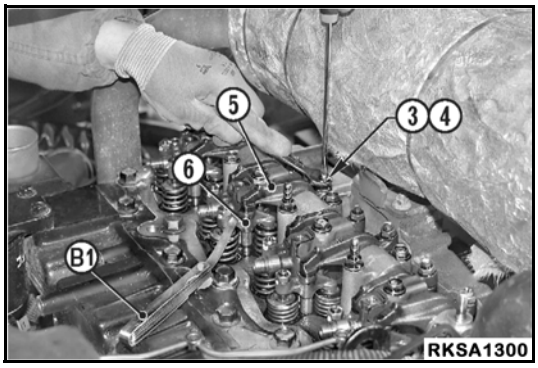


Fig. 3 CVRKS00880

MEMORANDUM

Machine model					SK1020-5N and SK1020-5NA	
Category	**Item**		**Measurement Conditions**	**Unit**	**Standard Value**	**Service Limit Value**
Pilot and secondary circuit pressure	Pilot system travel forward (start-up) *		• Engine speed: 2500 ± 10 rpm • Oil temperature: 45-55°C (113-131°F) • Machine raised from the ground • * Pressure of wheels at start of rotation	bar (psi)	5.5 (80)	4.0-7.0 (58-111)
	Pilot system travel (maximum)				14.5 (210)	14-15 (203-218)
	Pilot system travel reverse (start-up) *				5.5 (80)	4.0-7.0 (58-111)
	Pilot system travel reverse (maximum)				14.5 (210)	14-15 (203-218)
	Pilot system travel to right or left (maximum)				14.5 (210)	14-15 (203-218)
	Pilot system with parking brake disengaged				5.5 (80)	min. 22 (319)
Engine speed (with load)	With travel pump		• Engine speed: Maximum • Oil temperature: 45-55°C (113-131°F) • 2nd. speed • Travel lever: At full stroke • Parking brake: Applied	rpm	2600	2500-2700
	With travel and equipment pump		• Engine speed: Maximum • Oil temperature: 45-55°C (113-131°F) • 2nd. speed • Travel lever: At full stroke • Parking brake: Applied • Raise: At end of stroke		2525	2400-2650
Hydraulic drift of the work equipment	Front bucket	Total work equipment (Downward movement of bucket teeth)	Measuring posture 	mm (in)	Max. 130 (5.12)	Max. 200 (7.87)
		Rasing cylinder (Retraction)			Max 15 (0.59)	Max. 25 (0.98)
		Bucket cylinder (extension)	• In this position, measure extension or retraction of each cylinder, and any leakages occurring when a load is applied to the tips of the bucket teeth. • Horizontal and level ground • Engine: Switched off • Oil temperature: 45-55°C (113-131°F) • Take measurements as soon as the engine stops • Measure the variations every 5 minutes and check the total variation after 15 mins.		Max. 8 (0.32)	Max. 15 (0.59)

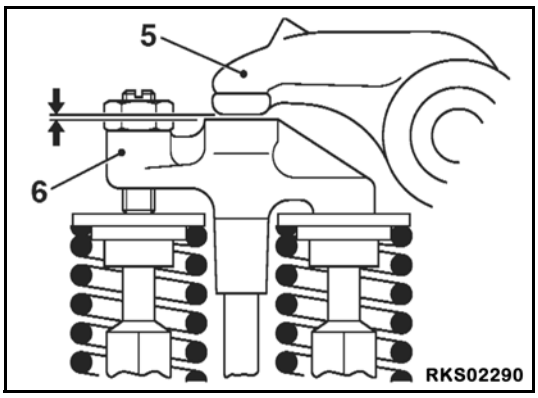
B. Loosen the lock nut (3) and unscrew the adjustment screw (4) by approximately 1 turn.



C. Insert feeler gauge **B1** between rocker (6) and valve cap (5). Rotate adjusting screw (4) until it rubs against feeler gauge **B1**. Secure this position with nut (3).

★ After locking nut (3), check the valve clearance again.

D. Adjust clearance between valve and rockers to the following values:



	Suction valves	Exhaust valves
With engine cold	0.20 mm (0.008 in)	0.20 mm (0.008 in)

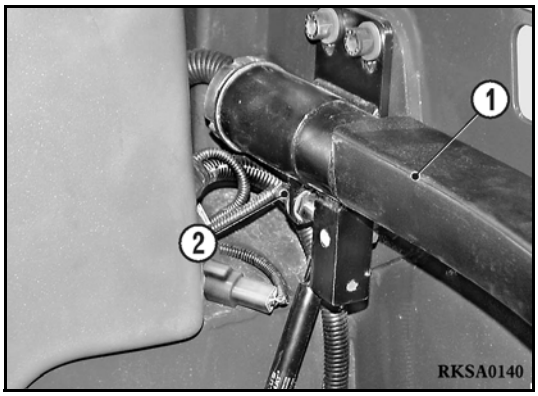
E. After adjusting the No. 1 cylinder, rotate drive shaft 180° each time and adjust the valve clearance of the other cylinders according to the ignition sequence.

★ Ignition sequence: 1 - 3 - 4 - 2.

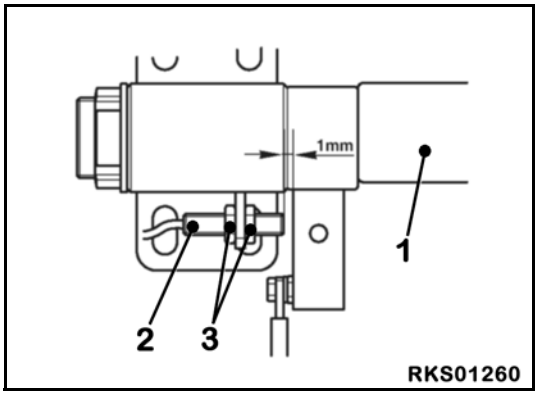
ADJUSTING SERVO-CONTROL SAFETY SENSOR

WARNING! Before proceeding with any adjustments, be sure all work equipment is on the ground and there controls neutralized. Be sure the parking brake is set and the machine is on a flat level surface. Stop the engine and remove the ignition key.

1. Lower the LH safety bar (1) and adjust the position of sensor (2) by loosening then tightening adjustment nuts (3).



★ Distance between safety bar and sensor: 1 mm (0.039 in)



Valve Adjustment

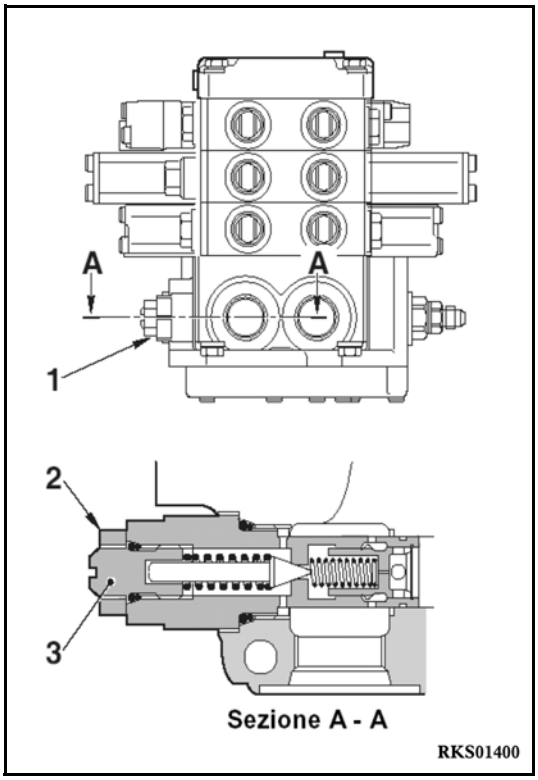
★ The unloading valve cannot be re-adjusted, only replaced.

Adjustment Of Main Relief Valve

1. If the pressures measured for the working equipment and machine travel do not fall within normal values, adjust the main relief valve (1) as follows:
   - ★ Loosen lock nut (2) and rotate the adjusting screw (3).
     - To INCREASE pressure, turn in a CLOCKWISE direction.
     - To DECREASE pressure, turn in a COUNTERCLOCKWISE direction.
   - ★ Each turn of the adjusting screw (3) varies the pressure by about 56.1 kg/cm^2 (798 psi).
2. Lock the nut (2).

Nut: 69 ± 10 N·m (51 ± 7 lbf ft)

- ★ After adjustment, check the adjustment of the main relief valve with the same procedures as used for the measurements.



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3. Check before troubleshooting.

   A. Check the oil level.

   B. Check for any external leakage of oil from the piping or hydraulic equipment.

   C. Check the travel of the control levers.

   D. Check the stroke of the control valve spool.

   E. Other maintenance items can be checked externally, so check any item that is considered to be necessary.

4. Confirming the failure.

   A. 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, etc.
      ★ When operating the machine to reenact the troubleshooting symptoms, do not perform any investigation or measurement that may make the problem worse.

5. Troubleshooting.

   A. Use the results of the investigation and inspection in Steps 2 - 4 to narrow down the causes of the failure, then use the troubleshooting flowchart to locate the position of the failure exactly.

   B. The basic procedure for troubleshooting is as follows.

      i. Start from the simple points.

      ii. Start from the most likely points.

      iii. Investigate other related parts or information.

6. Measures to remove root cause of failure.

   A. Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.

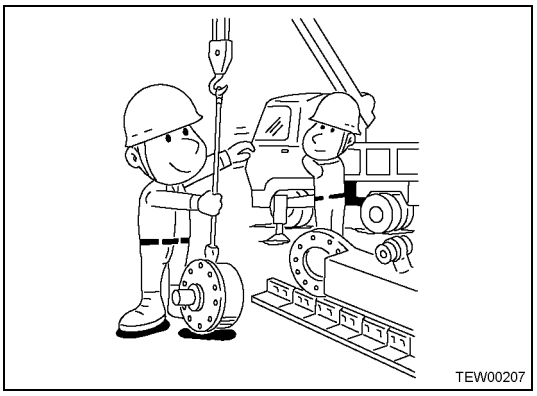
   B. To prevent this, always investigate why the problem occurred. Then, remove the root cause.

Points to Remember When Handling Hydraulic Equipment

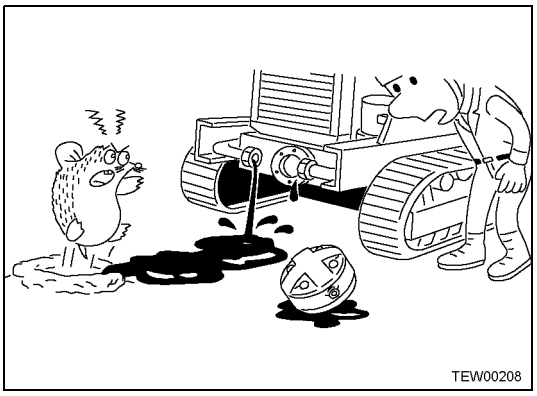
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1. Be careful of the operating environment.
   Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

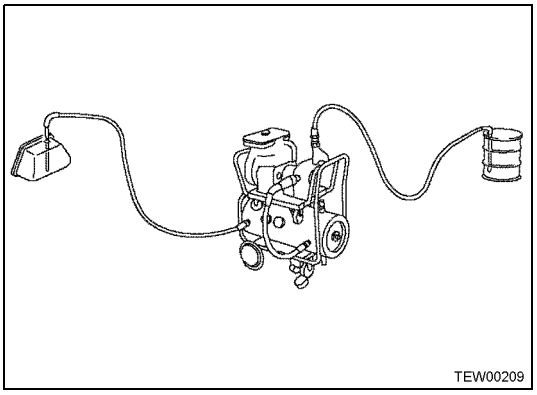
2. Disassembly and maintenance work in the field.
   If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to confirm the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dust proof workshop, and the performance should be confirmed with special test equipment.

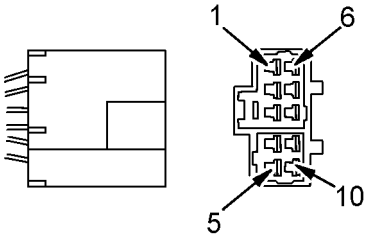
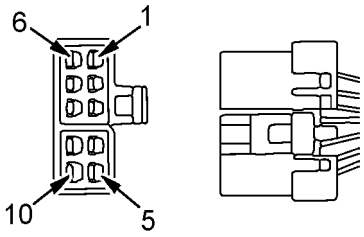
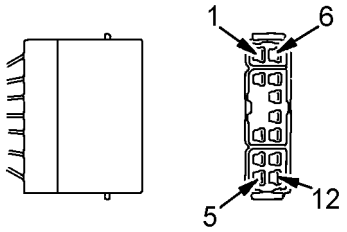
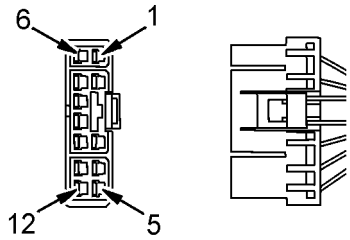
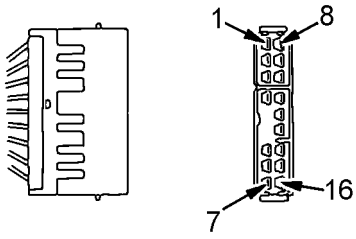
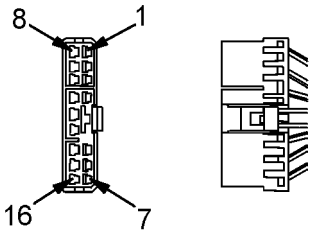


3. Seal or cover all openings of disconnected piping.
   After any piping or equipment is removed, the openings should be sealed with caps, tape, or vinyl bags to prevent any dirt or dust from entering. Never leave any openings opened or blocked with a rag, this could cause particles or dirt to get into the system. Drain all oil into a container and not unto the ground and be sure to follow the proper environmental regulation for any disposal of oil.

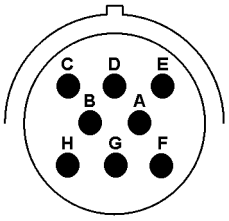
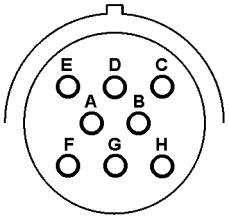
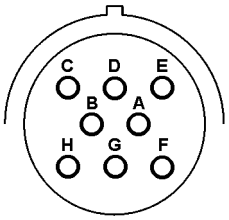
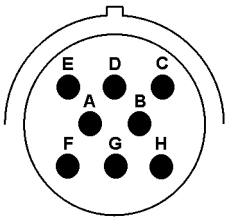
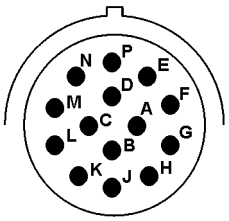
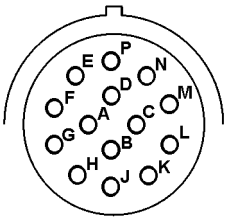
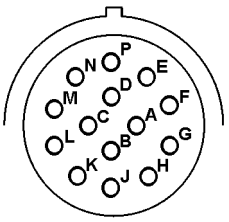
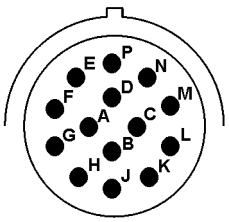


4. Do not let any dirt, or dust get in during refilling operations.
   Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.



Number of Pins	S Type Connector		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
10 (blue)	 BWP04735	 BWP04736	—
	—	—	
12 (blue)	 BWP04737	 BWP04738	799-601-7160
	Part number: 08056-11272	Part number: 08056-11282	
16 (blue)	 BWP04739	 BWP04740	799-601-7170
	Part number: 08056-11672	Part number: 08056-11682	

★ The pin No. is also marked on the connector (electric wire insertion end)

<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="3">HD30 Series connector</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part Number</td></tr>
<tr><td rowspan="6">18-8 (1)</td><td>Pin (male terminal)</td><td>Pin (female terminal)</td><td rowspan="2">799-601-9210</td></tr>
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</td><td>
</td></tr>
<tr><td>Part number: 08191-11201, 08191-11202
08191-11205, 08191-11206</td><td>Part number: 08191-14101, 08191-14102
08191-14105, 08191-14106</td></tr>
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</td><td>
</td></tr>
<tr><td>Part number: 08191-11201, 08191-12202
08191-11205, 08191-12206</td><td>Part number: 08191-13101, 08191-13102
08191-13105, 08191-13106</td></tr>
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08191-22205, 08191-22206</td><td>Part number: 08191-23101, 08191-23102
08191-23105, 08191-23106</td></tr>
</table>

Port No.	Connector type	Pin No.	KIT No. 799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	—
799-601-9230	HD30	18-20														O	O			
799-601-9240	HD30	18-21														O	O			
799-601-9250	HD24	24-9														O	O			
799-601-9260	HD30	2-16														O	O			
799-601-9270	HD30	24-21														O	O			
799-601-9280	HD30	24-23														O	O			
799-601-9290	HD30	24-31														O	O			
799-601-9310	Plate	For HD30														O	O		O	
799-601-9320	For measuring box	For DT, HD														O	O		O	
799-601-9330	Case															O				
799-601-9340	Case																O			
799-601-9350	DEUTSCH	40P																	O	
799-601-9360	DEUTSCH	24P																	O	
799-601-9410	For NE, G sensor	2P																		O
799-601-9420	For boost pressure, fuel	3P																		O
799-601-9430	PVC socket	2P																		O
799-601-9710	AMP 2-963215-1 AMP 2-963217-1 for HST controller	16P																		O
799-601-9720	AMP 2-963215-1 AMP 2-963217-1 for HST controller	16P																		O
799-601-9730	AMP 2-1437285-2 AMP 2-1437285-8 for HST controller	26P																		O

The evaporator temperature is controlled through pressure inside the evaporator, and temperature and pressure at the outlet of the evaporator.

Electrical Circuit

The air conditioner's electrical circuit is fed from an accessory circuit and is fused with a 30-ampere fuse or circuit breaker.

The blower control is a switch which provides a range of blower speeds from fast to slow. When the blower switch is turned on, current is fed to the thermostat. Once the blower is turned on, fan speeds may be changed without affecting the thermostat sensing level.

The thermostat reacts to changing temperatures which cause electrical contacts to open and close. The thermostat has a capillary tube extended into the evaporator coil to sense temperature.

When the contacts are closed, current flows to the clutch field and energizes the clutch, causing the crankshaft to turn which starts the refrigeration cycle. When the temperature of the evaporator coil drops to a predetermined point, the contacts open and the clutch disengages.

When the clutch is disengaged, the blower remains at the set speed. After the evaporator temperature rises about twelve degrees above the cutout point, the contacts in the thermostat close and the refrigeration cycle resumes.

Thermostat

An electromagnetic clutch is used on the compressor to provide a means of constant temperature control of the cab. The clutch is controlled by a thermostat in the evaporator which is set initially by the driver to a predetermined point. Coil temperature is then maintained by the cycling action of the clutch.

The thermostat is simply a thermal device which controls an electrical switch. When warm, the switch is closed; when cold, it is open. Most thermostats have a positive OFF position as a means to turn the clutch OFF regardless of temperature.

The bellows type thermostat has a capillary tube connected to it which is filled with refrigerant. The capillary tube is attached to the bellows inside of the thermostat. Expansion of the gases inside the capillary tube exerts pressure on the bellows, which in turn closes the contacts at a predetermined temperature.

Compressor Clutch

An electromagnetic clutch is used in conjunction with the thermostat to disengage the compressor when it is not needed, such as when a defrost cycle is indicated in the evaporator, or when the system is turned off.

The stationary field clutch is the most desirable type since it has fewer parts to wear out. The field is mounted to the compressor by mechanical means depending on the type field and compressor. The rotor is held on the armature by a bearing and snap rings. The armature is mounted on the compressor crankshaft.

When no current is fed to the field, there is no magnetic force applied to the clutch and the rotor is free to rotate on the armature, which remains stationary on the crankshaft.

When the thermostat or switch is closed, current is fed to the field. This sets up a magnetic force between the field and armature, pulling it into the rotor. When the armature becomes engaged with the rotor, the complete unit rotates while the field remains stationary. This causes the compressor crankshaft to turn, starting the refrigeration cycle.

When the switch or thermostat is opened, current is cut off. The armature snaps back out and stops while the rotor continues to turn. Pumping action of the compressor is stopped until current is again applied to the field. In addition, safety switches in the compressor clutch electrical circuit control clutch operation, disengaging the clutch if system pressures are abnormal.

9. Check the system pressure after the recovery equipment stops. After five minutes, system pressure should not rise above “0” gauge pressure. If the pressure continues to rise, restart and begin the recovery sequence again. This cycle should continue until the system is void of refrigerant.

10. Check the sight glass oil level to determine the amount of oil that needs to be replaced. (The amount of oil that was lost during the recovery cycle must be replaced back into the system).

11. Mark the cylinder with a RECOVERED (red) magnetic label to reduce the chance of charging a system with contaminated refrigerant. Record the amount of refrigerant recovered.

Performing the Recycling Procedure

The recovered refrigerant contained in the cylinder must undergo the recycle procedure before it can be reused. The recycle or clean mode is a continuous loop design and cleans the refrigerant rapidly. Follow equipment manufacturer’s instructions for this procedure.

Evacuating and Charging the AC System

Evacuate the system once the air conditioner components are repaired or replacement parts are secured, and the AC system is reassembled. Evacuation removes air and moisture from the system. Then, the AC system is ready for the charging process, which adds new refrigerant to the system.

Evacuating the System

1. Attach the high and low side hoses to the appropriate connections.

2. Start the vacuum pump and run it for five minutes.

3. Check the gauge readings for five minutes. If the gauge needle moves up, the system is not sealed. The vacuum that was just created did not hold, air and moisture are being sucked into the system by that same vacuum.

4. Tighten any loose connections. Re-start the pump, and open the hand valves on the gauges again. Repeat the vacuum test.

5. If the leak has been repaired, run the vacuum pump for at least an hour to remove any moisture from the system.

Remark

The moisture must turn to gas before the pump can pull it out. The moisture takes time to boil away, so that it can be drawn out of the system. The vacuum pump can draw most of the air out quickly, but a deep vacuum requires more time; the deeper the vacuum the more time required.

Charging the AC System

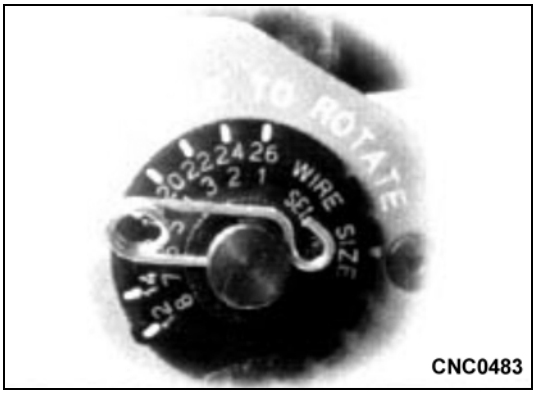
When adding a full charge of refrigerant, it is possible to put it in as a gas or as a liquid. Adding refrigerant as a liquid is faster but can damage the compressor if not done correctly. The procedure used, and where the refrigerant is added in the AC system makes a difference. When using refrigerant as a liquid, never add more than two thirds of system requirements as a liquid. Finish charging the system using gas.

Possible Causes	Suggested Corrective Action
Leaks found:	1. If a leak is present at a connection, tighten the connection, then add refrigerant as required. 2. It may be necessary to use a jumper wire to enable the compressor to operate, if the compressor has shut down due to faulty pressure sensing switch. 3. If a system component needs to be replaced, recover all refrigerant from the system. Replace the defective part, then check the compressor oil level; refill compressor oil as necessary. 4. Evacuate system. 5. Charge system with new / recycled refrigerant. 6. Check A/C operation and do system performance test.
Air and/or Moisture in the System	
Indications: • Gauge Reading - Low Side Normal. • High Side Normal. • Air and/or Moisture in the System. • Gauge Reading - Low Side Normal. • High Side Normal. Cause: • Air and/or moisture in the system. • The air from the vents in the cab is only slightly cool. In a cycling type system with a thermostatic switch, the switch may not cycle the clutch on and off, so the low pressure gauge will not fluctuate.	Repair Procedure: Test for leaks, especially around the compressor shaft seal area. When the leak is found, recover refrigerant from the system and repair the leak. Replace the receiver-drier or accumulator because the desiccant maybe saturated with moisture. Check the compressor and replace any refrigerant oil lost due to leakage. Evacuate and recharge the system with refrigerant, then check AC operation and performance.
Excessive Air and/or Moisture in the System	
Indications: • Gauge Reading- Low Side High. • High Side High. • Air from the vents in the cab is only slightly cool. Cause- System contains excessive air and/or moisture.	Repair Procedure: Test for leaks, recover refrigerant from the system and repair the leak. Depending on the type of system, replace the receiver-drier or accumulator. Check and replace any compressor oil lost due to leakage. Evacuate and recharge the system, then check AC operation and performance.

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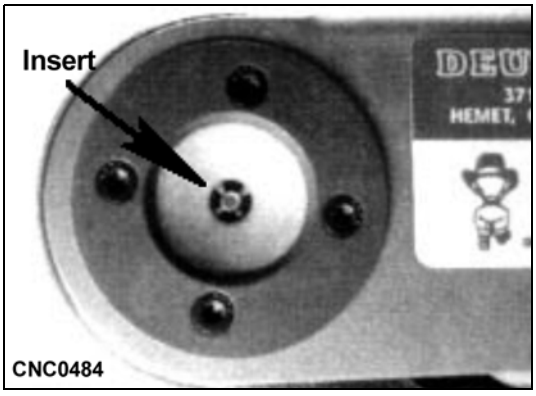
Crimping Contact Terminal (HD30 Type)

1. After insulation has been stripped from wire and contact terminal is ready for crimping, raise selector knob on Crimp Tool #HDT48-00 and rotate until arrow is aligned with wire size to be crimped.
2. Loosen locknut, turn adjusting screw in until it stops.



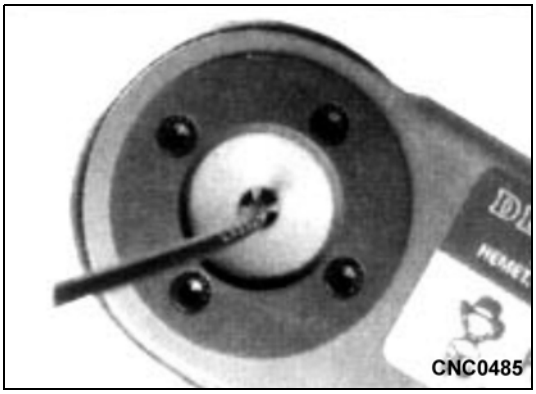
CNC0483

3. Insert contact terminal with barrel up. Turn the adjusting screw counterclockwise until contact terminal surface is flush with indenter cover. Tighten locknut.



CNC0484

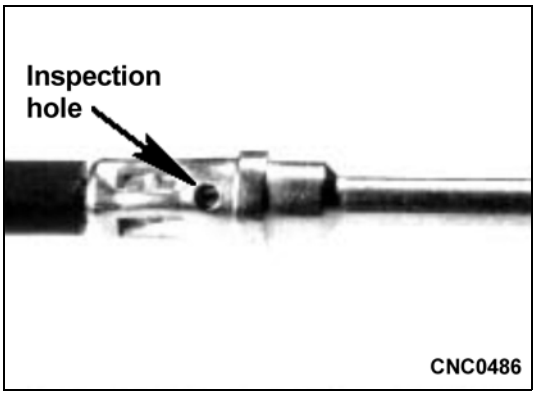
4. Insert wire into contact terminal. Be sure the contact terminal is centered between indicators.
5. Close crimp tool handle until crimp cycle is completed.
6. Release the tool handle and remove the crimped contact terminal.


CNC0485

7. Using the inspection hole in the contact terminal inspect the crimped contact terminal to ensure that all strands are in the crimped barrel.

Remark

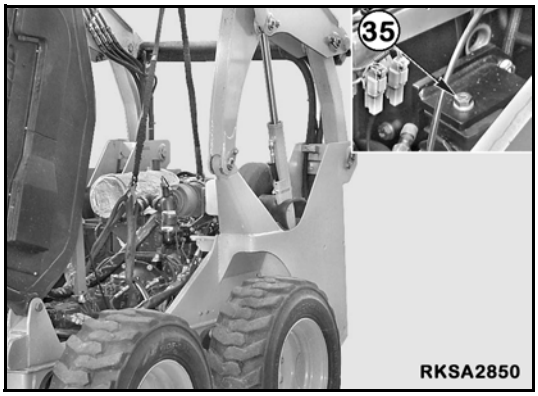
The tool must be readjusted for each type/size of contact. Use Crimp tool HDT04-08 for size 8 and 4 contacts.



CNC0486

18. Attach a hoist and tackle to the engine assembly and apply slight tension to the cables.
19. Loosen the four nuts (35) that secure the engine and remove the complete assembly. [*3]

Engine Assembly: 335 kg (739 lb)



Installation

- To install, reverse removal procedure. [*1]

1. Adjust the accelerator cables.
   (For details, see “Adjusting the Stroke of the Accelerator Cables” on page 30-13)
2. Fill the hydraulic oil tank up to maximum level. [*2]
3. While filling the tank, bleed the air from the pump.
   (For details, see “Bleeding Air From the Pump” on page 30-31).

Hydraulic oil: approx. 32 liters (8.5 gal)

4. Fill the cooling system up to maximum level.

Coolant liquid: approx. 15 liters (4 gal)

5. Fill the fuel tank and bleed the air from the system.
   (For details, see “Bleeding Air From Fuel System” on page 30-4).
6. Start the engine to circulate the oil and coolant and check for leaks.
7. Stop the engine, check the levels and, if necessary, top them off.
8. Bleed the air from the hydraulic circuits and pressurize the tank.
   (For details, see “BLEEDING HYDRAULIC CIRCUITS” on page 30-31).

[*3]

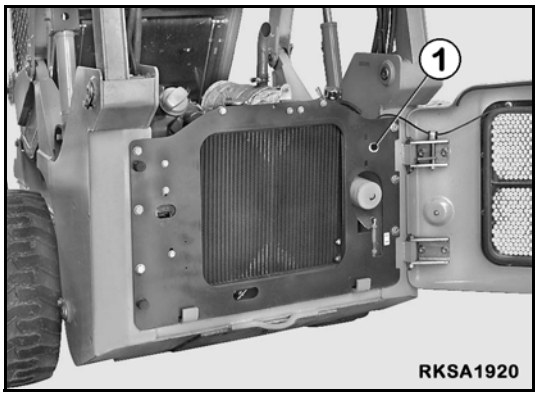
Engine nuts: 80 N·m (60 lbf ft)

Water Pump

Remark

For disassembly and assembly of the cylinder head, see the ENGINE SHOP MANUAL.

Removal



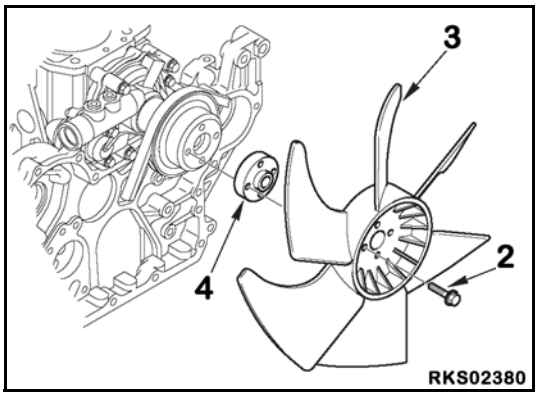
WARNING! Disconnect the negative terminal cable (-) from the battery.

★ Drain the engine coolant. [*1]

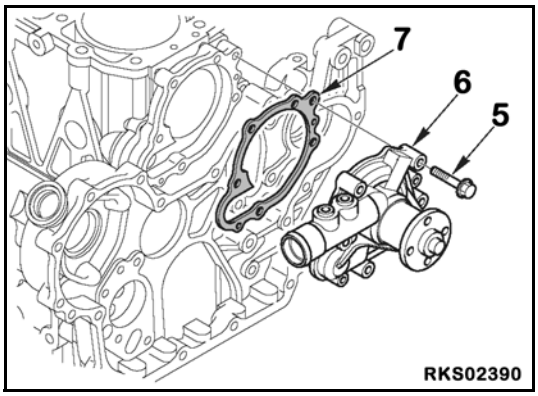
Coolant: Maximum 15 liters (4 U.S. gal)

1. Remove the radiator (1).
   (For details, see “RADIATOR ASSEMBLY” on page 30-48).

2. Loosen screws (2), remove fan (3) and spacer (4).
   Loosen the alternator drive belt and disengage the circulation pump pulley. [*2]



3. Loosen screws (5) and remove the complete pump (6) and gasket (7). [*3]



Installation

- To install, reverse removal procedure.

[*1]

1. Fill up the coolant circuit.
2. Start the engine and idle for a few minutes; re-check the coolant level again and add coolant if necessary before replacing radiator cap.

[*2]

★ Adjust the belt tension. (For details, see “Control and Adjustment of the Fan Belt Tension” on page 30-9).

Fan screws: 22.6 - 28.4 N•m (17 - 21 lbf ft)

[*3]

★ A new gasket (7) **must** be fitted each time the pump is removed.

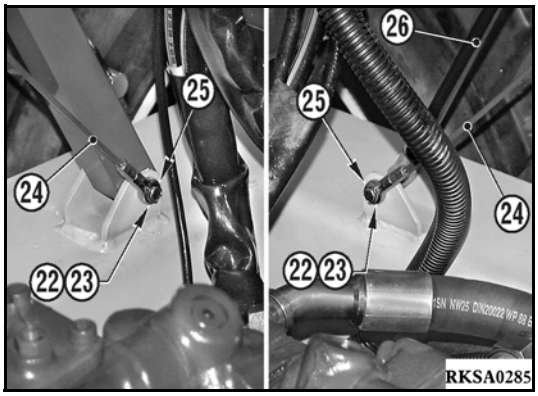
Pump screws: 22.6 - 28.4 N•m (17 - 21 lbf ft)

12. Connect the cab (21) to hoist and tackle.

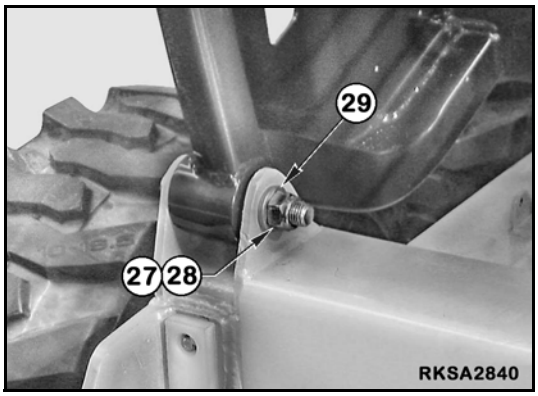


13. Remove the safety pins (22) and the washers (23).
14. Push the cab slightly towards its "at rest" position to relieve the strain on the safety cables (24), and disconnect the cables from the pins (25).

WARNING! Apply a slight tension to the hoist-tackle chains to prevent the cab from moving unexpectedly.



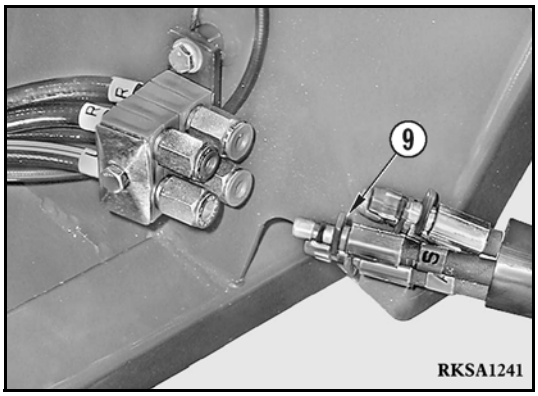
15. Tilt the cab (21) slowly until the distance between the centres of the hooks is 1100 mm (43 in)
    - ★ The distance of 1100 mm (43 in) corresponds to the maximum stretch of the hooks.
16. Remove the pins (25) from the hooks (26).
17. Loosen nuts (27) and remove the fasteners (28) and washers (29).
18. Remove the complete cab assembly (21).



Installing the Cab

1. To install, reverse removal procedure.
   - Install nuts (9) on the hoses and connect the pipes by pushing them fully into their seats. [*1]
   - Check the connections.
2. Adjust the accelerator lever cable. (For details, see "Adjusting the Stroke of the Accelerator Cables" on page 30-13). [*2]
3. Fill up the cooling system.

- Start the engine to circulate the coolant and check for leaks.
- Stop the engine, check the levels and, if necessary, top them off.



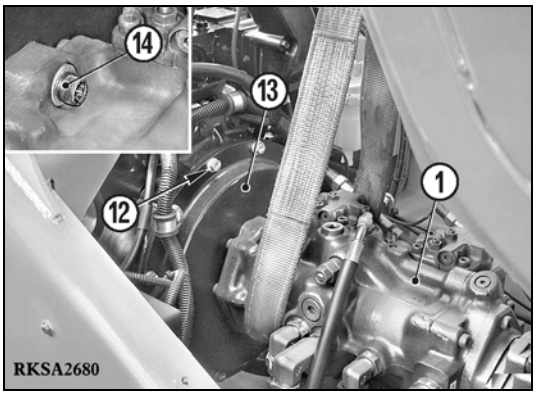
4. Attach the pump (1) to a hoist tackle and apply a slight tension to the cables.



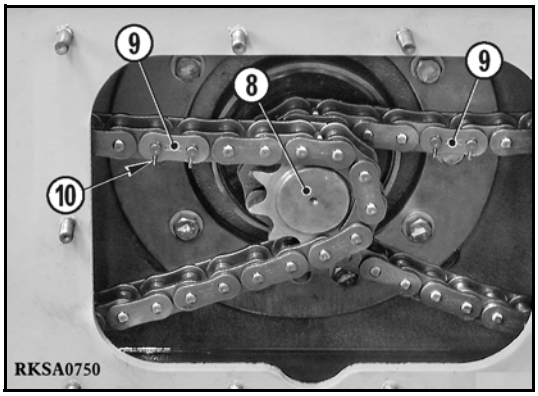
5. Loosen the eight fasteners (12) and remove the pump (1) complete with bell housing (13). [*1]

Pump: 98 kg (216 lb)

6. Loosen fastener (14) and disconnect pump (1) from bell housing (13). [*2]



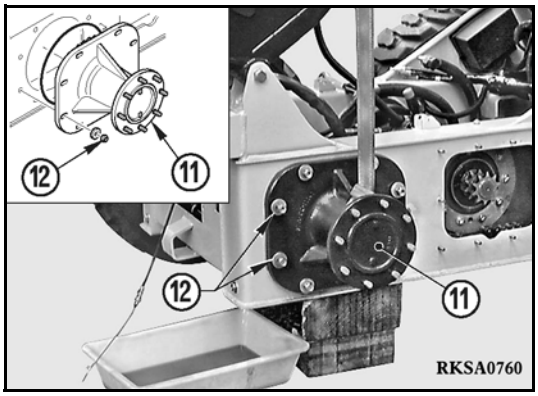
6. Start the engine and allow the pinion (8) to turn slowly until the master links (9) are both positioned on the upper section of the chain.
7. Remove the pins (10) and pull out the master link (9). [∗3]



8. Turn the wheel hub (11) to release it from the chain.
9. Attach the complete hub assembly (11) to a hoist and tackle and apply a slight tension to the cables.
10. Loosen the nuts (12) and remove the hub (11). [∗4]

Hub: 61 kg (135 lb)

11. Check the condition of the O-ring and replace it if necessary.



Installation

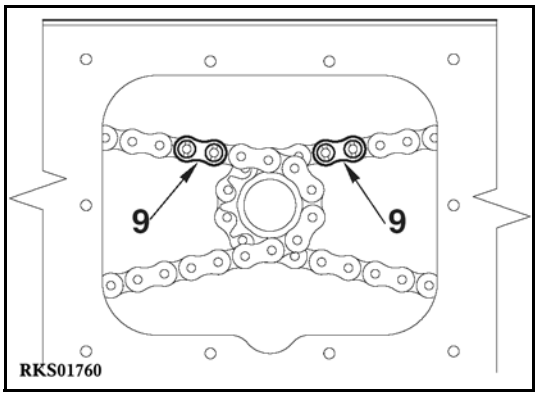
[∗1]

- To install, reverse removal procedure.

Nuts: 186 ±9.8 N•m (137 ±7 lbf ft)

[∗2]

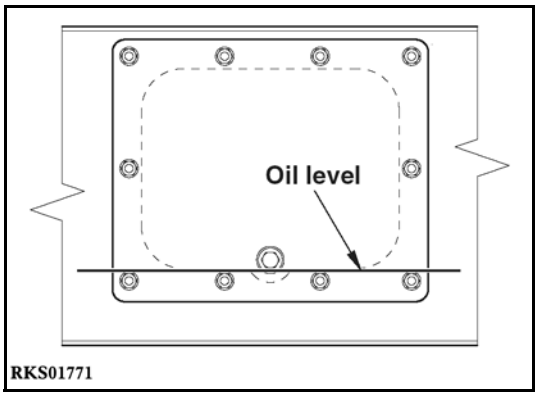
Nuts: 29 N•m (21 lbf ft)



[∗3]

1. Make sure that the master link is in the correct position with respect to the pinion.
2. Adjust the tension of the chains.
   (For details, see “CHAIN TENSION” on page 30-18).
3. Fill the oil up to maximum level.

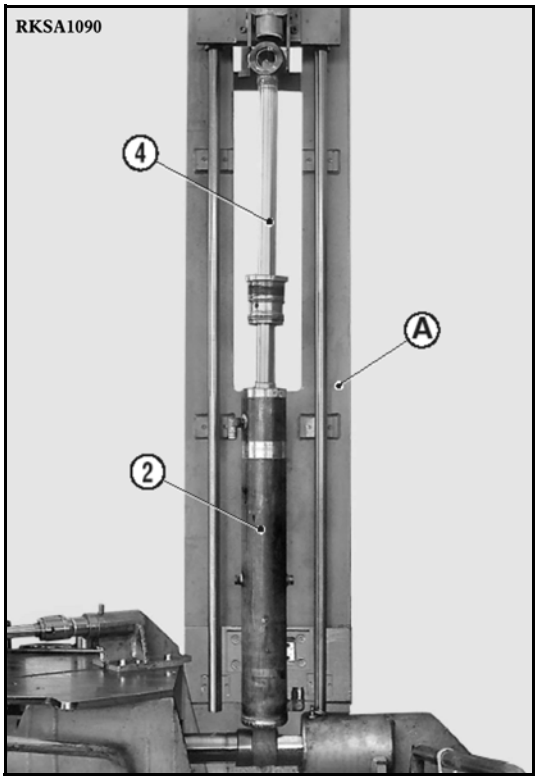
Transmission oil: max. 13.5 liters (3.6 gal)



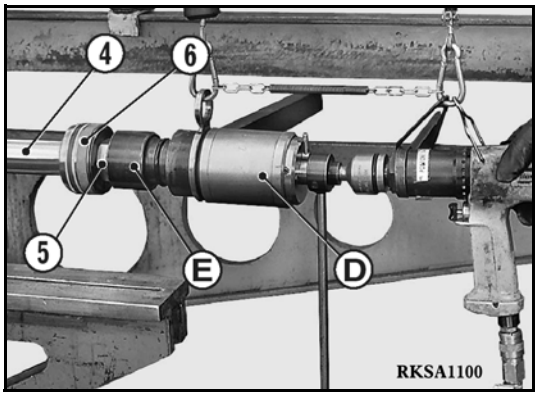
[∗4]

Nuts: 196 N•m (145 lbf ft)

5. Raise the cylinder, and hook the piston rod to the mobile group of tool "**A**".
6. Extract the piston rod assembly (4) from the cylinder.
7. Remove cylinder (2) and the piston rod assembly.



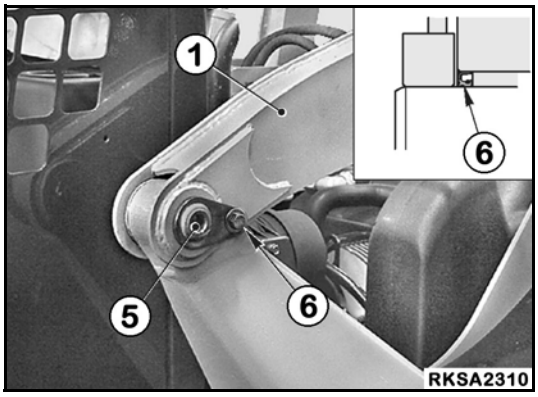
8. Lock the complete piston rod (4) onto apparatus "**A**".
9. Attach wrench "**E**" to lock nut (5) of piston (6), and using the dynamometric tool with a multiplier "**D**", remove the nut.
   ★ Socket wrench measurement: 41 mm
10. Take all the parts and remove all the seals, guard rings and guide rings.
    ★ The seals, guard rings, and guide rings cannot be re-used, always replace with new seals and rings.



5. Remove bolt (4) and lock pin (5) and remove lift lever (1).

Lift lever: 24 kg (53 lbs)

★ Check for any damaged seals (6) and replace if necessary.
★ Check and note position of the shims. [∗1], [∗2]



Installation of the Lift Lever

• To install, reverse removal procedure.

WARNING! When aligning the positions between the hole and the pin, **do not** insert fingers into the holes to check alignment.

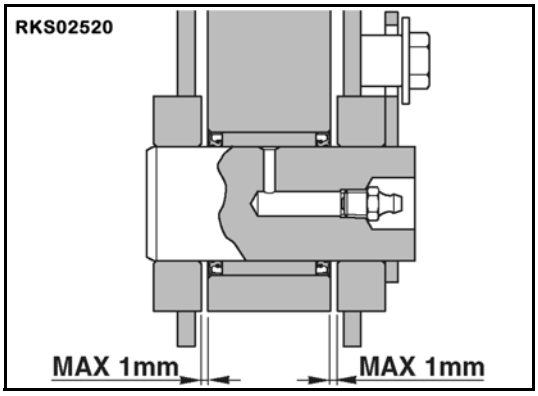
[∗1]

Bushing inner side: Lithium EP MS2 NLGI 2

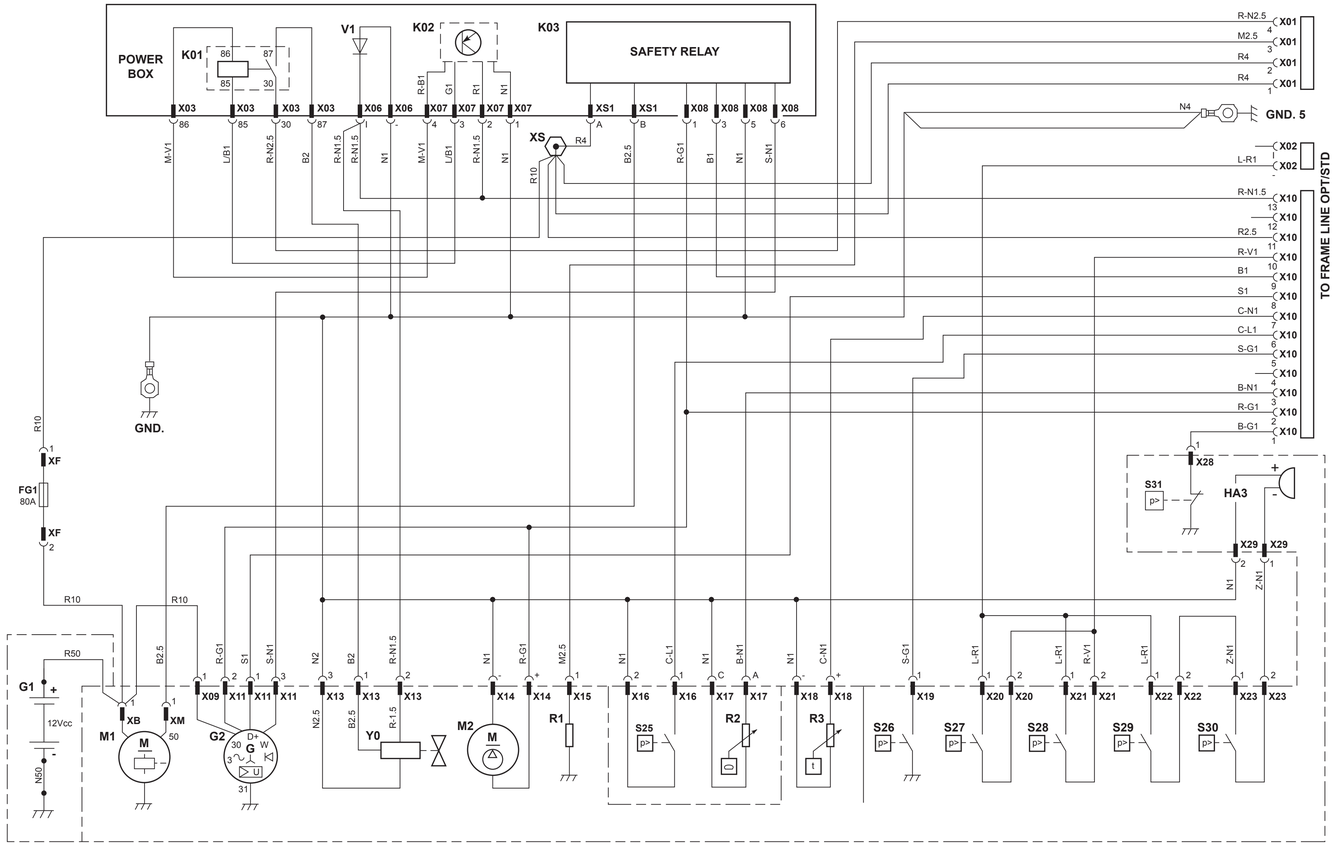
Lock pin bolt: 49 N•m (36 lbf ft)

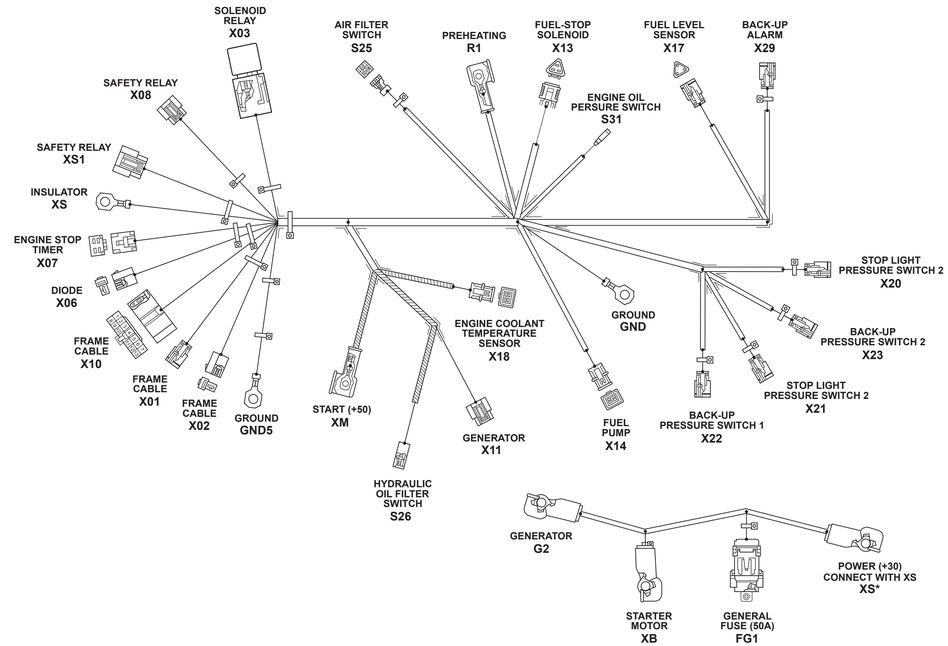
[∗2]

★ Introduce shims between the lift lever and frame until the residual clearance is less than 1 mm (0.039 in).



ELECTRICAL DIAGRAM (ENGINE LINE)





COMPONENTS

FG1 General Fuse 80A
G1 Battery 100Ah
G2 Generator
GND C8 Ground Terminal
GND5 C6 Ground Terminal
HA3 Back-Up Alarm
K01 Fuel Solenoid Valve Relay
K02 Fuel Pull Solenoid Valve Timer 1 Second
K03 Safety Relay
M1 Starter Motor
M2 Fuel Pump
R1 Preheating Starter
R2 Fuel Level Sender
R3 Engine Water Temperature Sender
S25 Air Filter Blocked Switch
S26 Hydraulic Oil Filter Blocked Switch
S27 Stop Lights Pressure Switch
S28 Stop Lights Pressure Switch
S29 Back-Up Alarm Pressure Switch
S30 Back-Up Alarm Pressure Switch
S31 Engine Oil Min. Pressure Switch
V1 Diode 1A
X01 Frame Line 3 Way Connector
X02 2 Way Connector
X03 Fuel Solenoid Relay Connector
X06 Diode 2 Way Connector
X07 Pool Solenoid Timer 4 Way Connector
X08 Safety Relay 6 Way Connector
X09 C6 Generator Terminal
X10 Frame Line Mark 13 Way Connector
X11 Generator 3 Way Connector
X13 Fuel Pool-Stop Solenoid 3 Way Connector
X14 Fuel Pump 2 Way Connector
X15 Preheating Start C6 Terminal
X16 Air Filter Blocked Switch 2 Way Connector
X17 Fuel Level Sender 3 Way Connector
X18 Engine Water Temperature Sender 2 Way Connector
X19 Hydraulic Oil Filter Blocked Switch C5 Terminal
X20 Stop Light Pressure 1 Switch 2 Way Connector
X21 Stop Light Pressure 2 Switch 2 Way Connector
X22 Back-Up Pressure 1 Switch 2 Way Connector
X23 Back-Up Pressure 2 Switch 2 Way Connector
X28 Engine Min. Pressure Switch Terminal
X29 Back-Up Alarm 2 Way Connector
XB C8 Start Motor Terminal
XF General Fuse 2 Way Connector
XM C4 Start Motor Terminal
XS Safety Relay 2 Way Connector
XS1 Insulator
Y0 Stop Fuel Solenoid Valve

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