CEBM003803

Shop Manual

avance LOADER

WA800-3LC

WHEEL LOADER

SERIAL NUMBERS **WA800-3LC** **A50001** and UP

It is our policy to improve our products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Due to this continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

November 2002
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STANDARD TIGHTENING TORQUE

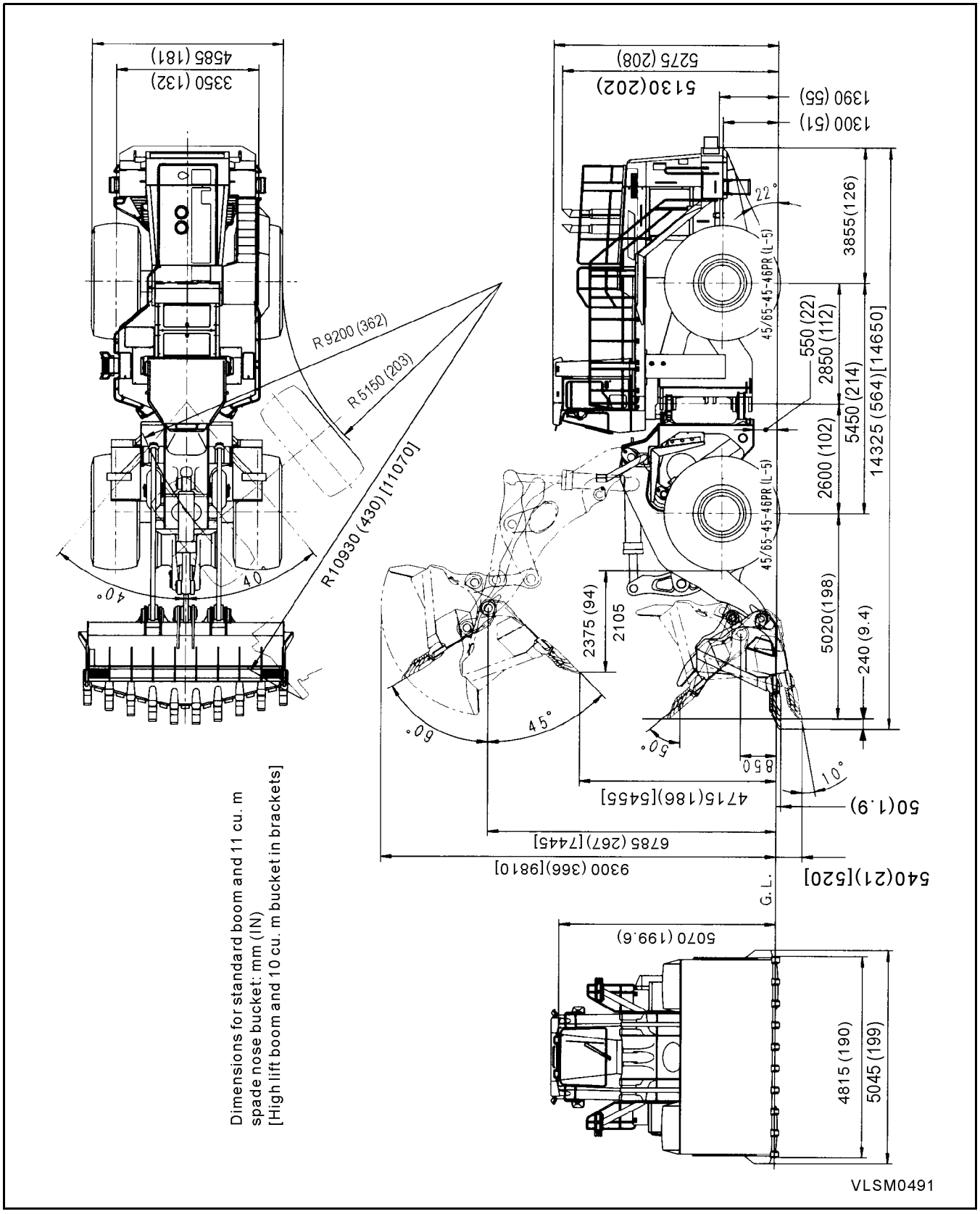
STANDARD TIGHTENING TORQUE OF BOLTS AND NUTS

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in sections of DISASSEMBLY AND ASSEMBLY.

Thread diameter of bolt	Width across flats		
mm	mm	Nm	kgm
6	10	13.2 ±1.4	1.35 ±0.15
8	13	31.4 ±2.9	3.20 ±0.3
10	17	65.7 ±6.8	6.70 ±0.7
12	19	112 ±9.8	11.5 ±1.0
14	22	177 ±19	18 ±2.0
16	24	279 ±29	28.5 ±3
18	27	383 ±39	39 ±4
20	30	549 ±58	56 ±6
22	32	745 ±78	76 ±8
24	36	927 ±98	94.5 ±10
27	41	1320 ±140	135 ±15
30	46	1720 ±190	175 ±20
33	50	2210 ±240	225 ±25
36	55	2750 ±290	280 ±30
39	60	3280 ±340	335 ±35

Thread diameter of bolt	Width across flats	
mm	mm	Nm	kgm
6	10	7.85 ± 1.95	0.8 ± 0.2
8	13	18.6 ± 4.9	1.9 ± 0.5
10	14	40.2 ± 5.9	4.1 ± 0.6
12	27	82.35 ± 7.85	8.4 ± 0.8

SPECIFICATION DRAWING



Approximate Freezing Point	Percentage of Antifreeze Concentration by Volume	Specific Gravity at 16°C (60°F)
0°C (+32°F)	0	1.000
-7°C (+20°F)	15	1.025
-12°C (+10°F)	25	1.040
-18°C (0°F)	33	1.053
-23°C (-10°F)	40	1.062
-29°C (-20°F)	45	1.070
-34°C (-30°F)	48	1.074
-40°C (-40°F)	53	1.080
-46°C (-50°F)	56	1.083
-51°C (-60°F)	59	1.088
-57°C (-70°F)	62	1.092
-62°C (-80°F)	65	1.095
-68°C (-90°F)	67	1.097
-69°C (-92°F)	68	1.098

In tropical climates where antifreeze availability may be limited, use a corrosion inhibitor or supplemental coolant additive (SCA), to protect the engine cooling system.

SUPPLEMENTAL COOLANT ADDITIVES

1. All supplemental cooling system additives, including those in antifreeze solutions, become depleted through normal operation. If the coolant additives in antifreeze are allowed to become depleted, the antifreeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system which reduces heat transfer. Cooling system conditioners which contain these additives must be added to maintain corrosion protection.

2. SOLUBLE OIL IS NOT RECOMMENDED for use in this engine as its use will reduce heat transfer and allow internal engine damage.

3. There are no miracle additives that will increase heat transfer or prevent overheating. Conditioned water is still the best coolant.

4. A corrosion inhibitor/conditioner is recommended to inhibit corrosion in the cooling system for the following reasons:

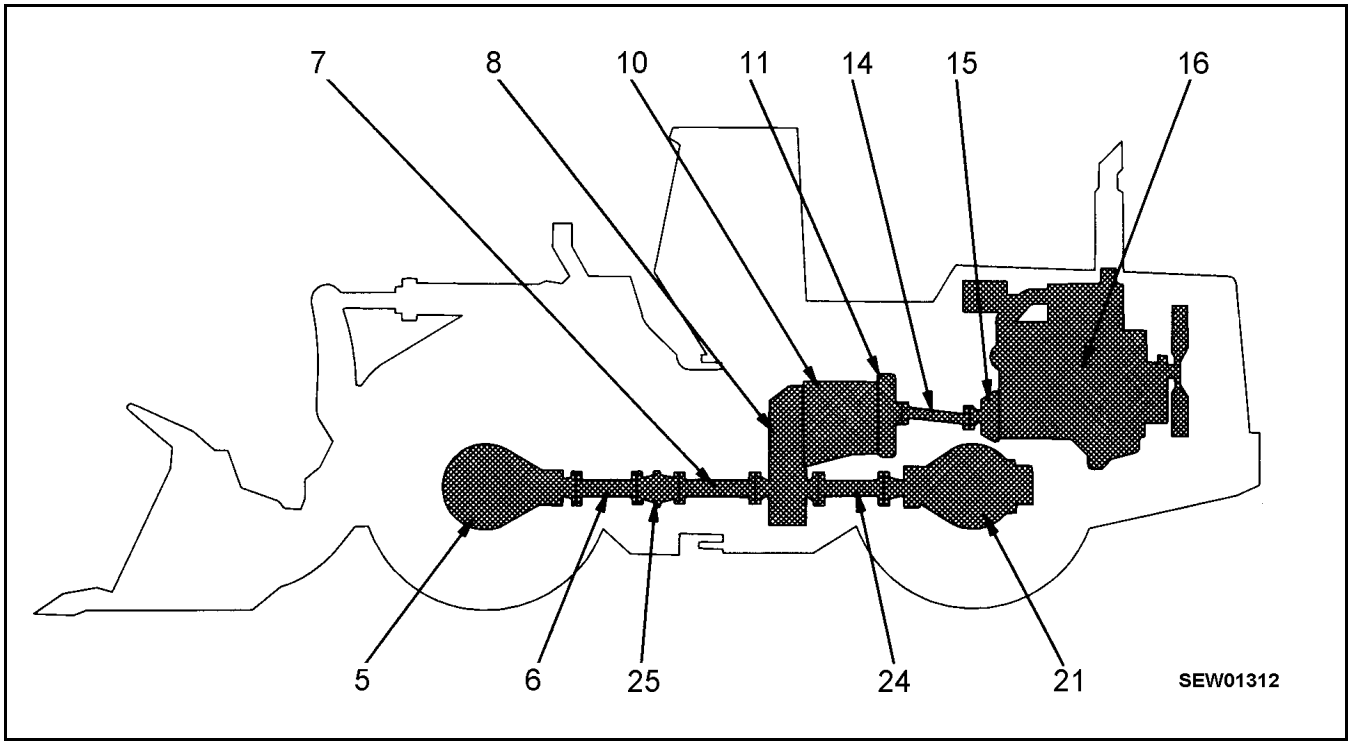
- Improved compatibility with high silicate antifreezes to minimize hydro-gel formation if over concentration occurs.
- Provides engine protection in the following areas:
  - Solder corrosion/bloom
  - Oil fouling
  - Aluminum cavitation/corrosion
  - Copper corrosion/erosion/stress cracking
  - Cylinder liner cavitation corrosion
  - Seal and gasket degradation

Maintenance of Supplemental Coolant Additives

Keeping the engine coolant properly inhibited will keep the engine and radiator free of rust, scale deposits and corrosion.

New machines are delivered with antifreeze protection. Service at a regular scheduled interval specified in the Operation and Maintenance Manual.

POWER TRAIN



OUTLINE

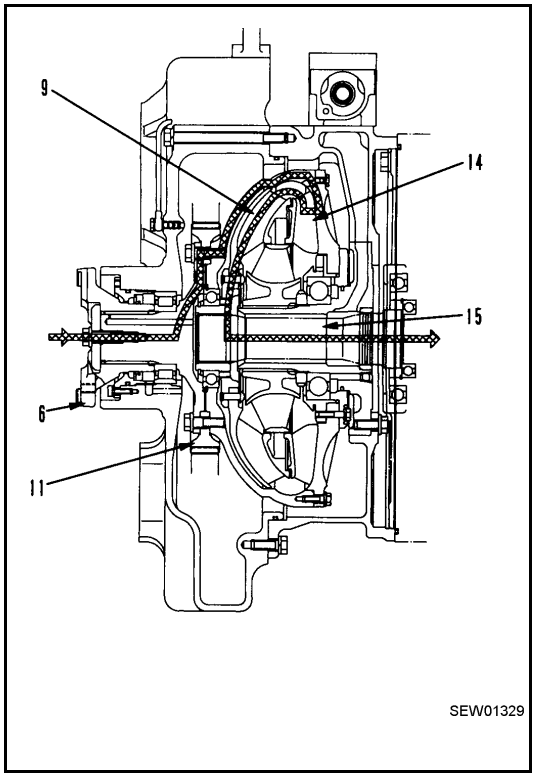
- The power from engine (16) is transmitted from the flywheel to damper (15) through the ring gear. The damper alleviates the torsional vibration caused by the variation of the engine torque and transmits the power to torque converter (11) through upper drive shaft (14). The torque converter converts the delivered torque according to the variation in load on the oil used as the medium, and transmits the power to the input shaft of transmission (10). Then, the engine power is transmitted to steering pump (12), main pump (13), switch pump (17), and torque converter charging pump + PPC pump + brake pump (18) through the pump driving gear in torque converter (11), thereby driving the pumps.
- In the transmission (10), the five hydraulically operated clutches are operated by the forward-reverse spool and the speed change spools in the transmission valves, which are themselves activated by solenoid valves. Thus, the desired travel speed can be selected from among the three forward and three reverse gear speeds.
- The output shaft of transmission (10) transmits the power to the output shaft of transfer (9) through the gear. The power from the output shaft of the transfer is transmitted to both the front axle (5) and the rear axle (21).

  In the front section of the chassis, the power is transmitted to front axle (5) through center drive shaft (7) and front drive shaft (6).
  In the rear section, the power is transmitted to rear axle (21) through rear drive shaft (24).
- The power transmitted to front axle (5) and rear axle (21) is reduced through pinion and ring gears in differential (22) and (1), and is transmitted to the axle shafts.
- The power from the axle shafts is reduced through final drive (19) and (3) and transmitted to wheel (20) and (4) through the planetary carrier.

Flow of motive force

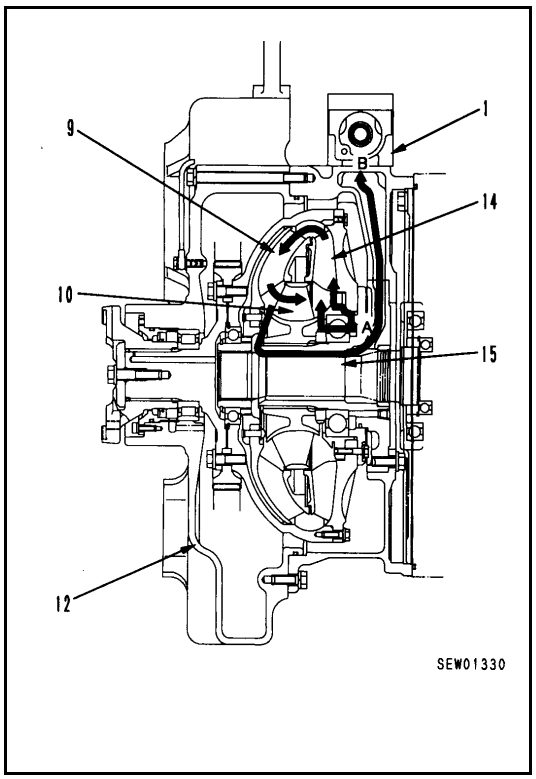
- The torque converter is installed between the damper and transmission. The motive force from the damper passes through the drive shaft and enters coupling (6). Coupling (6), pump (14) and PTO gear (drive) (11) are fixed with bolts. They are rotated directly by the rotation of the engine. The motive force of pump (14) uses oil to rotate turbine (9). This transmits motive force to transmission input shaft (15).

- The motive force of coupling (6) passes through PTO gear (drive) (11) and is also used as the motive force to drive the pump.

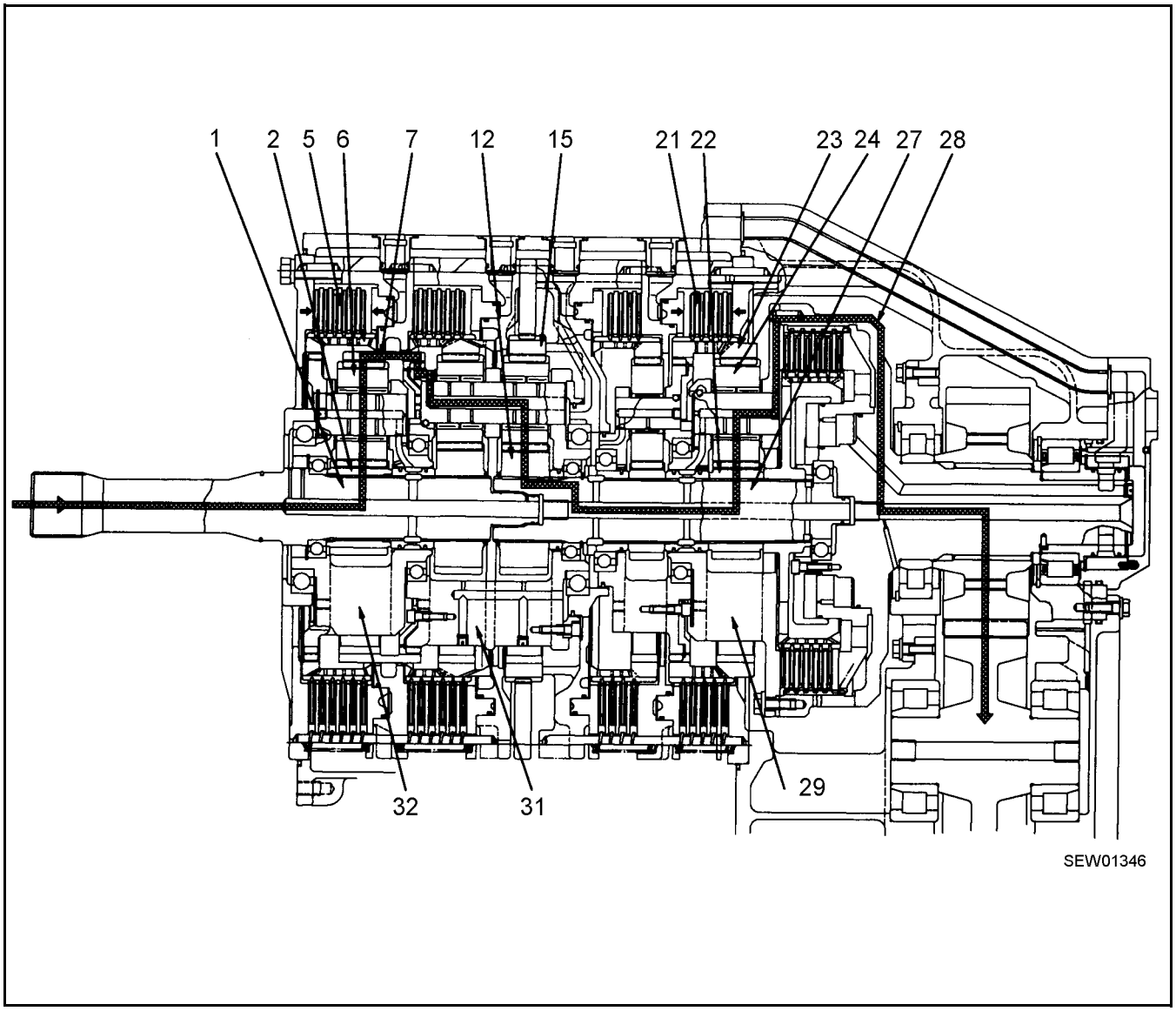


Flow of oil

- The oil pressure is adjusted by the torque converter relief valve and then enters inlet port **A**, passes through the oil passage in housing (12) and flows to pump (14). In pump (14) centrifugal force is applied. The oil enters turbine (9) and the energy of the oil is transmitted to the turbine. Turbine (9) is fixed to transmission input shaft (15), so the motive force is transmitted to the transmission input shaft (15). The oil from turbine (9) is sent to stator (10) and again enters the pump. However, part of the oil passes from the stator through outlet port **B** and is sent to regulator valve (1).
- The oil sent to regulator valve (1) passes through the oil cooler to be cooled, and is then used to lubricate the transmission.



REVERSE 1ST



- In the case of REVERSE 1st, REVERSE clutch (5) and 1st clutch (21) are engaged. The power from the torque converter transmitted to input shaft (1) is transmitted to output shaft (28).
- REVERSE clutch (5) is actuated by the hydraulic pressure applied to the clutch piston and holds carrier (32) in position. 1st clutch (21) is actuated by the hydraulic pressure applied to the clutch piston and holds ring gear (23) in position.
- The power from the torque converter is transmitted to input shaft (1). The rotation of the input shaft is transmitted through sun gear (2) to planet gear (6).
- Carrier (32) is being held in position by REVERSE clutch (5), so the rotation of planet gear (6) rotates ring gear (7). The direction of rotation of ring gear (7) is the opposite of the rotation of the engine.
- The rotation of ring gear (7) is transmitted to carrier (31). Ring gear (15) is being held in position, so the rotation of carrier (31) is transmitted through sun gear (12) to intermediate shaft (27). Ring gear (23) is being held in position by 1st clutch (21). For this reason, the rotation of sun gear (22) is transmitted from carrier (29) through planet gear (24) to output shaft (28).

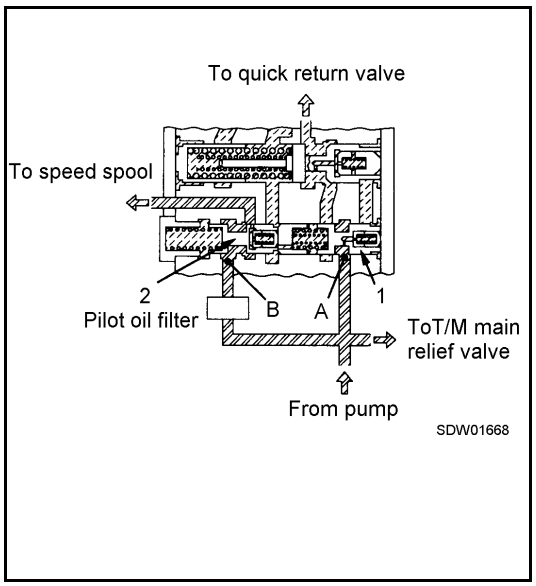
PRIORITY VALVE

FUNCTION

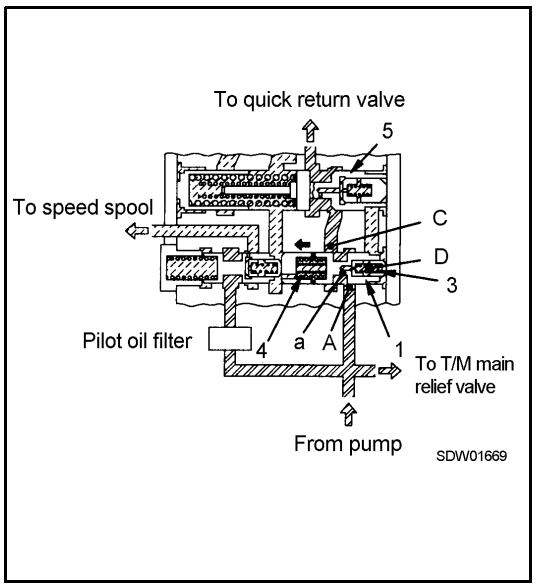
- Priority valve (1) controls the minimum pressure of pilot reducing valve (2). In addition, priority valve (1) gives the oil flow to pilot reducing valve (2) priority over the other circuit.

OPERATION

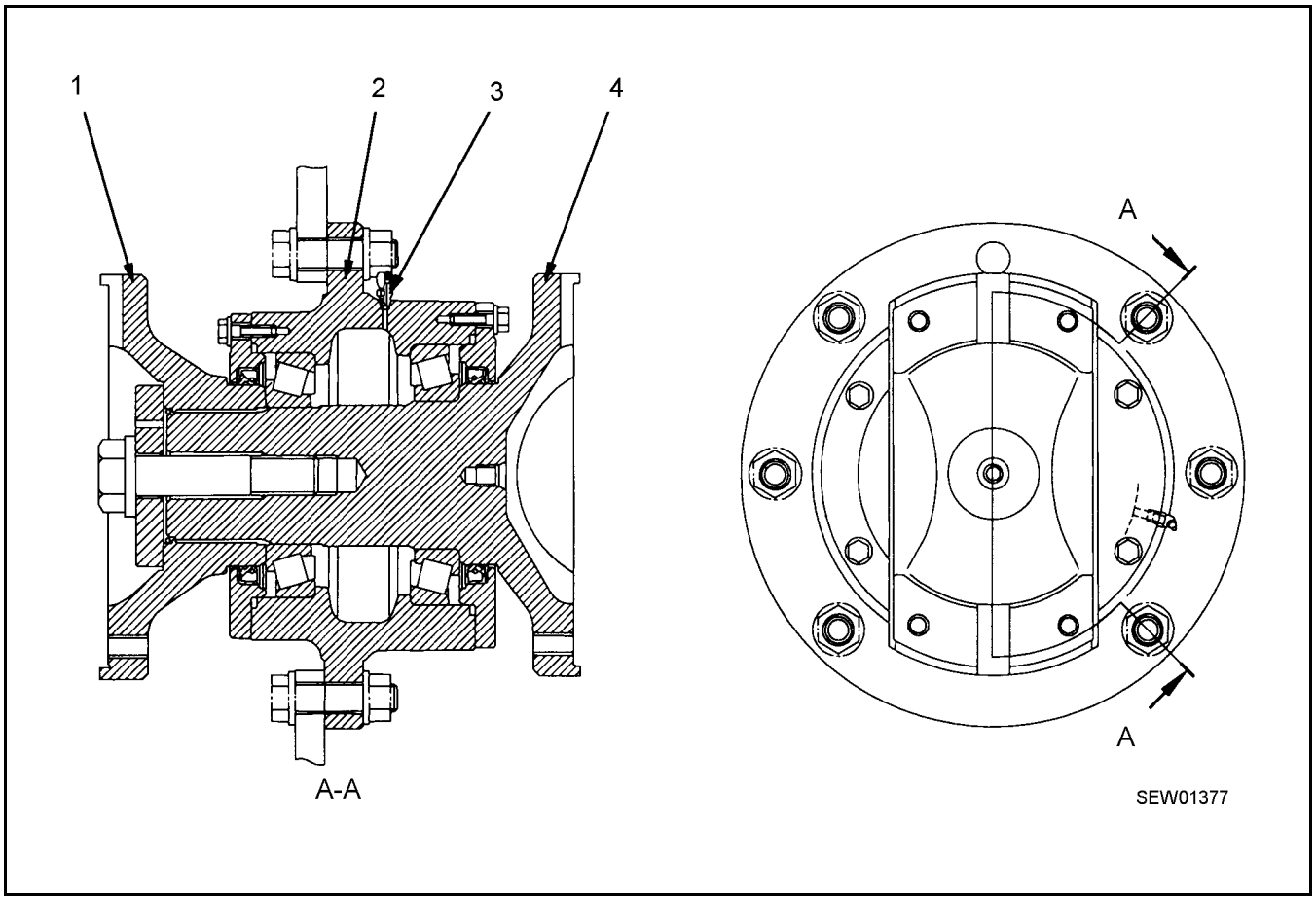
- The oil from the pump flows to port **A** of priority valve (1) and port **B** of pilot reducing valve (2).



- The oil entering port **A** flows from orifice **a** of priority valve (1) to port **D**. The hydraulic pressure and force of poppet spring (3) push back spring (4) and move priority valve (1) to the left. When this happens, port **A** and port **C** are connected, and the oil flows from port **C** to the modulating valve (5).
  - ★ Specified pressure: 20 kg/cm^2 (284 psi)



CENTER SUPPORT

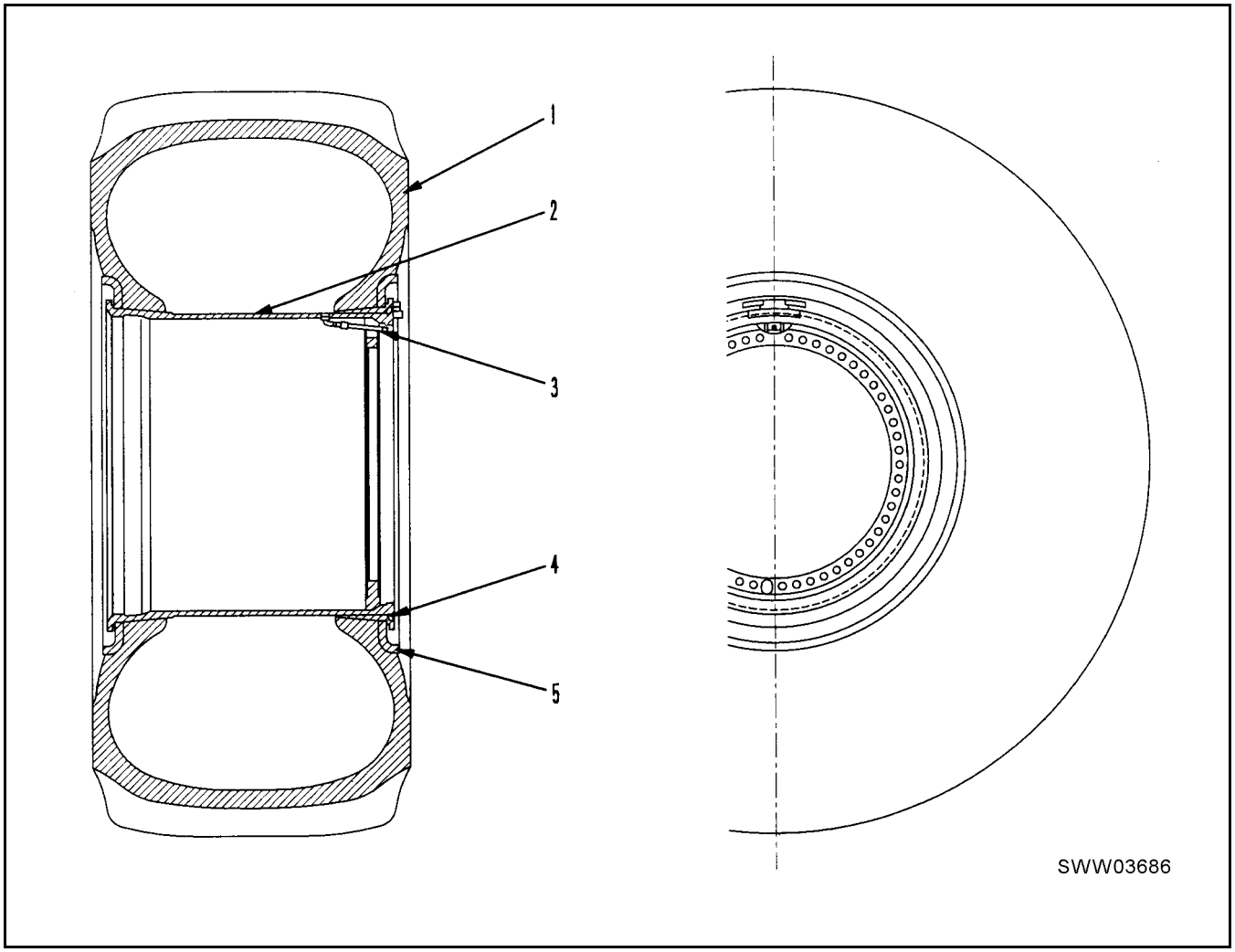


1. Front coupling
2. Case
3. Grease nipple
4. Rear coupling

FUNCTION

- The center support is installed to the front frame between the center drive shaft and the front drive shaft.
- With the articulating frame, this part is constantly twisting from side to side, so there is liable to be large stress on the drive shaft. Therefore, the center support is used to transmit the power smoothly, to reduce the stress on the drive shafts, and in this way improve the durability of the drive shafts.

TIRE AND WHEEL



1. Tire
2. Rim
3. Valve
4. Lock ring
5. Side ring

OUTLINE

The tires absorb shock that the machine receives from the road surface. At the same time, they transmit drive force by rotating in contact with the ground.

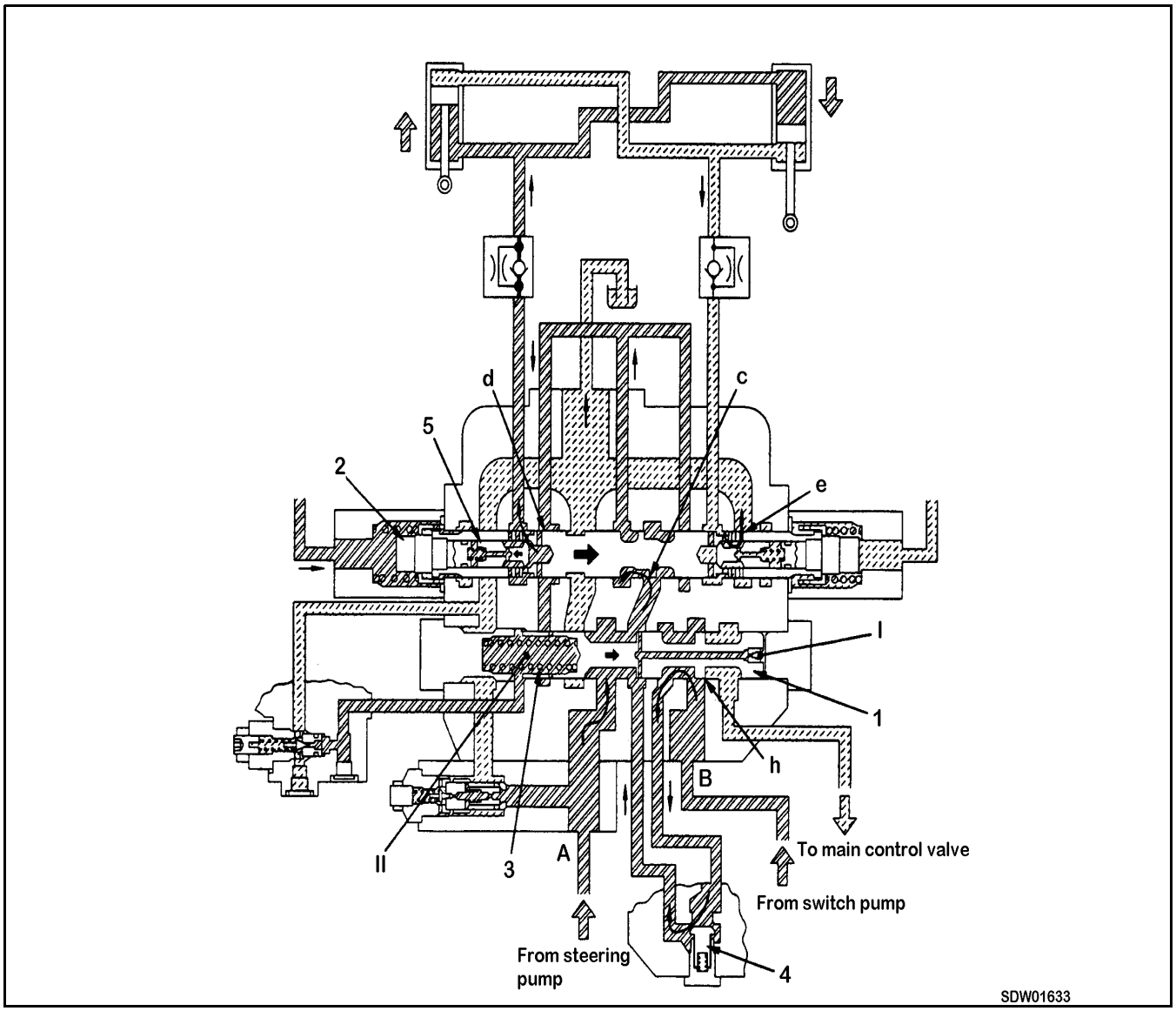
Various types of tires are available to suit the customers' needs, so it is important to select the correct tire to match the type of work and the bucket capacity.

Specifications

Tire type:	45/65-45-58PR
TRA code:	L5
Nominal wheel:	36.00 x 45WTB
Normal inflation pressure:	667 kPa (6.8 kg/cm^2)

WHEN STEERING SPOOL IS OPERATED

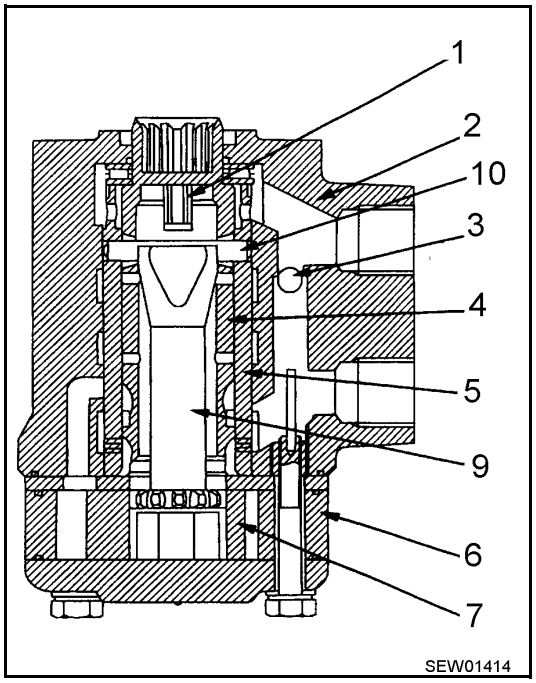
Engine running at low speed



- When the steering is operated, oil flows from the Orbit-Roll to steering spool (2) and pushes steering spool (2) to the right. The circuit between pressure receiving chamber (II) and the drain circuit is shut off, and at the same time, notch **c** opens.
- As a result, the pressure in pressure receiving chamber (II) rises, and demand spool (1) moves to the right until notch **h** closes.
- The passage from port **B** to the main control valve is shut off, so the oil from the switch pump pushes up pump merge-divider check valve (4) and merges with the oil from the steering pump at port **A**.
- The merged oil passes through notches **c** and **d**, pushes load check valve (5), and flows to the cylinder. The return oil from the cylinder passes through notch **e** and flows to the drain circuit.
- When this happens, the pressure before passing through notch **c** is sent to pressure receiving chamber (I) and the pressure after passing through notch **c** is sent to pressure receiving chamber (II). Demand spool (1) is actuated so that the difference in pressure on both sides of notch **c** is kept constant. Therefore, an oil flow corresponding to the opening of notch **c** is supplied to the cylinder port. These pressure differences (control pressure) are set by spring (3).

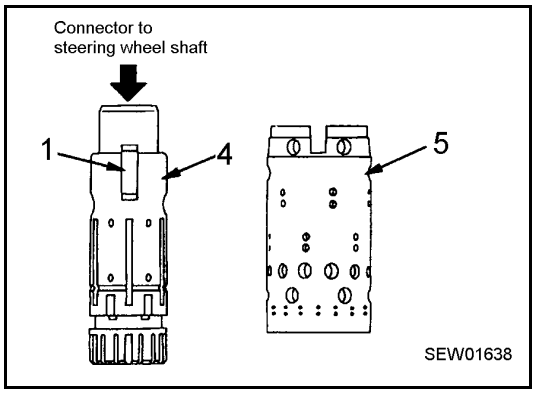
OUTLINE

- The steering unit is directly connected to the shaft of the steering wheel. The oil from the PPC pump passes through the steering demand valve, and is switched to the left and right steering cylinders to determine the direction of travel of the machine.
- The steering unit can be divided into the following: spool (4) and sleeve (5), which have a rotor type direction selection function, and the gear set (combination of gear (7) and gear rim (6)), which acts as a hydraulic motor when the steering is operated.



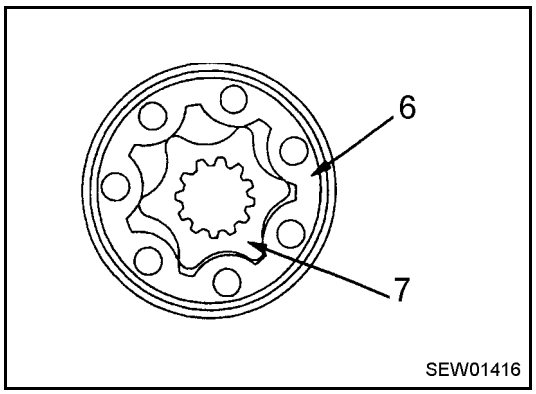
STRUCTURE

- Spool (4) is interconnected with the drive shaft of the steering wheel and is connected to sleeve (5) by neutral position spring (1) and center pin (10) (when the steering wheel is at neutral, it does not contact the spool).

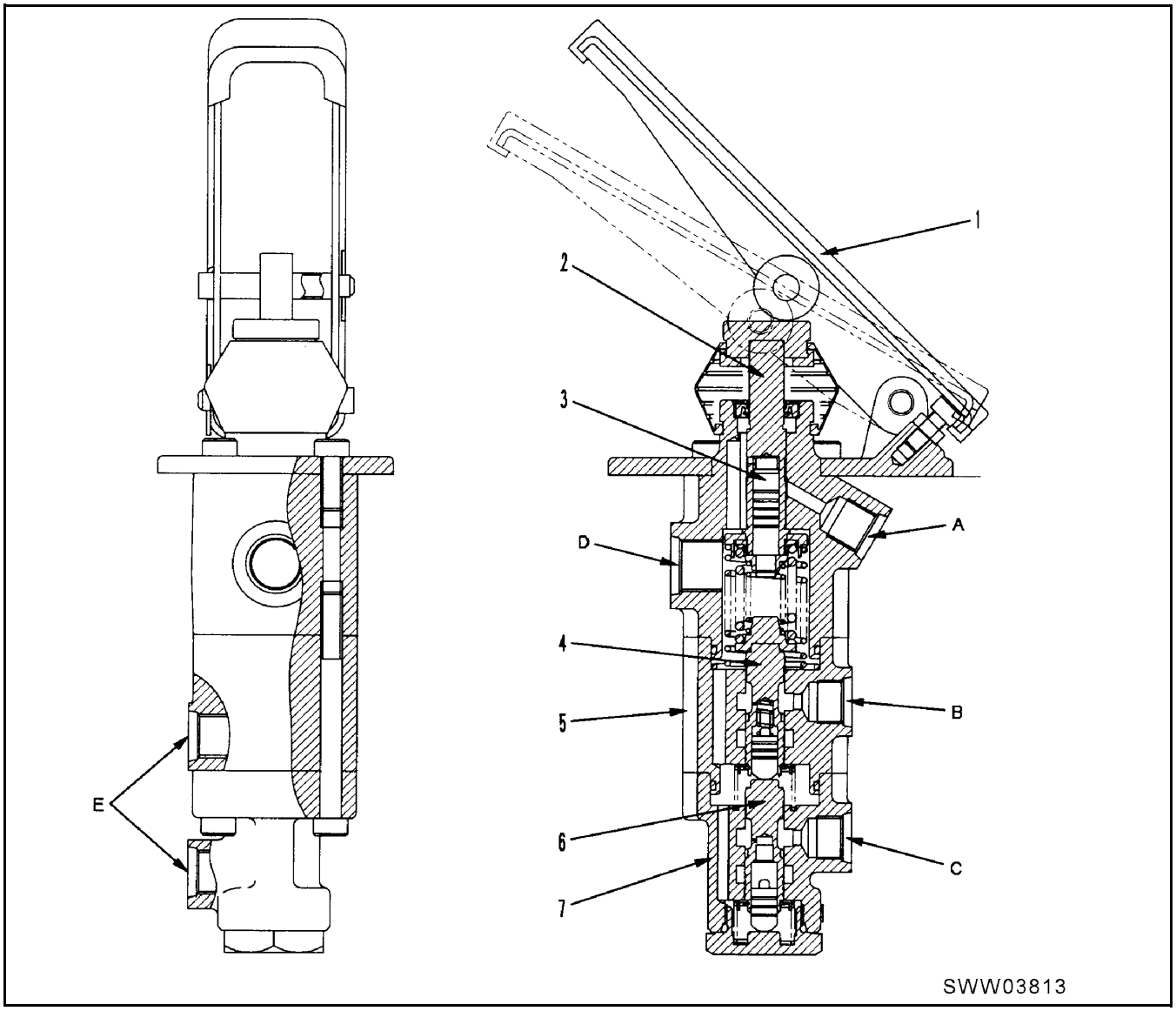


- The top of drive shaft (9) is meshed with center pin (1) and forms one unit with sleeve (5). The bottom is meshed with the spline of gear (7) of the gear set.
- Valve body (2) has four ports. These are connected, respectively, to the pump circuit, tank circuit, and pilot circuit of the steering demand valve.

  In addition, the port at the pump end and the port at the tank end are connected by check valve (3) inside the housing. If there is any failure in the PPC pump, oil is sucked in directly from the tank end by the check valve.



BRAKE VALVE



1. Brake pedal
2. Rod
3. Pilot piston
4. Spool
5. Upper cylinder
6. Spool
7. Lower cylinder

A. Pilot port
B. To brake (left)
C. To brake (right)
D. Drain
E. From brake pump

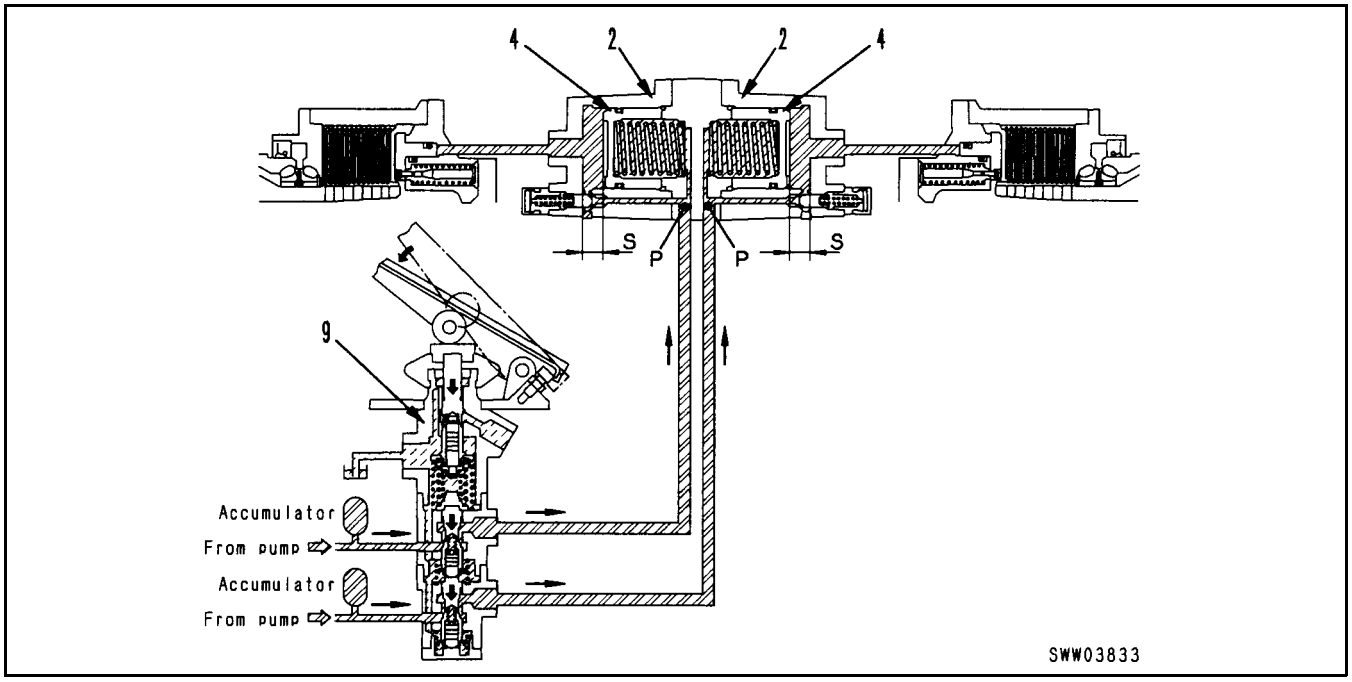
OUTLINE

- There are two brake valves installed in parallel under the front of the operator's compartment. They are actuated when the pedal is depressed.
- When the right brake pedal is depressed, oil is sent to the brake cylinder to actuate the brake. In addition, pilot oil is sent to the left brake valve and the brake is actuated in the same way as when the left brake pedal is depressed.
- In addition, when the left brake pedal is depressed, the transmission cut-off switch ON acts to actuate the transmission solenoid valve electrically and shift the transmission to neutral.

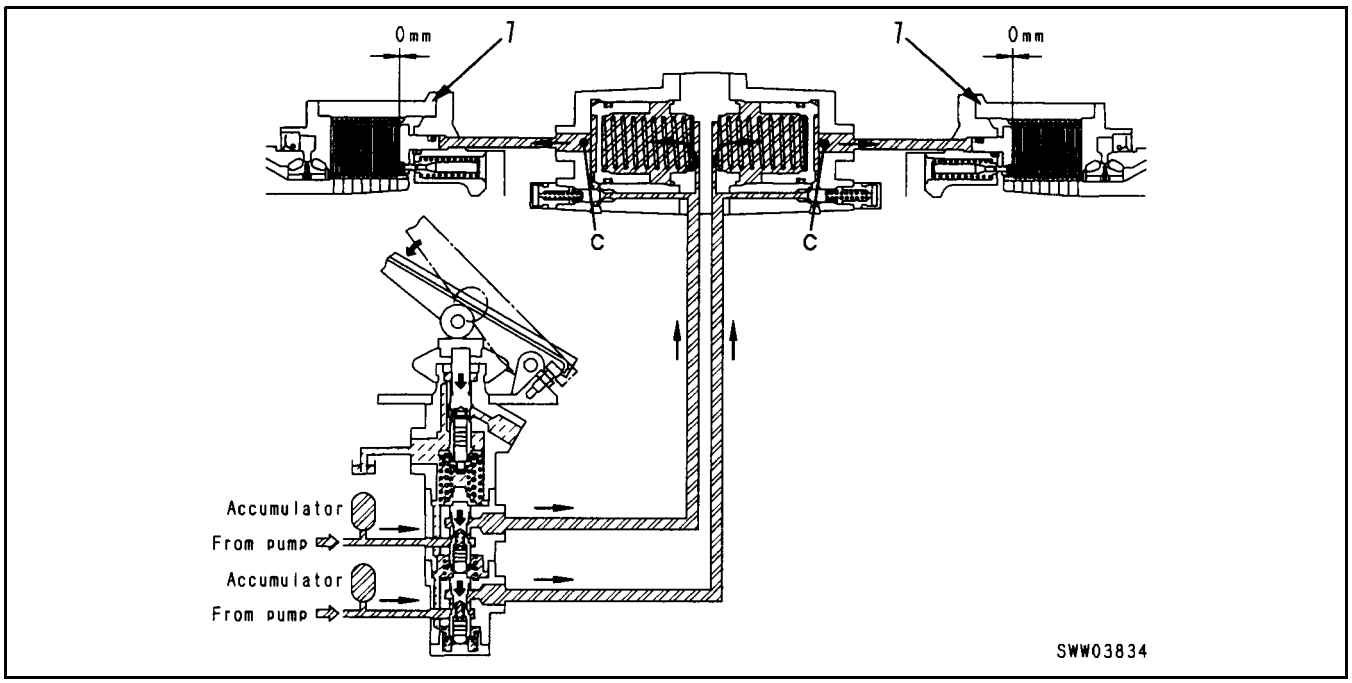
OPERATION

1. Brake pedal depressed

The oil pumped out from brake chambers (9) flows in from port **P** of the slack adjuster. From port **P** the oil is divided and sent to left and right cylinders (2) and moves piston (4) a distance of stroke **S** to the right or left.



Because of this, an amount of oil corresponding to stroke **S** flows from port **C** to brake cylinder (7). When this happens, the clearance between the brake piston and disc becomes zero, so no braking force is generated.

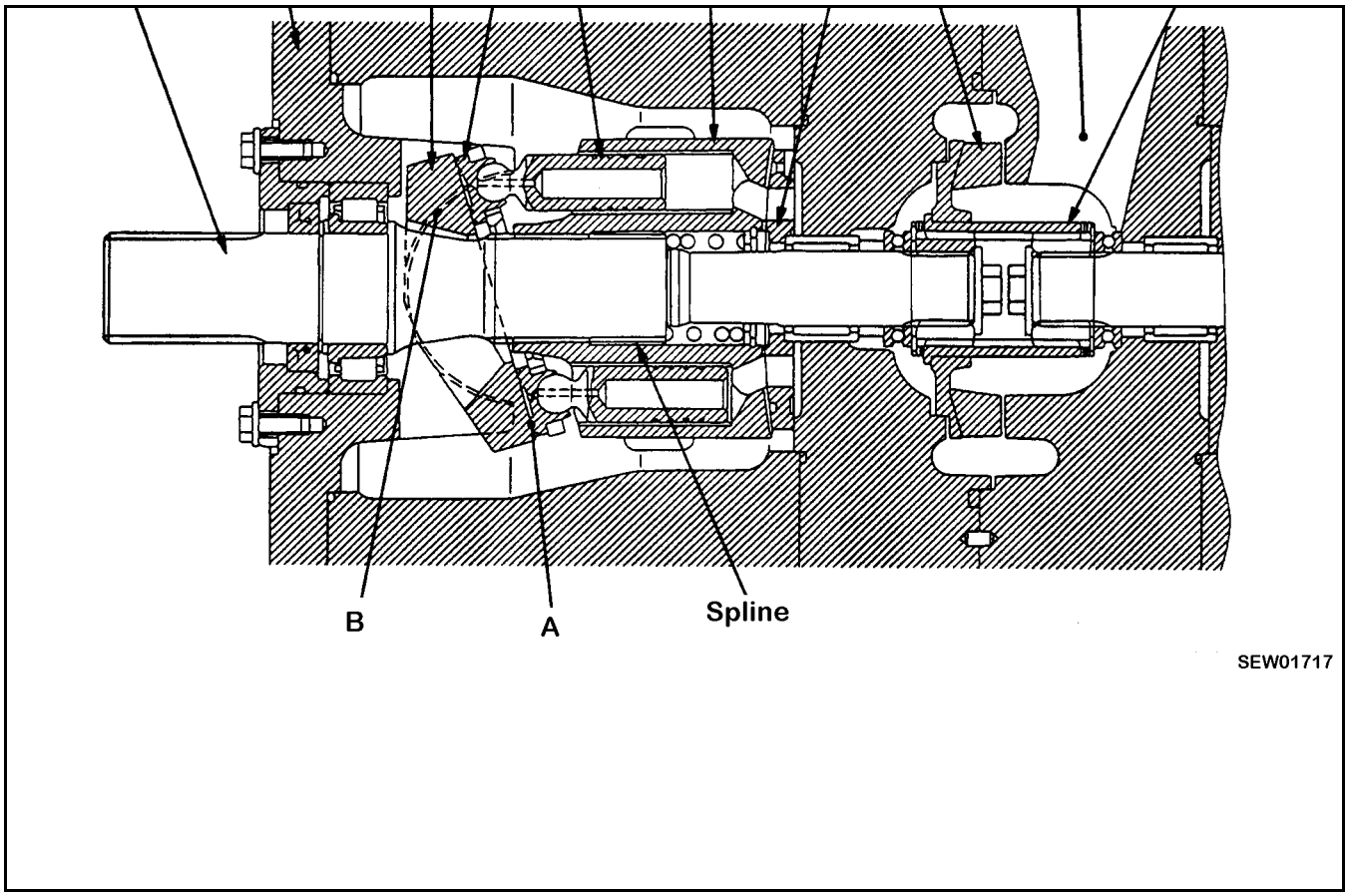


- The work equipment system consists of the hydraulic circuit and steering circuit. The hydraulic circuit controls the operation of the bucket and attachment.
- The oil from hydraulic tank is sent from main pump (4), steering pump, and switch pump (7) through the steering valve to two main control valves (10). If the dump and lift spools of the main control valve are both in neutral, the oil passes through the drain circuit of the main control valve, is filtered by the filter inside the hydraulic tank, and returns to the tank.
- The dump or lift spool in PPC valve is activated by operating the work equipment control lever, causing each spool in the work equipment valve to be hydraulically activated. Thereby, the oil is allowed to flow from the work equipment valve to lift cylinder (9) or dump cylinder (1), thus operating the lift arm or the bucket.
- The maximum pressure of the hydraulic circuit is regulated by the relief valve inside the main control valve. There are two safety valves (with suction valve) and an unloader valve in the dump cylinder circuit to protect the circuit.
- Even when engine is at rest, the lift arm can be lowered to the ground because accumulator (3) is provided in the circuit.
- Hydraulic tank is a pressurized, sealed type and has a breather with a relief valve. This acts to pressurize the tank and at the same time prevents negative pressure. This protects the pump from cavitation.
- In the hydraulic tank there is pressurizing valve installed to pressurize the hydraulic tank with air pressure. It is used to carry out air bleeding of the pump when changing the oil inside the tank or when assembling after removing the piping of the piston pump and pump.

FUNCTION

- The engine rotation and torque transmitted to the pump shaft is converted into hydraulic energy, and pressurized oil is discharged according to the load.
- It is possible to change the delivery amount by changing the swash plate angle.

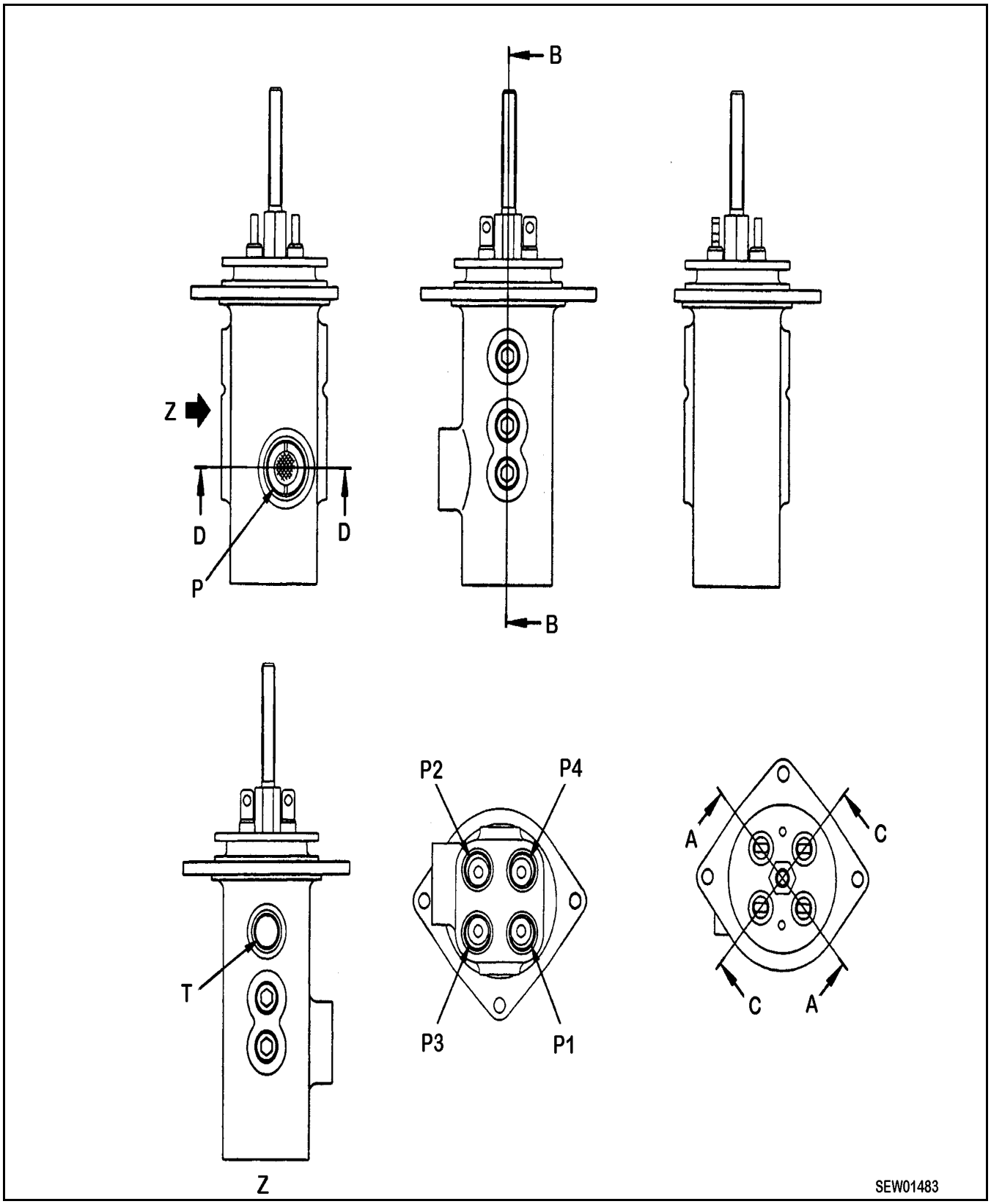
STRUCTURE



- Cylinder block (7) is supported to shaft (1) by a spline, and shaft (1) is supported by the front and rear bearings.
- The tip of piston (6) is spherical, and shoe (5) is caulked to it to form one unit. Piston (6) and shoe (5) form a spherical bearing.
- Rocker cam (4) has plane surface **A**, and shoe (5) is always pressed against this surface while sliding in a circular movement. Rocker cam (4) brings high pressure oil at cylindrical surface **B** with cradle (2), which is secured to the case, and forms a static pressure bearing when it slides.
- Piston (6) carries out relative movement in the axial direction inside each cylinder chamber of cylinder block (7).
- Cylinder block (7) seals the pressure oil to valve plate (8) and carries out relative rotation. This surface is designed so that the oil pressure balance is maintained at a suitable level. The oil inside each cylinder chamber of cylinder block (7) is sucked in and discharged through valve plate (8).
- Impeller (9) is connected to shaft (1) through the spline boss (10) and rotates together with the shaft. The oil sucked in through the suction port is sent to the cylinder chamber by centrifugal force to make suction easier.

PPC VALVE

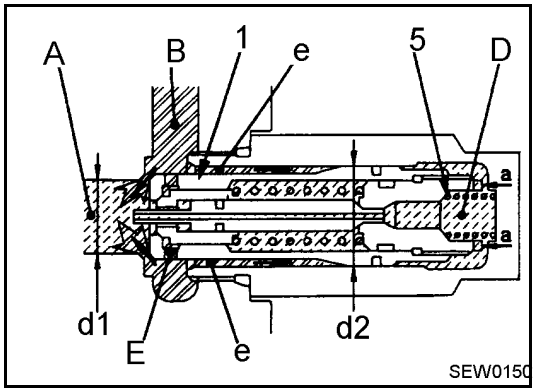
(Proportional Pressure Valve)



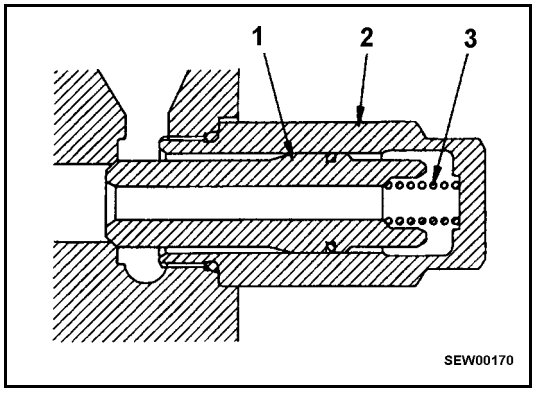
AS A SUCTION VALVE

- If negative pressure is generated in port **A**, port **D** also has negative pressure, because port **D** and **A** are connected with each other. The tank pressure in port **B** is applied to port **E**. Hydraulic pressure **a** equivalent to the area difference between $\mathbf{d_2}$ and $\mathbf{d_1}$ is applied to the safety valve because of the tank pressure in port **E**.

  Therefore, hydraulic pressure **e** acts to open the valve and hydraulic pressure **a** acts close suction valve (1).
- If the pressure **a** acts to close suction valve (1). If the pressure in port **A** drops, (approaching negative pressure) hydraulic pressure **a** becomes smaller than oil pressure **e**.
- When oil pressure **e** becomes larger than oil pressure **a** + valve spring (5) force, suction valve (1) opens, causing the oil to flow from port **B** into port **A**. This prevents negative pressure from building up in port **A**.



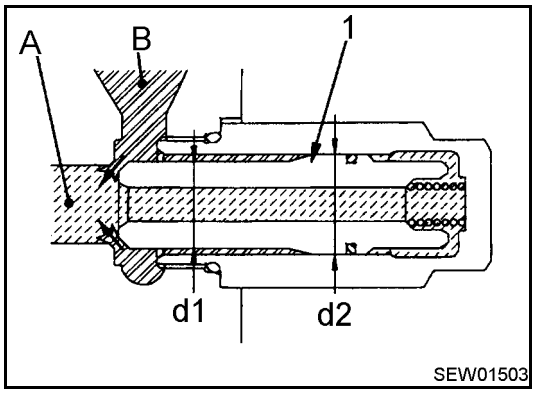
SUCTION VALVE



1. Main poppet
2. Sleeve
3. Spring

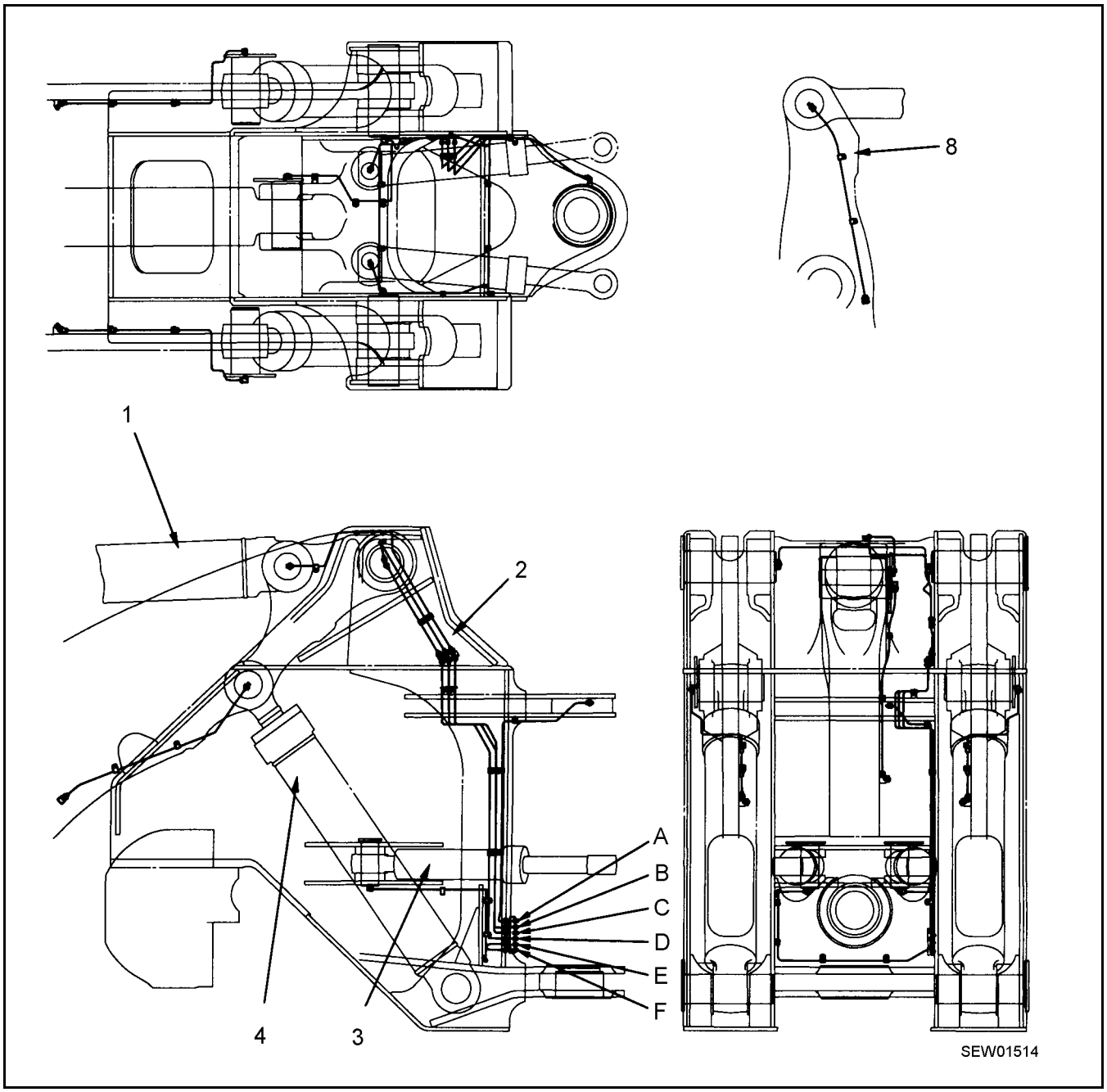
OPERATION

- If negative pressure is generated in port **A** (lift cylinder rod end) (if the pressure is lower than in port **B** in the tank circuit), main poppet (1) opens because oil then flows from port **B** at the tank end to port **A** at the cylinder port end.



WORK EQUIPMENT

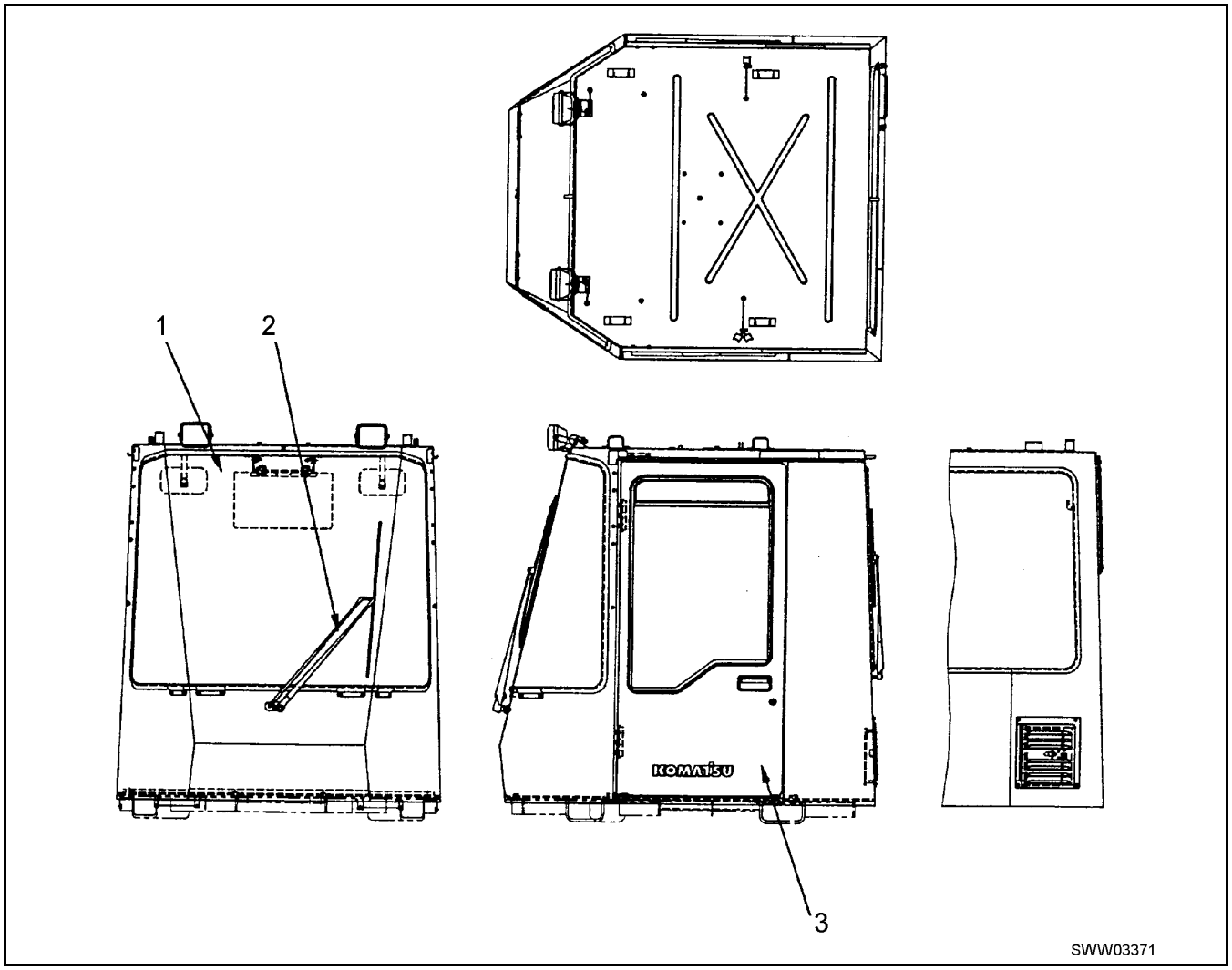
LUBRICATION



1. Dump cylinder
2. Front frame
3. Steering cylinder
4. Lift cylinder
5. Transmission
6. Torque converter
7. Damper
8. Bellcrank

A. Upper hinge pin
B. Dump cylinder bottom pin
C. Lift arm pin (left)
D. Lift arm pin (right)
E. Steering cylinder pin (left)
F. Steering cylinder pin (right)

CAB

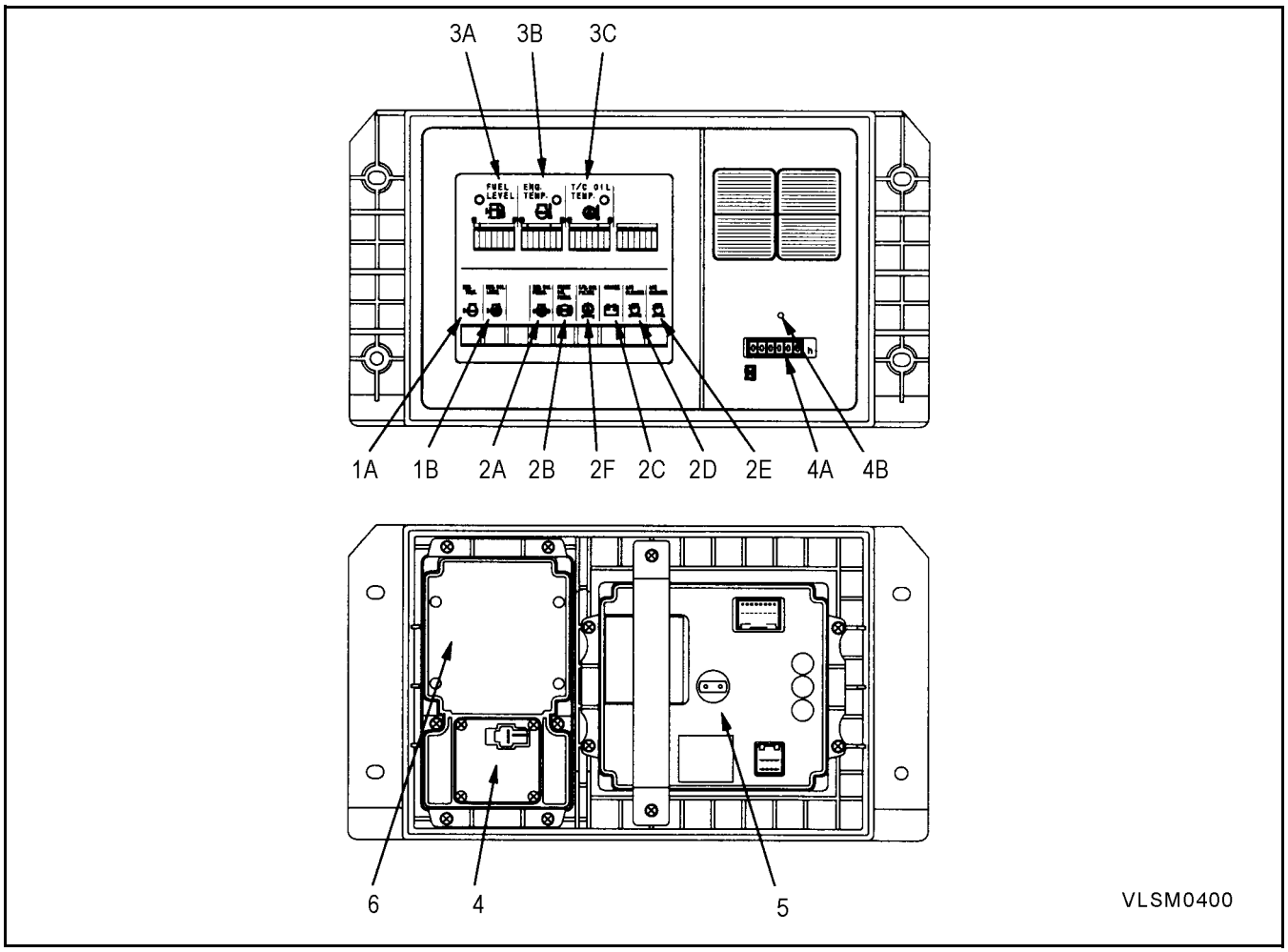


1. Front glass
2. Front wiper
3. Door

MEMORANDA

MEMORANDA

MAINTENANCE MONITOR

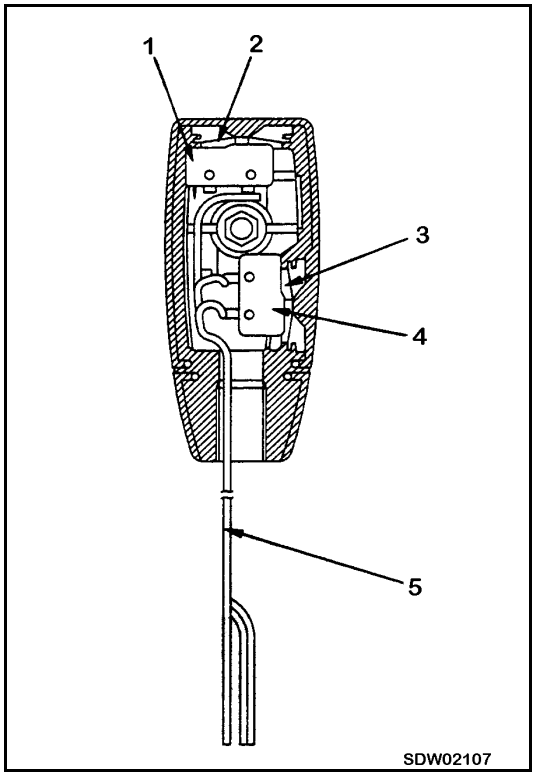


1. Check items (checks before starting)
1A. Engine water level
1B. Engine oil level
2. Caution items (warning items)
2A. Engine oil pressure
2B. Brake oil pressure
2C. Battery charge
2D. Air cleaner (L.H.)
2E. Air cleaner (R.H.)
2F. Transmission oil filter
3. Gauge items
3A. Fuel level
3B. Engine water temperature
3C. Torque converter oil temperature
4. Service meter
4A. Service meter numeric display
4B. Service meter RUN pilot lamp
5. Monitor module
6. Switch module housing

OUTLINE

- The maintenance monitor has a display function for the caution items and gauges.
- The maintenance monitor consists of the monitor module, switch module, service meter, case and other mechanisms.
- The monitor module has a built-in CPU (Central Processing Unit). It processes the signal from the sensors, and carries out the display and output.
- A liquid crystal display and LEDs are used for the display portions.

KICK-DOWN, HOLD SWITCH



1. Kick-down switch
2. Spring
3. Spring
4. Holds switch
5. Wiring harness

KICK-DOWN OPERATION

- The kick-down (shift down from 2nd to 1st) operates only when the transmission is in FORWARD 2.
- When traveling in FORWARD 2, it is possible to shift down to 1st without operating the speed control lever by pushing the kick-down switch at the top of the lift lever.
- After this, even if the kick-down switch is pressed, the transmission remains in FORWARD 1.

The kick-down is canceled (or will not operate) under the following conditions.

- When the directional lever is at **N**
- When the directional lever is at **R**
- When the speed control lever is at any position other than 2
- When the starting switch is at OFF

HOLD SWITCH OPERATION

- The hold switch is installed to the boom lever, and when the hold switch is pressed, the speed range displayed on the main monitor transmission indicator is held (when equipped with auto shift).
- Press the hold switch again to cancel (when equipped with auto shift).

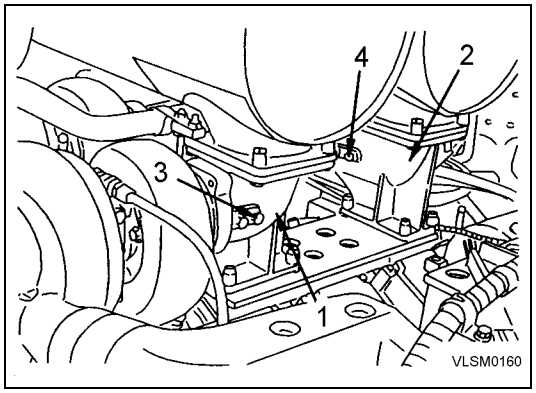
MEMORANDA

System	Name of component		Connector no.	Inspection method	Judgement table If condition is as shown in the table below, then it is normal	Measurement conditions
Transmission and Joystick steering controller	Controller	Engine speed	C4	Measure voltage	Measure in AC range Between (2), (9) - chassis: Min. 0.5 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Start engine
	Engine speed		-	Adjust	1) Screw in until the tip of sensor contacts gear, then turn back 1 turn. 2) It works normally by adjustment above.	-
	Speed		BC01 (male)	Measure resistance	Between (1) - (2): 500-1000 Ω Between (1), (2) - chassis: Min. 1 MΩ	1) Turn starter switch OFF. 2) Disconnect connectors 3) Connect T-adapter
	Speed		-	Adjust	1) Screw in until the tip of sensor contacts gear, then turn back 3/4-1 turn. 2) Sensor should work normally when adjusted as above.	-
	Controller	Speed control lever (1st)	C3B	Measure voltage	Between (7) - chassis: Speed control lever at 1st: 20 - 30 V Speed control lever not at 1st: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON
		Speed control lever (2nd)		Measure voltage	Between (15) - chassis: Speed control lever at 2nd: 20 - 30 V Speed control lever not at 2nd: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON
		Speed control lever (3rd)		Measure voltage	Between (8) - chassis: Speed control lever at 3rd: 20 - 30 V Speed control lever not at 3rd: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON
		Directional lever (F)		Measure voltage	Between (5) - chassis: Direction lever at F: 20 - 30 V Directional not at F: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON
		Directional lever (R)		Measure voltage	Between (6) - chassis: Direction lever at R: 20 - 30 V Directional not at R: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON
		Directional lever (N)		Measure voltage	Between (13) - chassis: Direction lever at N: 20 - 30 V Directional not at N: Max.1 V	1) Turn starter switch OFF. 2) Insert T-adapter 3) Turn starter switch ON

TOOLS FOR TESTING, ADJUSTING AND TROUBLESHOOTING

Check or measurement item	Symbol		Part No.	Part Name	Remarks
Engine Speed Engine electronic control system	A		Commercially available	Laptop or Desk top computer	IBM PC or 100%compatible 486DX 66 Mhz or higher 16MB RAM memory 3.5" 1.44 MB Floppy drive 120 MB Hard drive or larger SVGA 800 x 600 Color display One serial/One parallel ports 14.4 bhps Data/fax modem MS-DOS 6.2 or later MS Windows 3.1 or later
			3824801	Insite for Quantum software	Available from Komatsu America International Co. **ONLY** if certified through service training program.
Water, oil, exhaust temperatures	B		799-101-1502	Digital temperature gauge	-99.9 to +1,299°C
Oil pressure	C	1	799-101-5002	Hydraulic tester	Pressure gauge: 2.5,5.9,39.2,58.8 MPa (25, 60, 400, 600 kg/cm²)
			790-261-1203	Digital hydraulic tester	Pressure gauge: 68.6 MPa (700 kg/cm²)
		2	•799-101-5160	• Nipple	PT 1/8
		3	799-401-2320	Hydraulic gauge	1.0 MPa (10 kg/cm²)
Compression pressure	D	1	795-502-1590	Compression gauge	0 - 6.9 MPa (0 - 70 kg/cm²) Kit part No.: 795-502-1205
		2	795-502-1500	Adapter	
Blow-by pressure	E	1	799-201-1504	Blow-by checker	-
		2	799-201-1590	Gauge	0 - 9.8 kPa (0 - 1,000 mmH20)
Valve clearance	F		Commercially available	Feeler gauge	-
Exhaust color	G	1	799-201-9000	Handy smoke checker	Discoloration 0 - 70% (with standard color) (Discoloration x1/10 = Bosch index)
		2	Commercially available	Smoke meter	
Air supply pressure (boost pressure)	H		799-201-2201	Pressure gauge	-101.3 - 199.9 kPa (-760 - 1500 mmHg)
Brake oil pressure	J	1	793-605-1001	Brake tester kit	-
		2	790-101-1430	Coupler	-
		3	790-101-1102	Pump	-
Operating effort	K		79A-264-0020	Push-pull scale	0-294.2 N (0 - 30 kg)
			79A-264-0090		0 - 490.3 N (0 - 50 kg)
Operating angle of pedal	L		Commercially available	Angle gauge	-
Stroke, hydraulic drift	M		Commercially available	Scale	-
Work equipment speed	N		Commercially available	Stop watch	-
Measuring brake disc wear	P		Commercially available	Caliper gauge	-

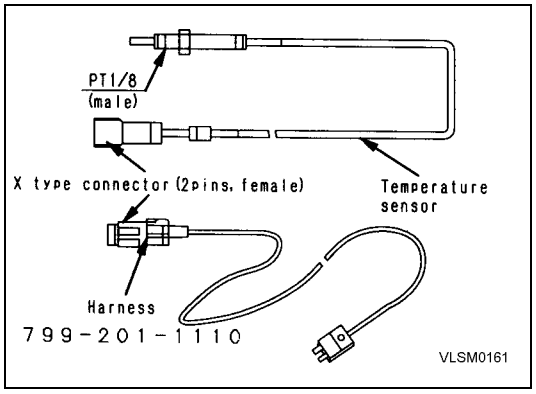
MEASURING EXHAUST TEMPERATURE



WARNING! The temperature sensor must be installed to the exhaust system, so if the machine has been operated, wait for the manifold temperature to drop before installing the sensor.

★ Raise water temperature to operating range.

1. Remove measuring plugs (3) and (4) (PT 1/8) from right bank connector (1) and left bank connector (2) between the turbocharger and exhaust muffler.
   ★ The right bank and left bank have two plugs respectively. Remove either one from each side.



2. Install temperature sensors of digital temperature gauge **B** to both banks of engine.
   - Temperature sensor
     : 6215-11-8180 (Cable length 610 mm)
     or
     : 6215-11-8170 (Cable length 490 mm)

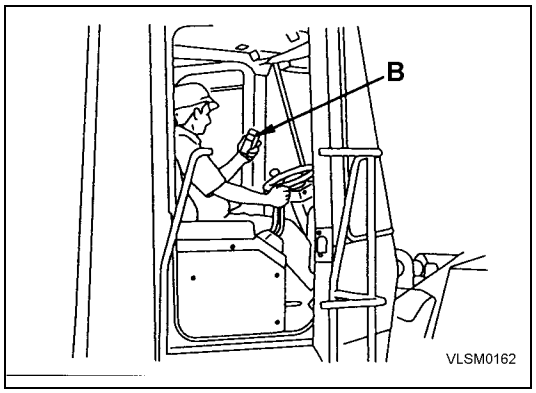
3. Connect to digital temperature gauge **B** with the wiring harness (799-201-1110).

MEASUREMENT PROCEDURE

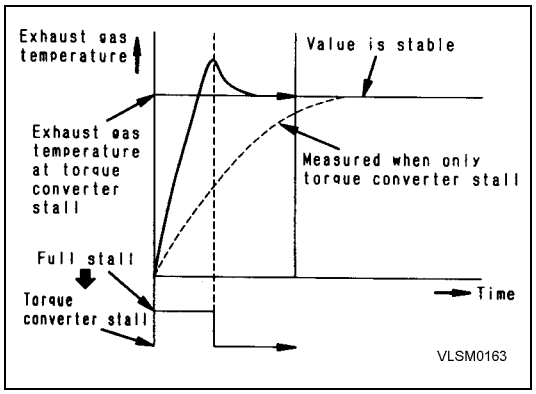
1. When measuring the maximum value during troubleshooting: Carry out actual work and measure the maximum value during operation.
   ★ Use the PEAK mode (it can store the maximum value in memory) of the temperature gauge function.

Note: The exhaust temperature varies greatly according to the ambient temperature (temperature of the engine intake air), so if any abnormal value is obtained, carry out temperature compensation.

★ Compensation = Measured value + 2 x (standard ambient temperature - actual ambient temperature)
   ★ The standard ambient temperature is taken as 20°C. ambient temperature is taken as 20°C.



2. When measuring periodically (during preventive maintenance etc.)
   A. Raise the exhaust temperature to approximately 700°C by using full stall (torque converter stall and hydraulic pump relief).
   B. In the above condition, cancel the hydraulic relief, and carry out only torque converter stall.
   C. Note the stable temperature.
      ★ If only torque converter stall is used when measuring the exhaust temperature, torque converter will overheat before a stable value is obtained.



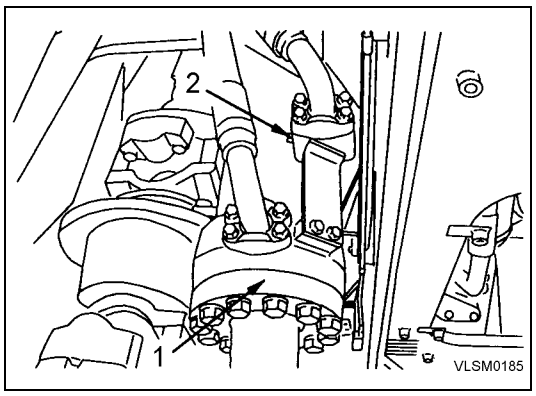
STEERING OIL PRESSURE

MEASURING

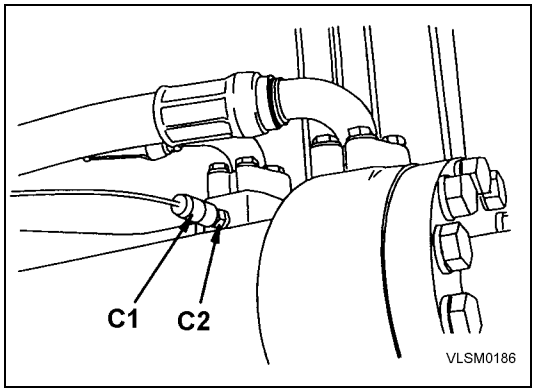
- Hydraulic oil temperature: 45 - 55°C

WARNING! Install the safety bar to lock front frame and rear frame.

WARNING! Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then operate the steering wheel 2 - 3 times to release the remaining pressure in the hydraulic piping.



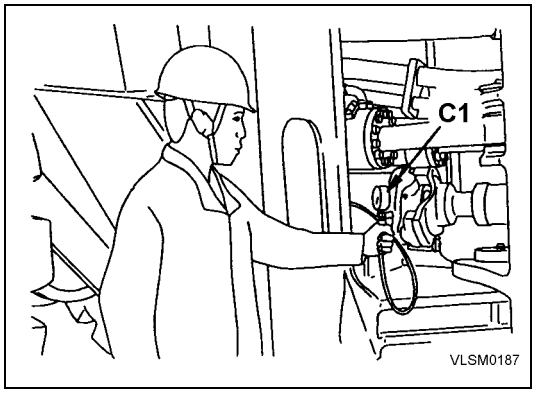
1. Remove hydraulic oil pressure measurement plug (2) (PT 1/8) from right-hand steering cylinder (1).
2. Install nipple **C2**, then install oil pressure measurement gauge **C1** (39.2 Mpa (400 kg/cm²))
3. Start the engine and run it at the full speed. Turn the steering wheel to the left and measure the hydraulic pressure when the relief valve actuates.
   - ★ When removing the oil pressure measurement plug from left-hand steering cylinder, turn the steering wheel to the right and measure the oil pressure.



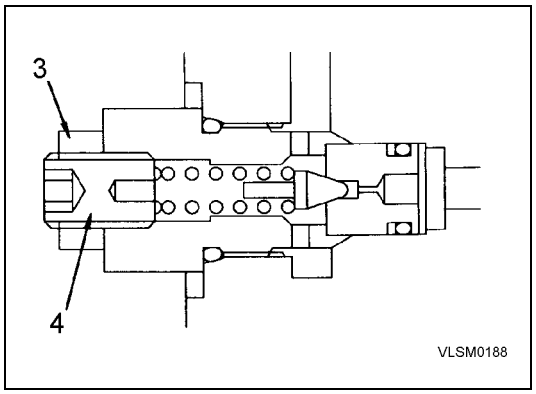
ADJUSTING

WARNING! If the relief pressure is not normal, adjust the steering relief valve according to the following procedure

WARNING! Adjust the steering relief valve when the engine is stopped.



1. Loosen lock nut (3), then turn adjustment screw (4) to adjust.
   - ★ Amount of adjustment for 1 turn of adjustment screw. 1 turn: approximately 17.8 MPa (181 kg/cm²)
   - ★ Adjust the set pressure as follows: To INCREASE pressure, TIGHTEN screw. To DECREASE pressure, LOOSEN screw.
   - ★ If it is impossible to measure relief pressure accurately, do not try to adjust the pressure.



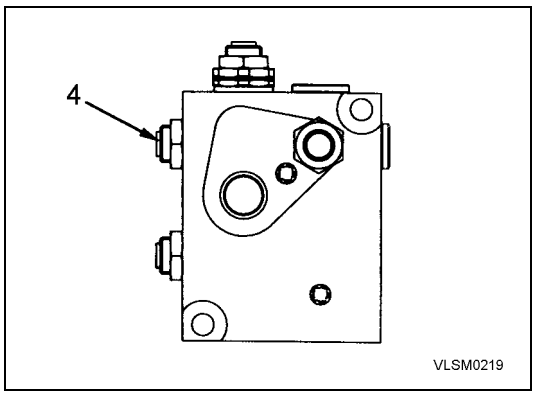
ADJUSTING

Accumulator charge cut-out pressure

★ When the accumulator charge cut-out pressure is adjusted, the cut-in pressure also changes in proportion to the ratio of the valve area. For this reason, there is no adjustment screw for the cut-in pressure.

1. Loosen locknut (5) of cut-out valve (4) and adjust cut-out pressure with the adjustment screw (6) as follows.

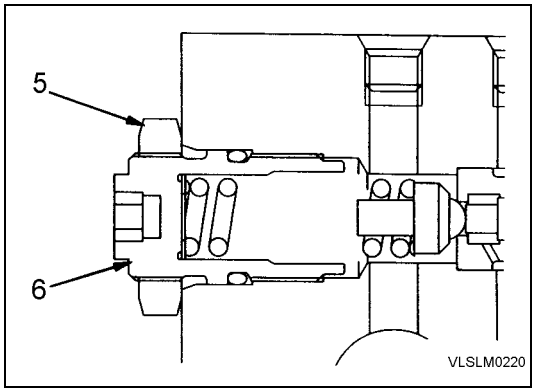
★ Adjustment screw
- TO INCREASE cut-out pressure, turn CLOCKWISE
- To DECREASE cut-out pressure, turn COUNTERCLOCKWISE



★ Pressure adjustment for one turn of adjustment screw: 5.59 MPa (57kg/cm²)

N·m Locknut: 9.8 - 11.8 Nm (1.0 - 1.2 kgm)

★ After adjustment, check again the cut-in and cut-out pressure according to the procedure mentioned in the previous page.



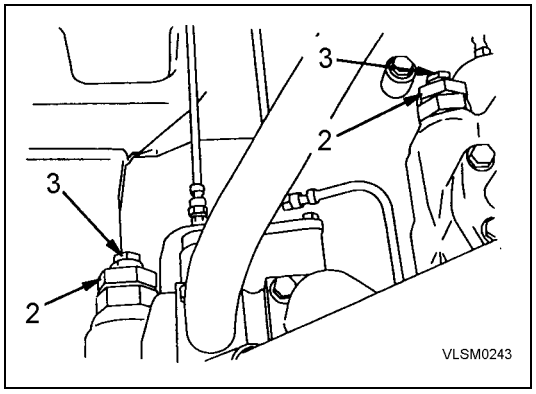
ADJUSTING

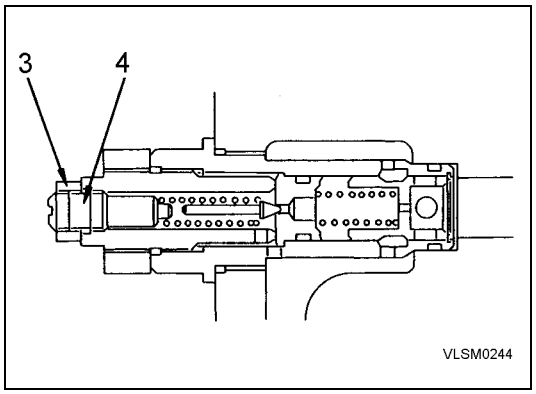
Adjusting work equipment relief valve

WARNING! Adjust the hydraulic pressure while the engine is stopped.

Loosen locknut (3) of work equipment relief valve (2), then turn adjustment screw (4) to adjust.

- ★ Turn the adjustment screw to adjust as follows.
  - TO INCREASE the pressure, turn CLOCKWISE.
  - TO DECREASE the pressure, turn COUNTERCLOCKWISE.
- ★ Amount of adjustment for one turn of adjustment screw: 12.6 MPa (128 kg/cm²)
- ★ After completion of the adjustment, repeat the above procedure to measure the work equipment relief pressure again.





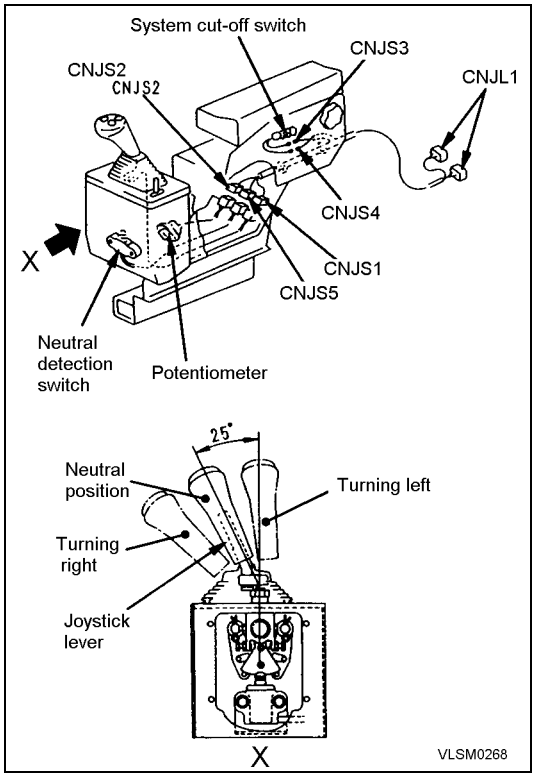
ADJUSTING JOYSTICK LEVER POTENTIOMETER

PREPARATORY WORK

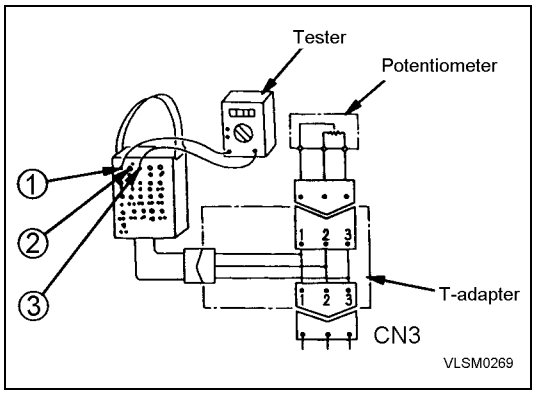
Loosen the potentiometer mounting screws, remove potentiometer connector CNJS2, then connect a T-adapter (X type 3-pin)

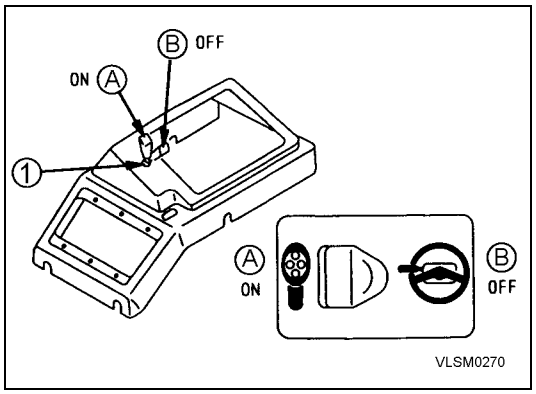
★ Turn the starter switch OFF before doing this.

1. Adjusting neutral position
   A. Set the joystick selector switch to the OFF position and set the joystick lever to the N position.
   B. Turn the starter switch ON.
   ★ Turn only to the ON position. Do not start the engine.



   C. Check the voltage between pins (2) and (3) of the T-adapter.
   • Voltage between pins: DC 5V ± 0.05V Adjust the voltage by turning the potentiometer slowly so that the voltage between pins (1) and (3) of the T-adapter become the standard value.
   • Voltage between pins: DC 2.5V ± 0.1V (set value)
   ★ After adjusting the voltage, tighten the potentiometer screws.





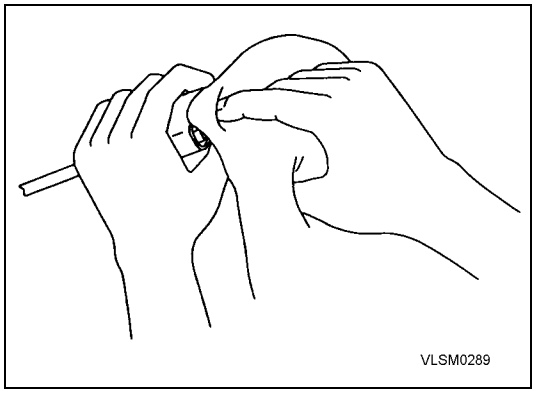
C. Drying wiring harness

★ If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness.

★ If water gets directly on the connector, do as follows.

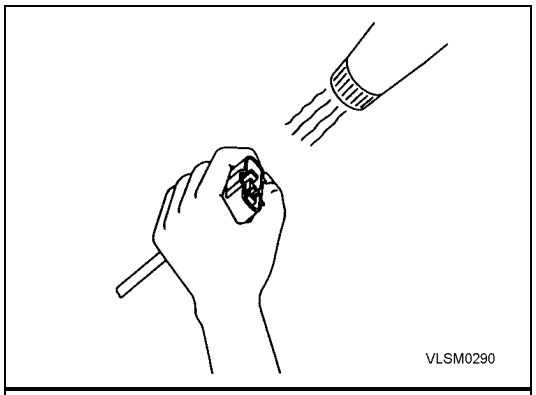
i. Disconnect the connector and wipe off the water with a dry cloth.

★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air before blowing with air.



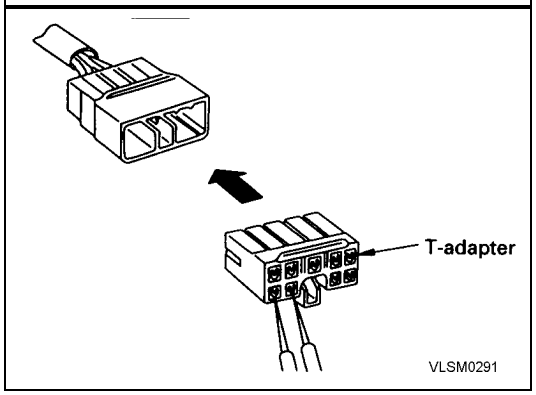
ii. Dry the inside of the connector with a dryer.

★ If water gets inside the connector, use a dryer to dry it. Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.

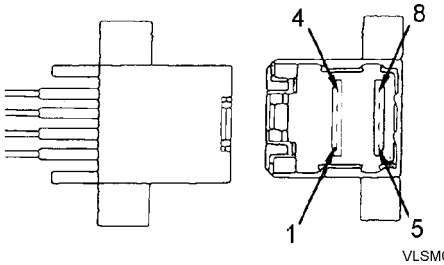
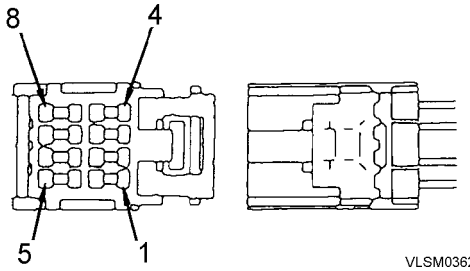
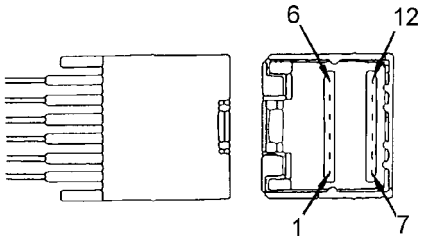
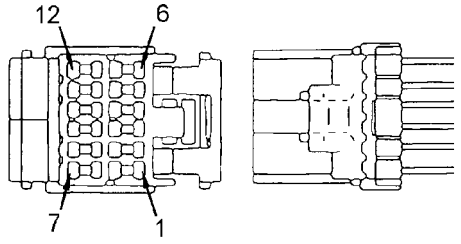
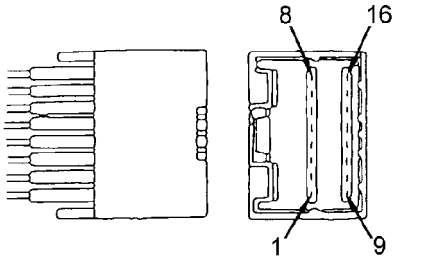
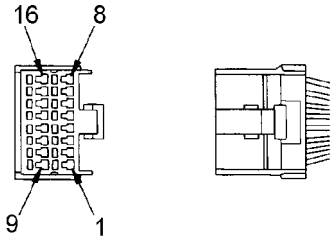
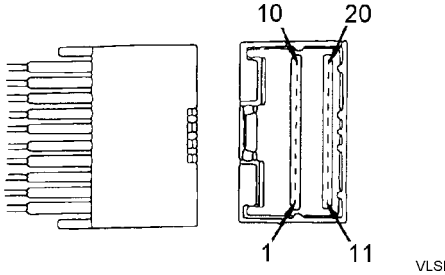
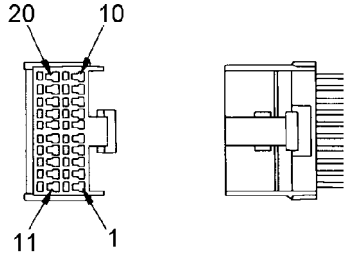


iii. Carry out a continuity test on the connector. After drying leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.

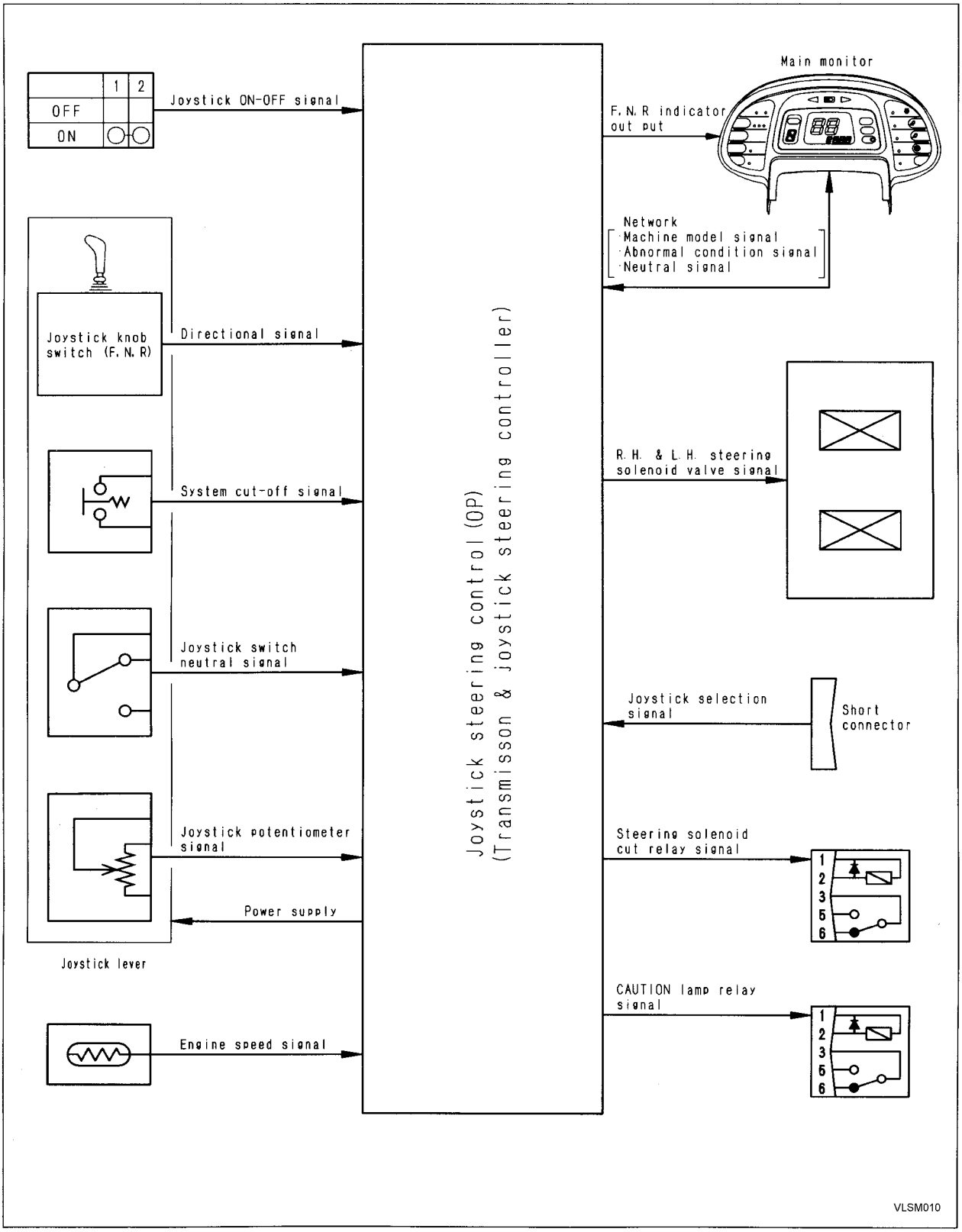
★ After completely drying the connector, blow it with contact restorer and reassemble.



MEMORANDA

No.of pins	AMP040 type connector	
	Male (female housing)	Female (male housing)
8	 VLSM0361	 VLSM0362
12	 VLSM0363	 VLSM0364
16	 VLSM0365	 VLSM0366
20	 VLSM0367	 VLSM0368

JOYSTICK STEERING CONTROL SYSTEM



3) Operate the machine and check the troubleshooting items other than those in 1).

Operate the machine and check the items in the same way as in 1) and if the symptom appears, mark that item. (In the chart on the right, the symptom appears again for item 5).

4) Find the appropriate cause from the cause column. In the same way as in Step 2), if the symptom appears, the O marks on that line indicate the possible causes. (For item No.5 in the table on the right, the possible causes are **b** or **e**.)

5) Narrow down the possible causes.

There is one common cause among the causes located in Steps 2) and 4). (One cause marked O, appears on the line for both items.) This cause is common to both the symptoms in troubleshooting Steps 1) and 3).

★ The causes which are not common to both troubleshooting items (items which are not marked O for both symptoms) are unlikely causes, so ignore them. (In the example given on the right, the causes for Troubleshooting Item 2 are **c** or **e,** and the causes for Troubleshooting Item 5 are **b** or **e,** so cause **e** is common to both.)

6) Repeat the operations in Steps 3), 4) and 5) until one cause (one common cause) remains.

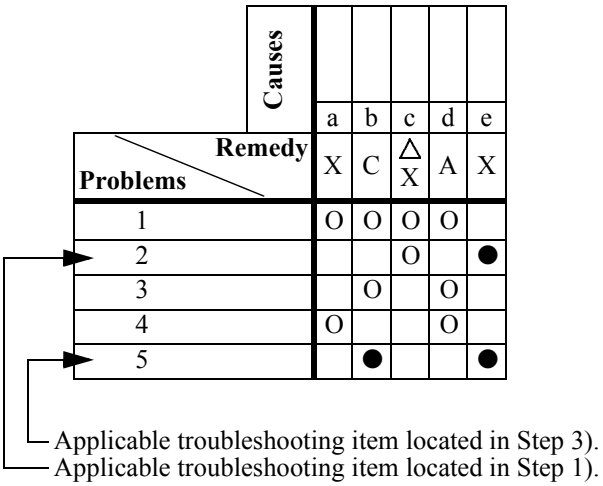
★ If the causes cannot be narrowed down to one cause, narrow the causes down as far as possible.

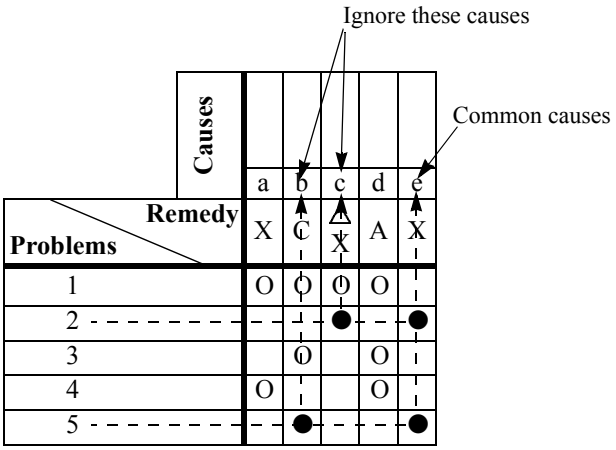
7) Remedy

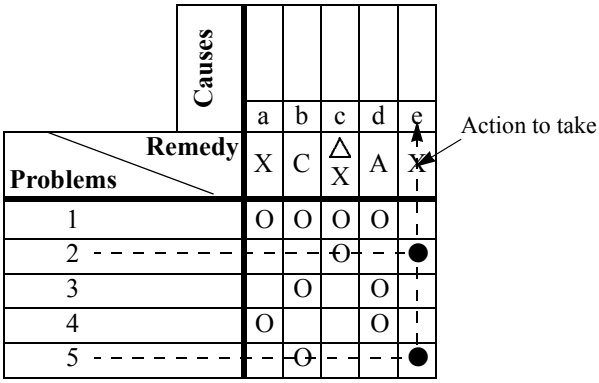
If the causes are narrowed down to one common cause, take the action given in the remedy column.

The symbols given in the remedy column indicate the following:

X: Replace
△: Repair
A: Adjust
C: Clean







S-3

Engine does not pick up smoothly (Follow-up is poor)

General causes why engine doe not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used

Legend
O: Possible causes (judging from questions and check items)
◎: Most probable causes (judging from questions and check items)
△: Possible causes due to length of use (used for a long period)
●: Items to confirm the cause

			Causes										
			Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Worn piston ring cylinder	Seized turbocharger, interference	Improper valve clearance	Clogged, fuel tank air breather hole	Clogged, leaking fuel piping	Defective contact of valve, valve seat
Questions	Confirm recent repair history												
	Degree of use	Operated for long period	△	△	△			△				△	
	Replacement of filters has not been carried out according to operation manual		◎	◎	◎								
	Non-specified fuel has been used			◎	◎	◎	◎						
	Engine oil must be added more frequently							◎					
	Rust and water are found when fuel is drained			◎	◎								
	Dust indicator caution lights up		◎										
	Noise of interference is heard from around turbocharger								◎				
Check items	Engine pick-up suddenly became poor					O			◎		O	O	
	Color of gas	Blue under light load						◎					
		Black	◎			◎			◎				O
	Engine pick-up is deferent between left and right banks												
	Clanging sound is heard from around cylinder head									◎			
	Mud is stuck to fuel cap										◎		
	There is leakage from fuel piping											◎	
	High idle speed is normal, but speed suddenly drops when load is applied			◎	◎						O		
	There is hunting from engine (rotation is irregular)			O	◎	O					O		
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	O						
	Blow-by gas is excessive						◎						
Troubleshooting	When air element is inspected, it is found to be clogged		●										
	When fuel filter, stainer are inspected, they are found to be clogged			●									
	When feed pump strainer is inspected, it is found to be clogged				●								
	Stop fuel injection to one cylinder at a time, if there is no change in engine speed, that cylinder is not working					●							
	When control rack is pushed, it is found to be heavy, or does not return						●						●
	When compression pressure is measured it is found to be low							●				●	
	When turbocharger is rotated by hand, it is found to be heavy								●				
	When valve clearance is checked, it is found to be outside standard value									●			
	When fuel cap is inspected, it is found to be clogged										●		
	When feed pump is operated, operation is too light or too heavy												
		Remedy	Clean	Clean	Clean	Repair	Replace	Replace	Replace	Adjust	Clean	Repair	Replace

S-13

Oil level rises

★ If there is oil in the coolant water, carry out troubleshooting for "Oil is in coolant water".

General causes why oil level rises

- Water in oil (cloudy white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of oil from other components

Legend
O: Possible causes (judging from questions and check items)
◎: Most probable causes (judging from questions and check items)
△: Possible causes due to length of use (used for a long period)
●: Items to confirm the cause

			Causes											
			Broken oil l cooler core, O-ring	Defective nozzle holder sleeve	Broken head, head gasket	Clogged water pump breather hole, defective seal	Worn, damaged rear seal surface	Defective seal of pump or auxiliary equipment	Leakage of fuel form nozzle holder	Defective part inside injection pump (flange type)	Defective thermostat seat	Damage liner O-ring, holes made by pitting	Cracks inside cylinder block
Questions	Confirm recent repair history												
	Degree of use	Operated for long period		△		△	△	△				△	
	There is oil in radiator coolant water		◎	O	O							O	O
Check items	Exhaust gas white			◎					O		O		
	When engine is first started, drops of water come from muffler			◎									
	Leave radiator cap open. When engine is idling, an abnormal number of bubbles appear, or water spurts back				◎							O	
	Water pump breather hole is clogged with mud					◎							
	When water pump breather hole is cleaned, water comes out					◎							
	Oil level goes down in clutch, TORQFLOW transmission, or damper chamber						◎						
	Oil level goes down in hydraulic tank							◎					
	Engine oil smells of diesel fuel								◎	◎	◎		
	Fuel is added more frequently								◎	◎	◎		
Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage		●										
	Pressure-tightness test of cylinder head shows there is leakage			●									
	When compression pressure is measured, it is found to be low				●								
	Remove water pump and inspect					●							
	Check rear seal						●						
	When pump auxiliary equipment is removed, seal is found to be broken							●					
	Remove head cover and inspect								●				
	Remove injection pump and inspect									●			
	There is improper contact of thermostat seat valve										●		
	Remove oil pan and inspect											●	●
	Remedy		Replace	Replace	Replace	Replace	Repair	Replace	Repair	Replace	Repair	Replace	Replace

Failure code	Abnormal system	Nature of abnormality
19	Abnormality in joy-stick directional switch	1) Defective joystick directional lever F, N, R switch 2) Disconnection between joystick directional lever connector JS1 (8) and chassis ground When the wire harness is in any of the following conditions with the switch not pressed 3) Defective contact or disconnection in wire harness between transmission & joystick controller C5 (female) (8) - JS1 (2) - joy stick lever connector (4) or short circuit with chassis ground in wire harness between C5 (female) (16) - JS1 (3) - joystick lever connector (3) 4) Defective contact or disconnection in wire harness between transmission & joystick controller C5 (female) (7) - JS1 (4) - joy stick lever connector (4) or short circuit with chassis ground in wire harness between C5 (female) (15) - JS1 (5) - joystick lever connector (5) 5) Defective contact or disconnection in wire harness between transmission & joystick controller C5 (female) (9) - JS1 (6) - joy stick lever connector (6) or short circuit with chassis ground in wire harness between C5 (female) (17) - JS1 (7) - joystick lever connector (7)
20	Abnormality in direc-tional switch signal system	1) Defective directional lever 2) Defective combination switch power source Short circuit with power source, short circuit with chassis ground, defective contact, disconnection in the following wire harness 3) Wire harness between transmission & joystick controller C3B (female) (5) and L04 (2) 4) Wire harness between transmission & joystick controller C3B (female) (13) and L04 (3) 5) Wire harness between transmission & joystick controller C3B (female) (6) and L04 (4) 6) Defective transmission & joystick controller
21	Abnormality in shift switch signal system	1) Defective directional lever 2) Defective combination switch power source Short circuit with power source, short circuit with chassis ground, defective contact, disconnection in the following wire harness 3) Wire harness between transmission & joystick controller C3B (female) (7) and L04 (5) 4) Wire harness between transmission & joystick controller C3B (female) (15) and L04 (6) 5) Wire harness between transmission & joystick controller C3B (female) (8) and L04 (7) 6) Defective transmission & joystick controller
22	Disconnection in speed sensor	1) Defective speed sensor 2) Defective adjustment of speed sensor mount 3) Defective contact or disconnection in wire harness between transmission & joystick controller C5 (female) (2) - CBL1 (6) - C01 (1) 4) Defective contact or disconnection in wire harness between transmission & joystick controller C5 (female) (10)- CBL1 (7) - C01 (2) 5) Defective transmission & joystick controller
23	Abnormality in engine speed sensor system	1) Defective engine speed sensor 2) Defective adjustment of engine speed sensor mount 3) Defective contact or disconnection in wire harness between transmission & joystick controller C4 (female) (2) - LR3 (14) - ER1 (10) - E03 (1) 4) Defective contact or disconnection in wire harness between transmission & joystick controller C4 (female) (9) - LR3 (15) - ER1 (17) - E03 (2) 5) Defective transmission & joystick controller

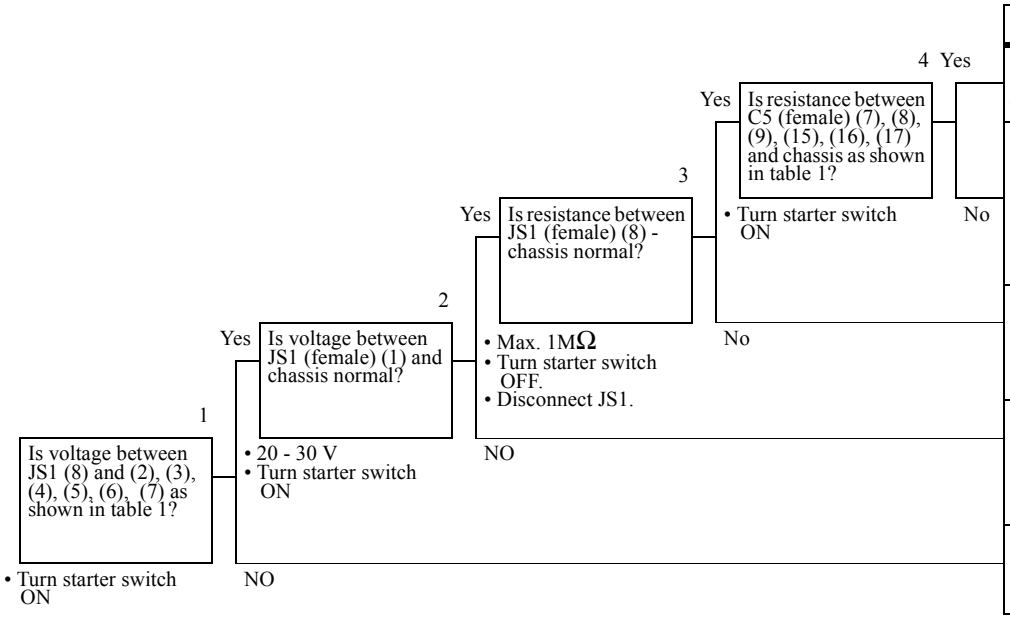
T-7

Failure code [19] (Short circuit, disconnection in joystick directional switch system) is displayed

★ This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the error code is no longer displayed on the monitor display, the problem has been removed.

★ Before carrying out troubleshooting, be sure that all the related connectors are properly inserted.

★ Always connect any disconnected connectors before going on to the next step.

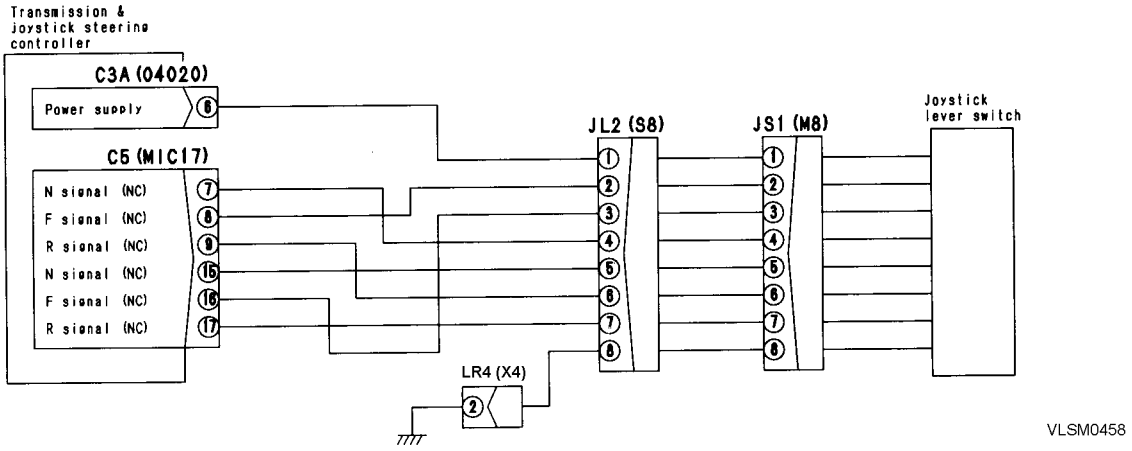


Cause	Remedy
Defective transmission & joystick steering controller	Replace
Short circuit, short circuit with chassis ground, defective contact, or disconnection in wire harness JS1 (female) (2), (3), (4), (5), (7) and C5 (female) (7), (8), (9), (15), (16), (17)	Repair or replace
Defective contact or disconnection in wire harness between JS1 (female) (8) and chassis	Repair or replace
Short circuit, short circuit with chassis ground, defective contact, or disconnection in wire harness C3A (male) (6) and chassis	Repair or replace
Defective joystick lever	Replace

Table 1 Voltage on each position of joystick lever

Terminal		Pushed switch		
		F	N	R
JS1 (male) (8) - (2)	Between C5 (8) and chassis	20 - 30 V	Max. 1 V	Max. 1 V
JS1 (male) (8) - (3)	Between C5 (16) and chassis	Max. 1 V	20 - 30 V	20 - 30 V
JS1 (male) (8) - (4)	Between C5 (7) and chassis	Max. 1 V	20 - 30 V	Max. 1 V
JS1 (male) (8) - (5)	Between C5 (15) and chassis	20 - 30 V	Max. 1 V	20 - 30 V
JS1 (male) (8) - (6)	Between C5 (9) and chassis	Max. 1 V	Max. 1 V	20 - 30 V
JS1 (male) (8) - (7)	Between C5 (17) and chassis	20 - 30 V	20 - 30 V	Max. 1 V

T-7 Related electrical circuit diagram



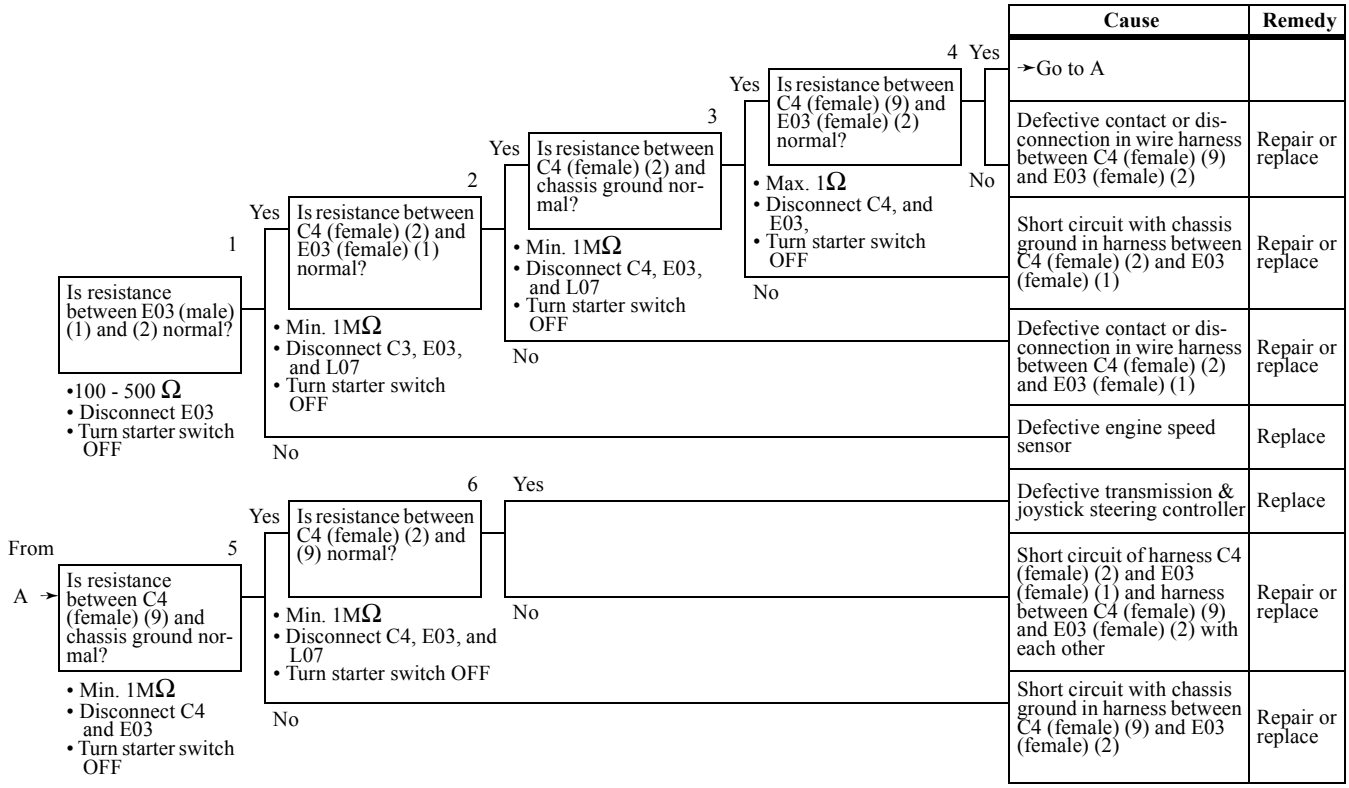
T-11

Failure code [23] (Short circuit, disconnection in engine speed sensor system) is displayed

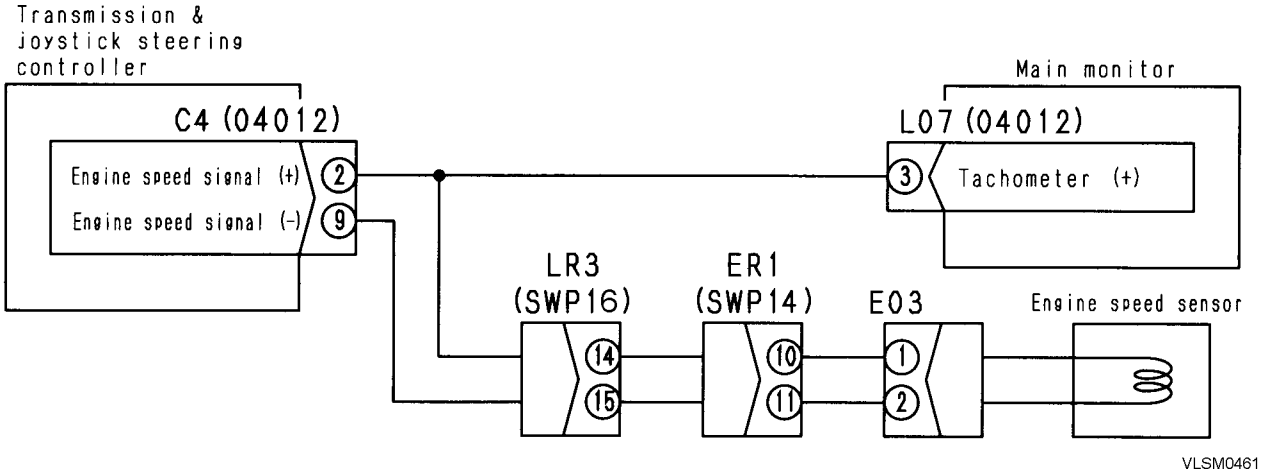
★ This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the error code is no longer displayed on the monitor display, the problem has been removed.

★ Before carrying out troubleshooting, be sure that all the related connectors are properly inserted.

★ Always connect any disconnected connectors before going on to the next step.



T-11 Related electrical circuit diagram

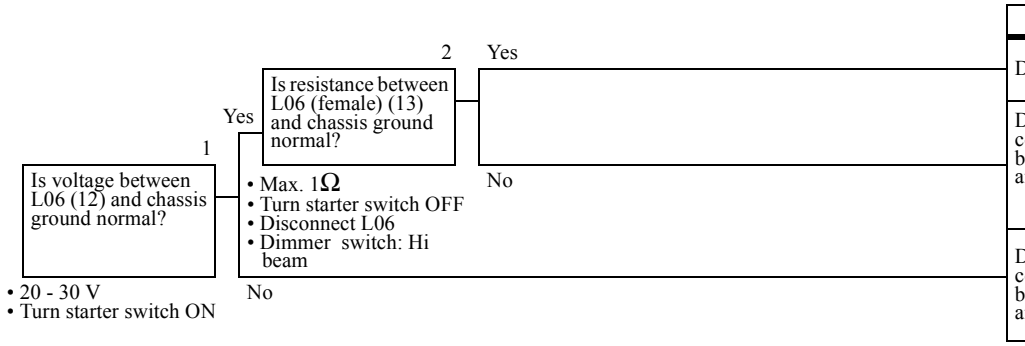


MEMORANDA

M-5

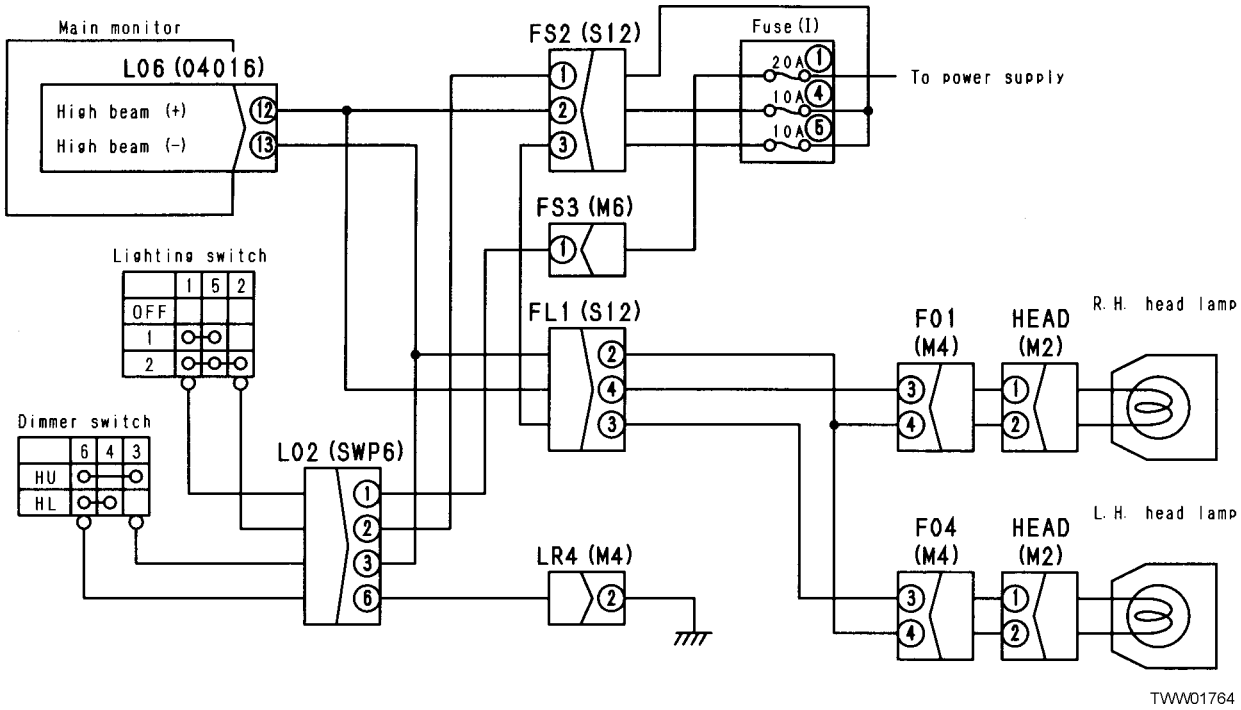
High beam display does not light up

★ Before carrying out troubleshooting, be sure that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ Before starting troubleshooting, check that the lamp bulb is not blown.



Cause	Remedy
Defective main monitor	Replace
Defective contact or disconnection in wire harness between L06 (female) (13) and L02 (female) (3)	Repair or replace
Defective contact or disconnection in wire harness between L06 (female) (12) and FS2 (female) (2)	Repair or replace

M-5 Related electrical circuit diagram



M-11

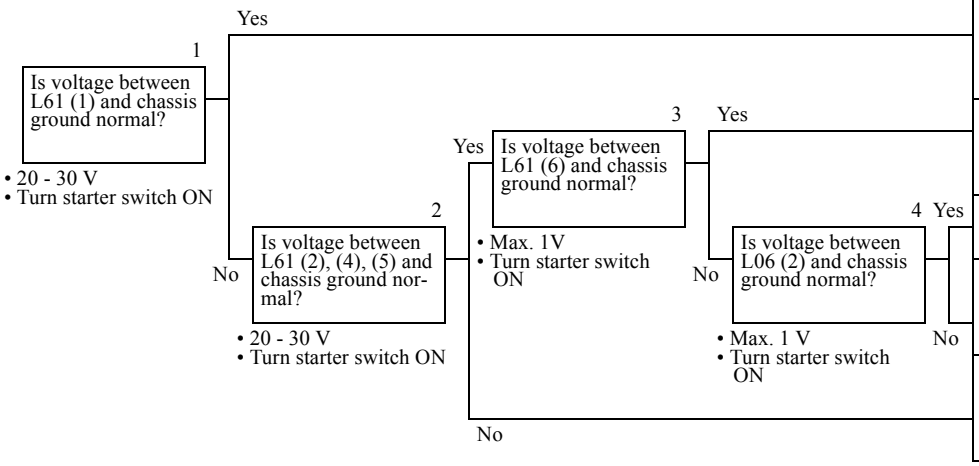
Abnormality in rear working lamp

★ Before carrying out troubleshooting, be sure that all the related connectors are properly inserted.

★ Always connect any disconnected connectors before going on to the next step.

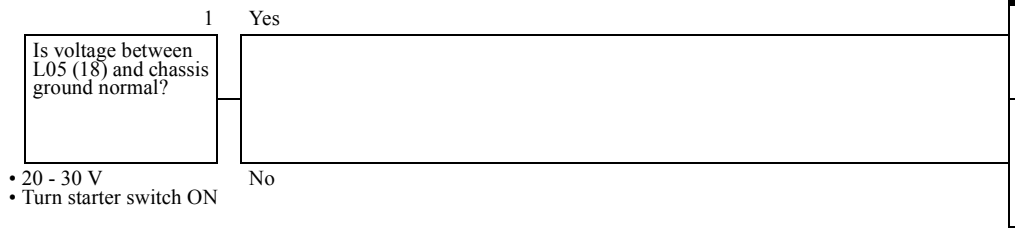
★ Before starting troubleshooting, check that the monitor lighting is lit up.

a) Neither monitor display nor rear working lamp light up



Cause	Remedy
Defective contact or disconnection in wire harness between L61 (female) (1) - L05 (female) (18), LR1 (female) (12)	Repair or replace
Defective front working lamp relay	Replace
Defective main monitor	Replace
Defective contact or disconnection in wire harness between L06 (female) (2) and L61 (female) (6)	Repair or replace
Defective contact or disconnection in wire harness between L61 (female) (2), (4), (5) and FS5 (female) (2)	Repair or replace

b) Rear working lamp lights up but monitor display does not light up

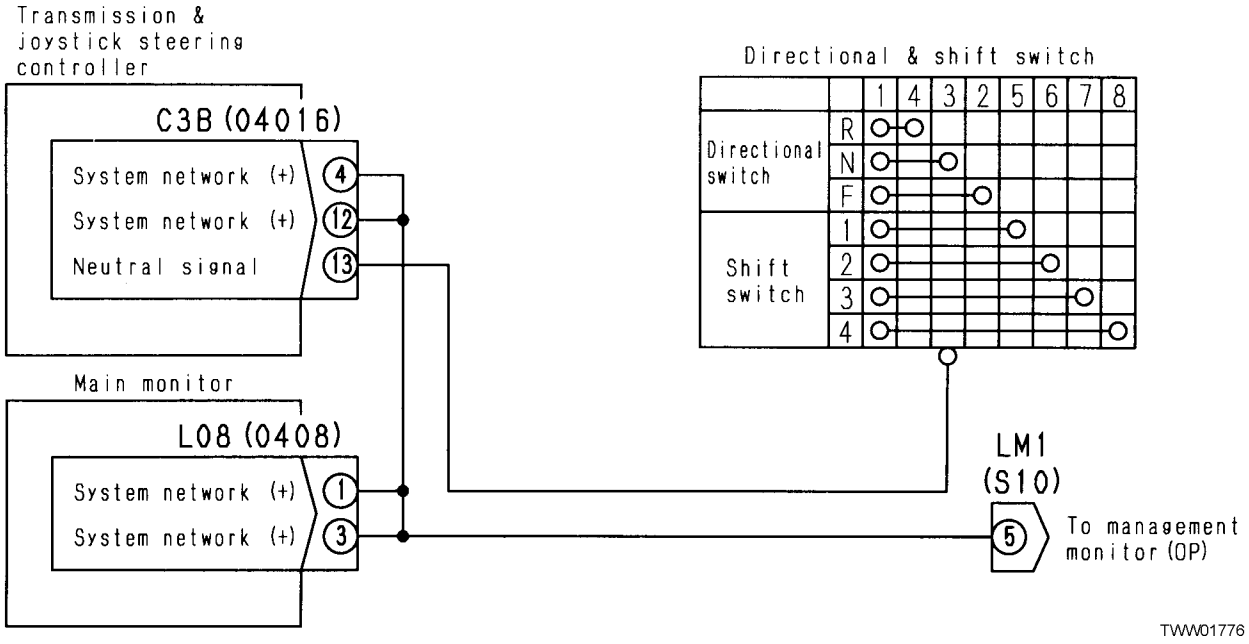


Cause	Remedy
Defective main monitor	Replace
Defective contact or disconnection in wire harness between L05 (female) (18) and L61 (female) (1)	Repair or replace

c) Monitor display lights up but rear working lamp does not light up

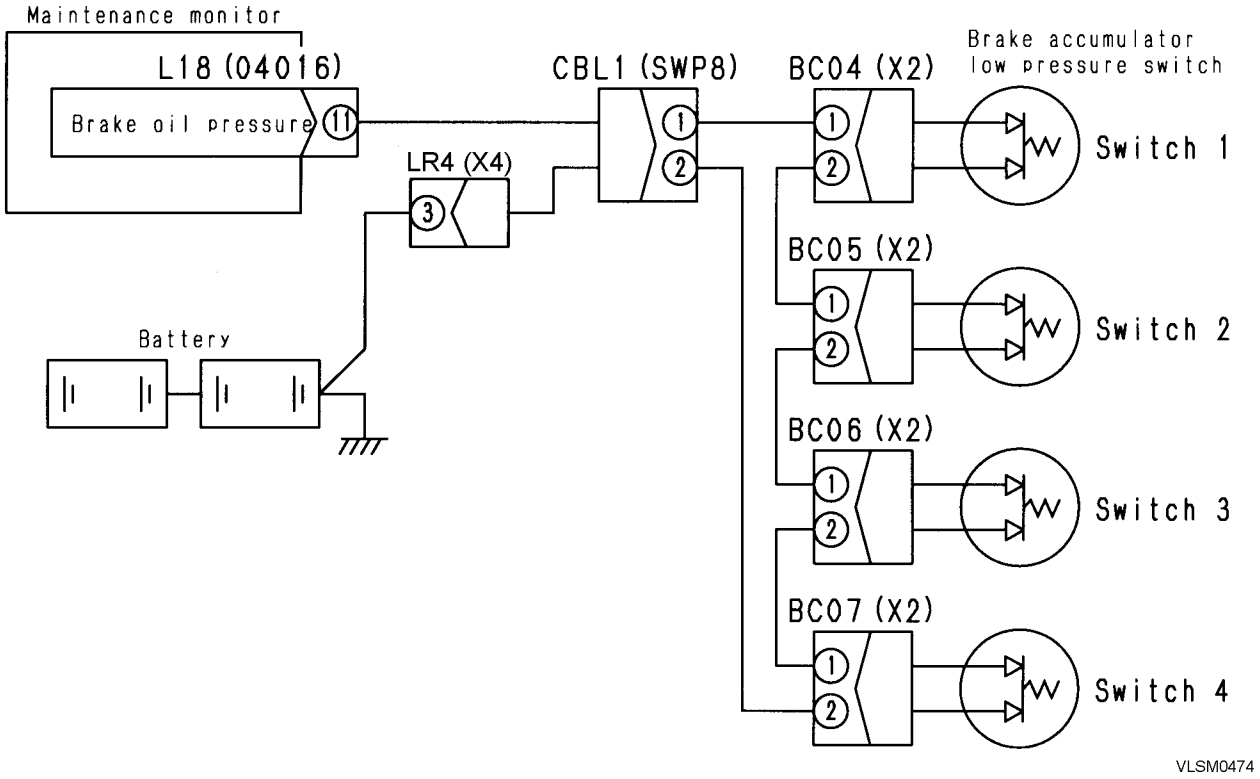
Cause	Remedy
Defective contact or disconnection in wire harness between L61 (female) (1) - G03 (female) (1), G07 (female) (1), or L61 (female) (3) - G02 (female)(1), G08 (female) (1), or blown working lamp bulb	Repair or replace

M-16 Related electrical circuit diagram



MEMORANDA

K-5 c) Related electrical circuit diagram



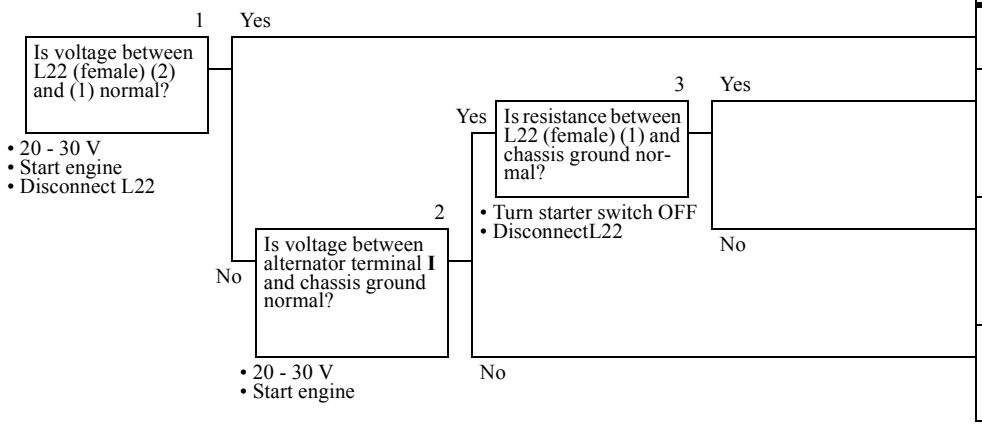
K-12, K-13

K-12

Service meter does not work

★ Before carrying out troubleshooting, be sure that all the related connectors are properly inserted.

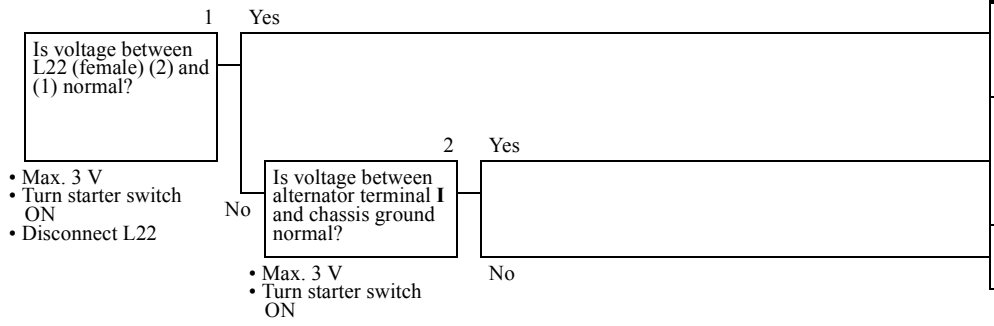
★ Always connect any disconnected connectors before going on to the next step.



Cause	Remedy
Defective service meter	Replace
Defective contact or disconnection in wire harness between L22 (female)(2) and alternator terminal R	Repair or replace
Defective contact or disconnection in wire harness between L22 (female) (1) and chassis ground	Repair or replace
Defective alternator	Replace

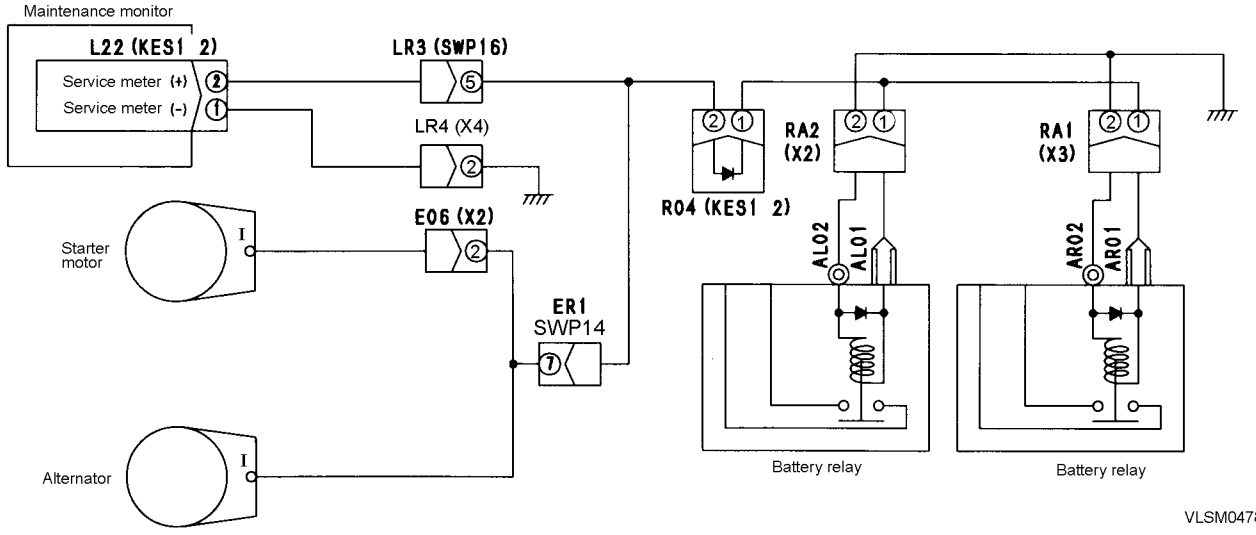
K-13

Service meter is running even when engine is stopped



Cause	Remedy
Defective service meter	Replace
Short circuit with power supply in wire harness between L22 (female) (2) and alternator terminal I	Repair or replace
Defective alternator	Replace

K-12, 13) Related electrical circuit diagram



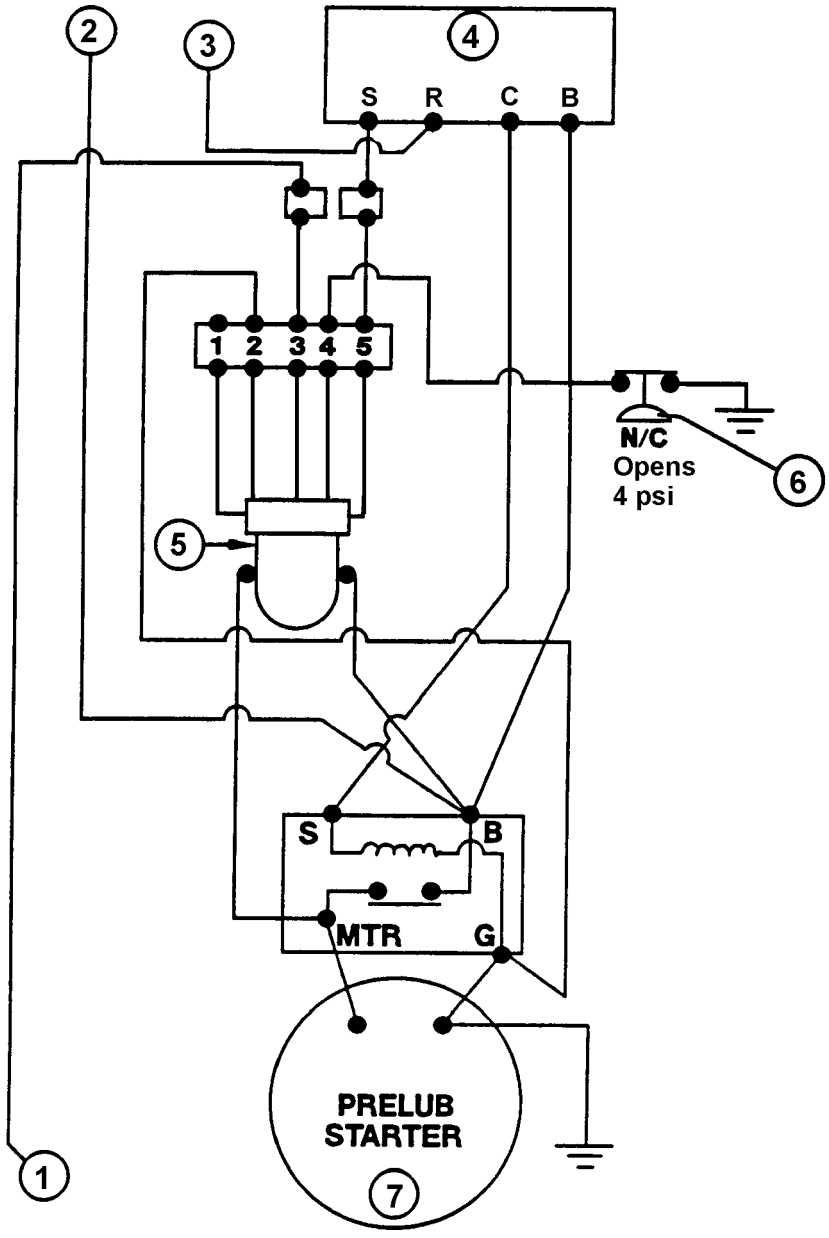


Figure 2-1 Schematic diagram

E-1 AND E-2

Related electrical circuit diagram

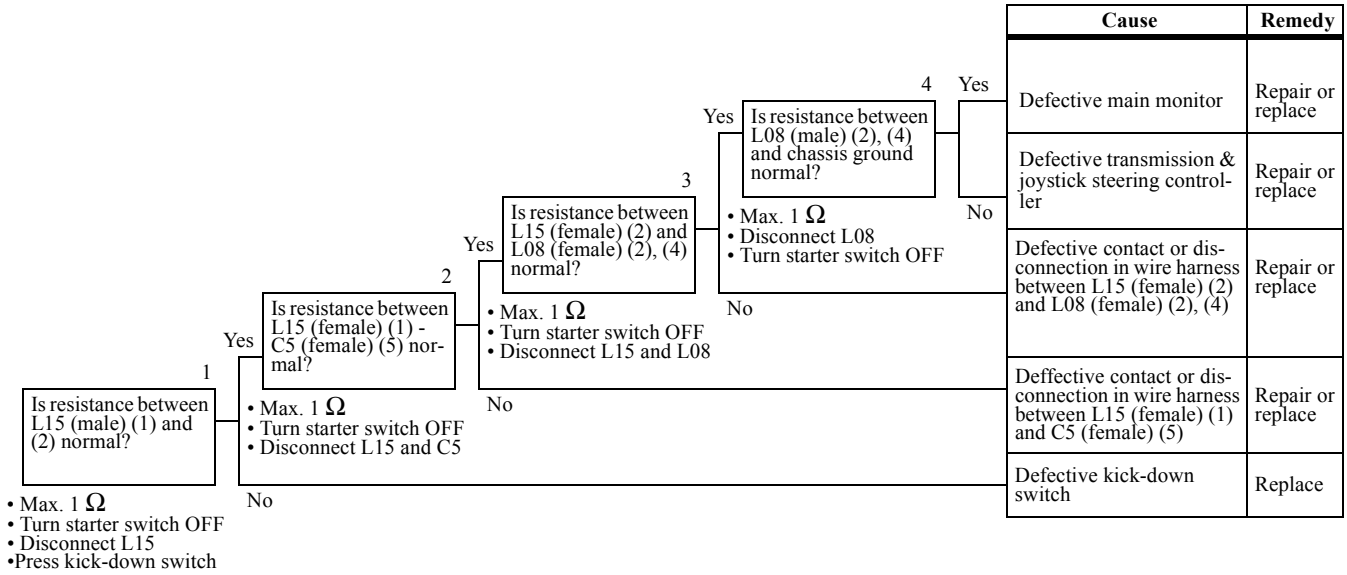
For this page 20-716
see **foldout 20-703** in section 90 of this Shop Manual

E-8

Kick-down switch does not work

- ★ When connecting or disconnecting the T-adapter (or socket adapter) or short connector to carry out checks, always turn the starter switch OFF before starting.
- ★ When connecting T-adapter (or socket adapter), connect to the connector specified as CNO△( ).
- ★ Always connect any disconnected connectors and disconnect the T-adapter before going on to the nest step.

a) Kick-down switch does not work even though gear shift works normally



Cause	Remedy
Defective main monitor	Repair or replace
Defective transmission & joystick steering controller	Repair or replace
Defective contact or disconnection in wire harness between L15 (female) (2) and L08 (female) (2), (4)	Repair or replace
Deffective contact or disconnection in wire harness between L15 (female) (1) and C5 (female) (5)	Repair or replace
Defective kick-down switch	Replace

MEMORANDA

H-9, H-10

H-9 Steering is heavy

Checking for abnormalities

- Is the steering difficult to turn?
  Yes = Go to H-7 or H-8
- Measure the operating effort and turning speed, and check the STANDARD VALUE TABLE to see if they are abnormal

Ask the operator the following points

- Did the problem suddenly start?
  Yes = Related equipment broken
- Was there previously any symptom, such as heavy steering?
  Yes = Wear of related equipment, defective seal

Checks before troubleshooting

- Is the oil level in the hydraulic tank correct?
- Is the type of oil correct?
- Is the tire inflation pressure correct?

The following symbols are used to indicate the action to be taken when a cause of failure is located.
X: Replace
A: Adjust
△: Repair
C: Clean

No.	Problems		Causes / Remedy	Defective Orbit-roll (a)	Defective actuation of stop valve (b)	Defective actuation of steering spool (c)	Interference of steering wheel or steering shaft (d)
				Orbit-roll	Stop solenoid	Steering valve	Others
			Remedy	△ X	△ X	△ X	△ X
1	Steering wheel is heavy in both directions (left and right)			O		O	O
2	Steering wheel is heavy in one direction (left or right)				O		
3	Steering is heavy even when joint between steering shaft and Orbit-roll is disconnected						O
4	When steering relief pressure is measured	Oil pressure is low or there is no pressure in both directions (left or right)		O		O	
5		Oil pressure is low or there is no pressure in one direction (left or right)			O		
6	When Orbit -roll output pressure is measured, oil pressure is found to be low			O			O

H-10 Joystick is heavy [machine with joystick (OP)]

Causes and Remedy

- Abnormality of joystick (X)
  (The joystick is an electrically operated lever, so if the operating effort is great, the abnormality is in the joystick.)

H-24

Bucket moves slowly and has insufficient tilt back power

Checks before troubleshooting

- Is the travel of the bucket control lever and the work equipment control valve spool correct?
- Seizure of bushing in bucket linkage? (Does emits abnormal noise)

Fault check

- Check deficient tilt back force by performing actual work
- Measure the operating speed of the bucket and check it against the standard value table to determine whether or not it is normal

The following symbols are used to indicate the action to be taken when a cause of failure is located.
X: Replace
A: Adjust
△: Repair
C: Clean

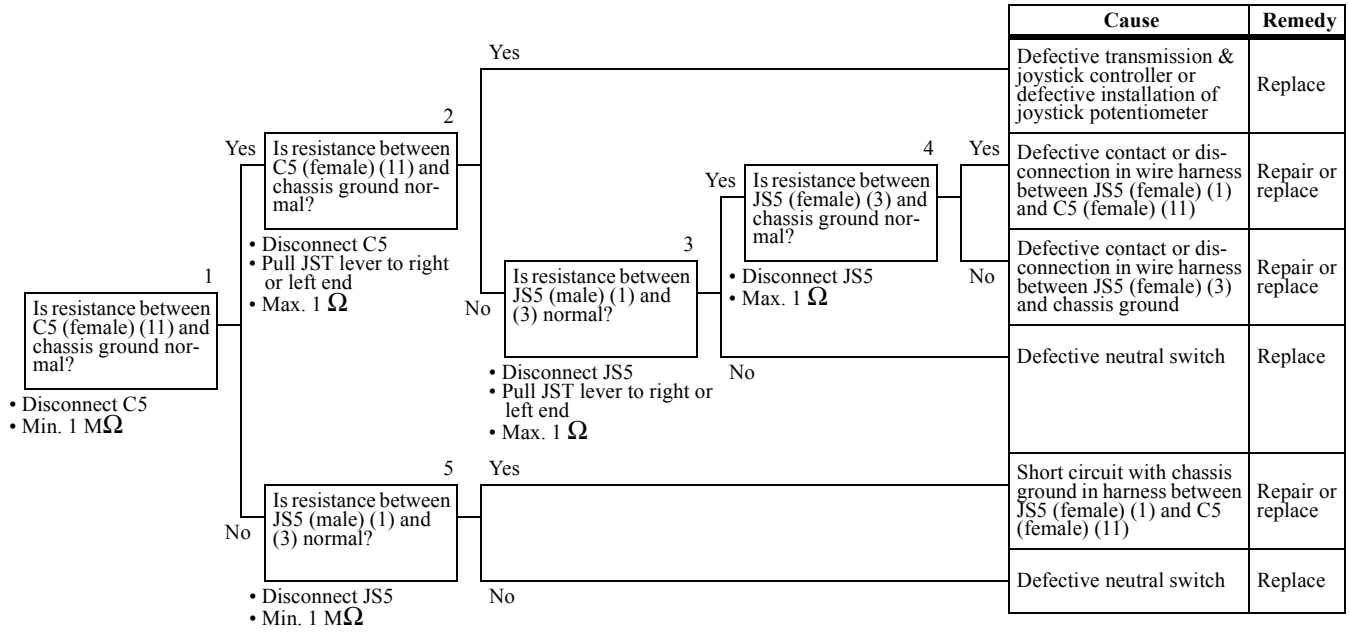
No.	Problems	Remedy	Causes	Blockage in suction port of pump or excessive amount of air contained in oil	Defective hydraulic and switch pump	Defective actuation of demand spool	Defective actuation of relief valve	Defective actuation of spool	Defective actuation of main relief valve and incorrectly adjusted	Defective actuation of safety valve (with suction valve) on rod side of the bucket cylinder	Internal worn or damaged valve body (bucket spool)	Damage bucket cylinder piston seal
				Tank pump		Steering valve	PPC valve		Main control valve			Cylinder
				a	b	c	d	e	f	g	h	i
		C △		△ X	△ X	△ X	△ X	△ X	A △ X	△ X	X	X
1	Boom lifting force and lifting speed are abnormal and also bucket tilt force and tilt speed are abnormal			O	O	O	O		O			
2	Boom lifting force and lifting speed are normal and also bucket tilt force and tilt speed are abnormal							O		O	O	O
3	Phenomena of item 1 become particularly bad when the oil temperature increases				O							
4	The hydraulic pump emits an abnormal noise			O	O							
5	Steering action is light and excessively fast when the engine is at full					O						
6	Steering is heavy and slow when the engine is at full			O								
7	The bucket cylinder has a great amount of hydraulic drift									O	O	O
8	The relief pressure of the relief valve of the work equipment control valve is also low								O	O	O	O
9	The discharge volume of the hydraulic pump is low				O							

Failure code	Abnormal system	Nature of abnormality
61	Steering solenoid cut relay	1) Defective caution solenoid relay 2) Short circuit with ground, defective contact, or disconnection in wire harness between C1 (female) (1) - L67 (1) 3) Short circuit with ground, defective contact, or disconnection in wire harness between JS5 (3) - chassis ground 4) Defective transmission & joystick steering controller
62	Joystick neutral switch	1) Defective joystick neutral switch 2) Short circuit with ground, defective contact, or disconnection in wire harness between C5 (female) (11) - JS5 (female) (1) 3) Defective contact, or disconnection in wire harness between JS5 (3) - chassis ground 4) Defective transmission & joystick steering controller
63	Joystick potentiometer	1) Defective boom angle potentiometer 2) Short circuit with power source, short circuit with ground, defective contact, or disconnection in wire harness between CA3 (female) (3) - JS2 (1) 3) Short circuit with power source, defective contact, or disconnection in wire harness between C3A (female) (7) - JS2 (2) 4)Short circuit with power source, short circuit with ground, defective contact, or disconnection in wire harness between C3A (female) (17) - JS2 (female) (3) 5) Defective transmission & joystick steering controller

J-7

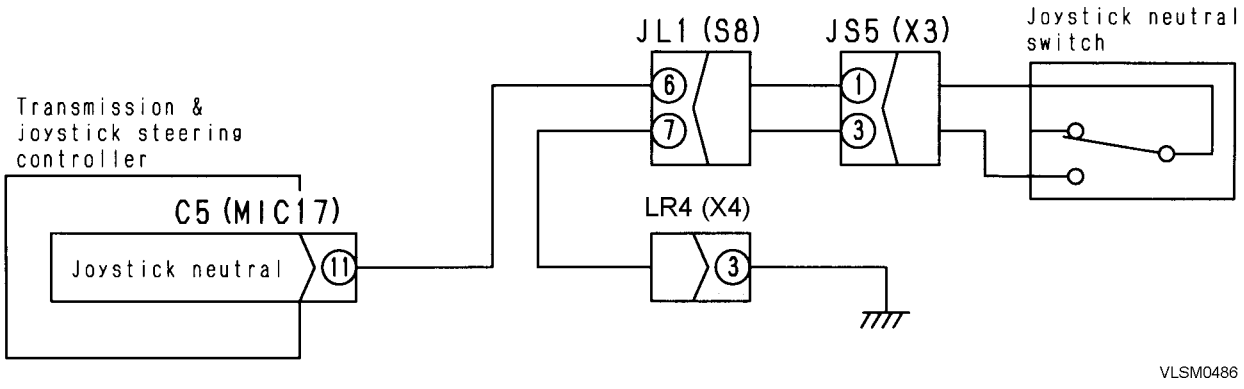
Failure code [62] (Short circuit, disconnection in joystick steering neutral circuit) is displayed

- ★ Before carrying out troubleshooting, check that all related connectors are properly inserted
- ★ Always connect any disconnected connectors before going on to the next step
- ★ When joystick steering lever is not being used, leave it at the neutral position and turn the joystick steering selector switch ON



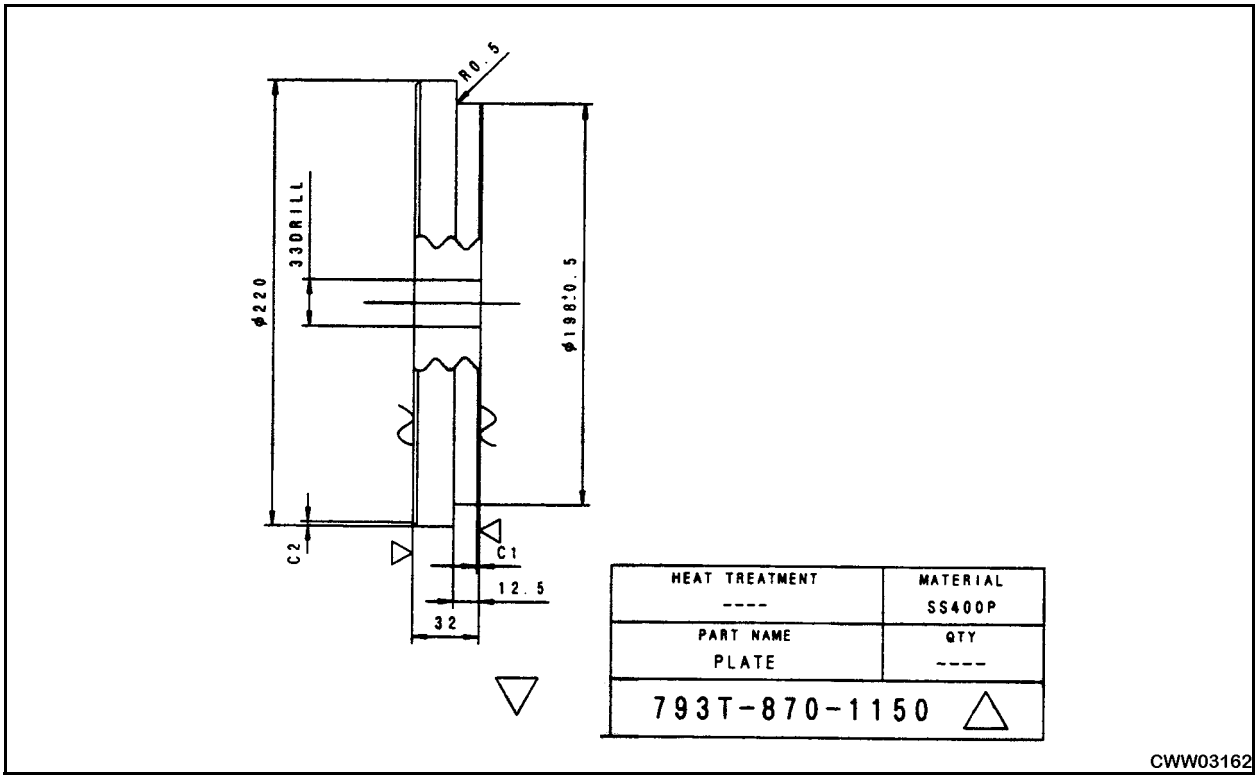
Cause	Remedy
Defective transmission & joystick controller or defective installation of joystick potentiometer	Replace
Defective contact or disconnection in wire harness between JS5 (female) (1) and C5 (female) (11)	Repair or replace
Defective contact or disconnection in wire harness between JS5 (female) (3) and chassis ground	Repair or replace
Defective neutral switch	Replace
Short circuit with chassis ground in harness between JS5 (female) (1) and C5 (female) (11)	Repair or replace
Defective neutral switch	Replace

J-7 Related electrical circuit diagram



Component	Symbol		Part No.	Part Name	Necessity	Q'ty	New/ remod-eled	Sketch	Nature of work, remarks
Disassembly, assembly of center hinge	K	1	.790-101-2610	.Leg		2			Press fitting of upper center hinge bearing
			.790-101-2570	.Plate		4			
			.790-101-2740	.Adapter		2			
			.790-101-2560	.Nut		2			
			790-101-7340	Push tool	n	1			
			790-101-7350	Guide	n	1			
			790-201-1310	Spacer	n	1			
			.790-101-2102	.Puller (30 ton)	n	1			
			.790-101-1102	.Hydraulic pump	n	1			
		2	790-201-1970	Plate	n	1			Press fitting of upper retainer dust seal
			.790-101-5021	.Grip	n	1			
			.01010-50816	.Bolt	n	1			
		3	790-101-2300	Push tool	n	1			Press fitting of lower center hinge
			.790-101-2310	.Plate		1			
			.790-101-2320	.Screw		1			
			.790-101-2330	.Nut		1			
			.790-101-2340	.Washer		1			
			.790-101-2390	.Leg		2			
			.790-101-2360	.Plate		4			
			.02215-11622	.Nut		2			
			790-101-7330	Adapter	n	2			
			790-201-1310	Spacer	n	1			
			790-101-7310	Push tool	n	1			
			790-101-7320	Grip	n	1			
			.790-101-2102	.Puller (30 ton)	n	1			
			.790-101-1102	.Hydraulic pump	n	1			
		4	793T-846-1110	Plate	n	1	N	O	Press fitting of lower retainer dust seal
			.790-101-5221	.Grip	n	1			
			.01010-51225	.Bolt	n	1			
		5	790-450-1110	Adapter	n	1			Removal, installation of center hinge shaft

V2 PLATE

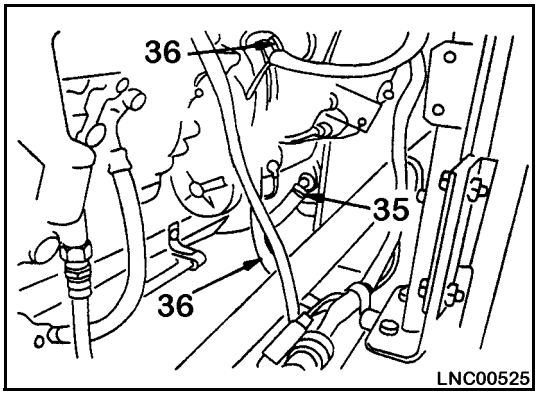

R0.5
33DRILL
φ220
φ198±0.5
C2
C1
12.5
32
HEAT TREATMENT

MATERIAL
SS400P
PART NAME
PLATE
QTY

793T-870-1150
CWW03162

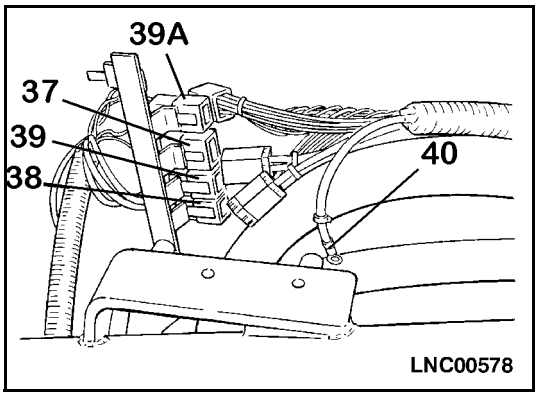
24. Disconnect ground connection cable (35).

25. Disconnect cable (36) from starting motor.



26. Disconnect connectors CN-ER1 (37, 14 wires), CN-ER2 (38, 2 wire), CN-ER3 (39, 1 wire) and CN-ER4 (39A, 16 wire).

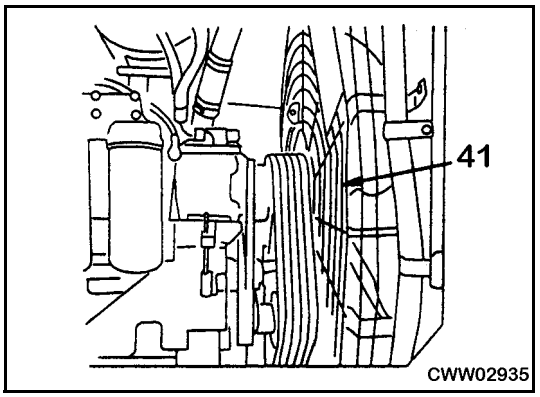
27. Disconnect ground connection cable (40).



28. Remove fan guard (41).

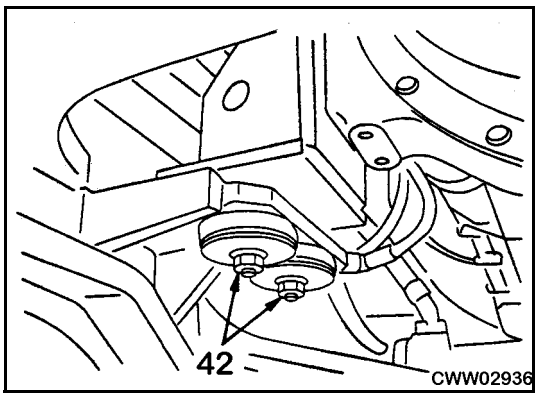
    Sling fan temporarily and remove mount bolts, then secure fan to bar at top of radiator with wire.

    ★ Be careful not to damage the radiator core with the fan.



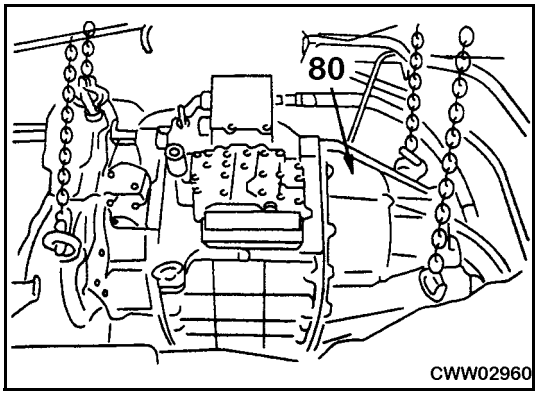
29. Sling engine temporarily, and remove left and right front mount bolts (42).

    ※2



57. Sling transmission and torque converter assembly (80) temporarily.

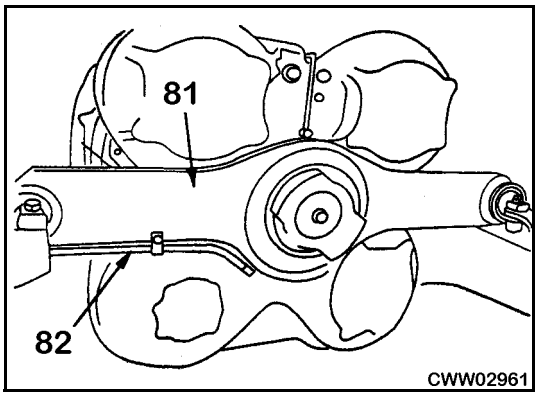
    ★ Set the slings as short as possible.



58. Remove the mount bolts of the trunnion (81).

    ※6

    ★ Secure the trunnion to the torque converter with wires.
    ★ If shims are installed between the frame and trunnion, check its quantity and thickness.
    ★ Disconnect trunnion greasing hose (82) from the trunnion.

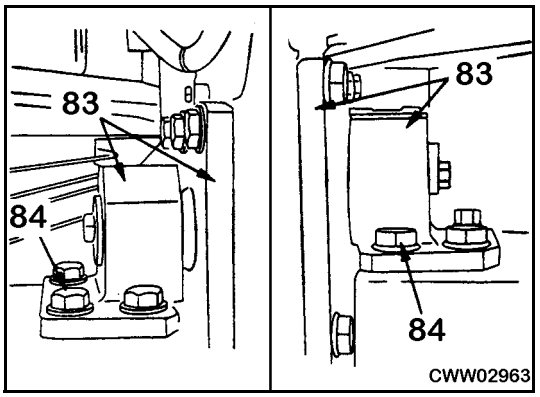


59. Remove mount bracket (83) and mount bolt (84) on the front side.

    ※7

    ★ Keep mount bracket (83) on the front side removed.
    ★ Be careful not to lose the pin between the transmission and bracket.

60. Moving the transmission and torque converter (80) toward the engine, lift it off slowly.

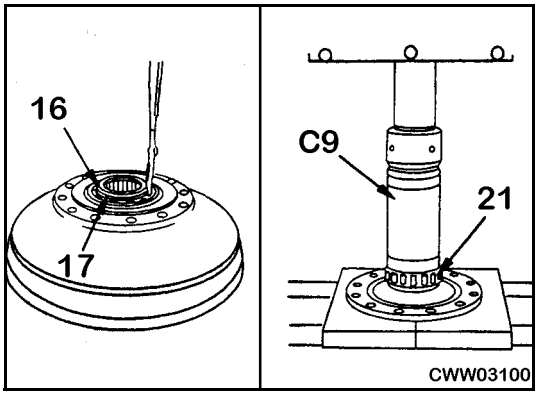


kg

Transmission and torque converter assembly:
2880 kg (6349.31 lb)

D. Fit plate (17) and install snap ring (16).

E. Using push tool **C9** (inside diameter: 90 mm), press fit bearing (21) in pilot.

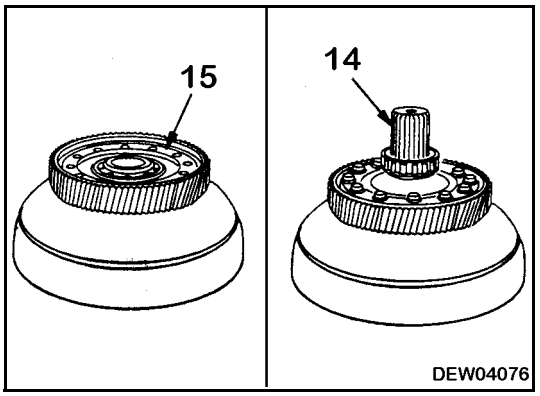


F. Install gear (15).

G. Install pilot (14).

Mount bolt: Adhesive (LT-2)

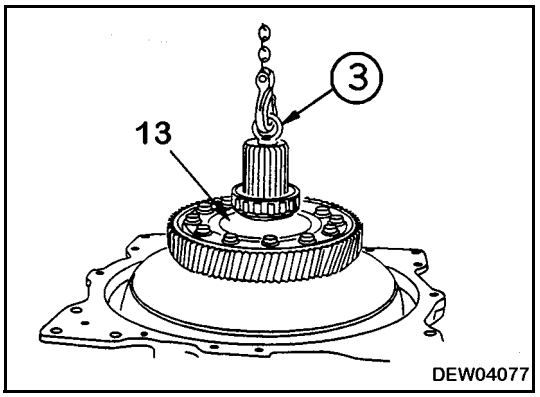
Mount bolt: 275 ± 29 Nm (202.82 ± 21.38 lbf ft)



H. Using eyebolts ③ (Dia. = 16 mm, Pitch = 2.0 mm), raise turbine case assembly (13), align oil groove of case with drain hole of pump (2 places), then install.

I. Tighten pump mount bolts temporarily.

Mount bolt: Adhesive (LT-2)



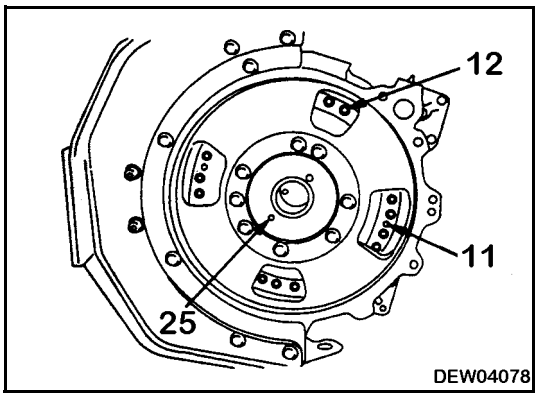
J. Rotate repair stand 90° and tighten mount bolts (12).

Mount bolt: 54 ± 5 Nm (39.82 ± 3.68 lbf ft)

K. Tighten drain plug (11).

L. Tighten 2 plugs (25).

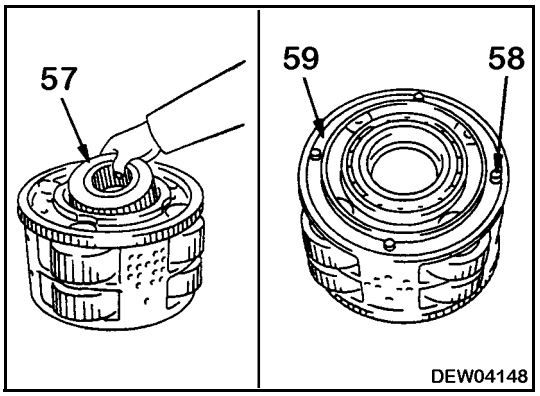
Plug: 7.4 ± 2.5 Nm (5.45 ± 1.84 lbf ft)



D. Disassemble No. 2 and 3 carrier assembly as follows.

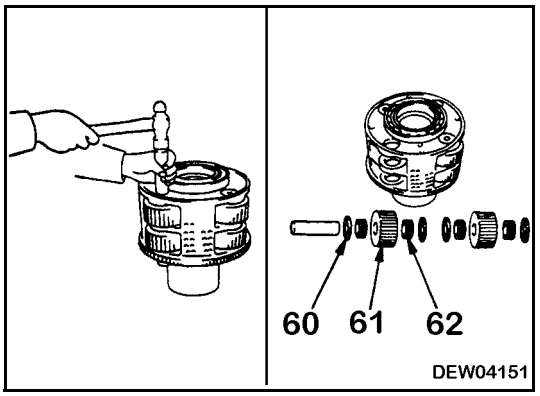
i. Remove sun gear (57).

ii. Remove mount bolts (58), then remove retainer (59).

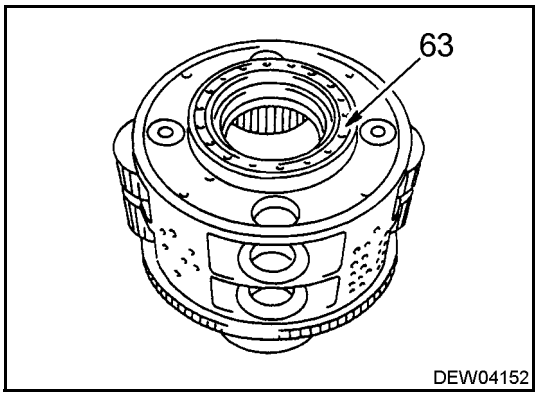


iii. Remove pin, then remove thrust washer (60), planetary gear (61), and needle bearing (62).

★ When removing the pin, be careful not to lose the ball.



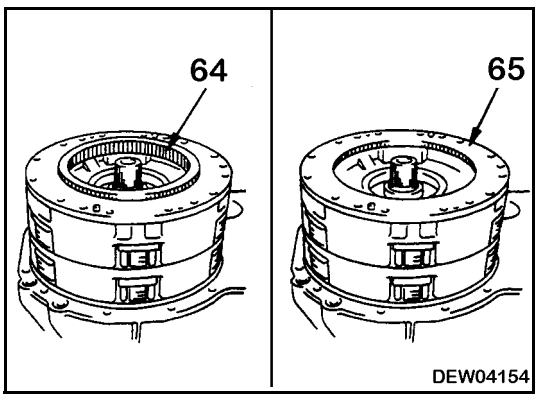
iv. Remove bearing (63).



19. Ring gear, plate

A. Remove ring gear (64).

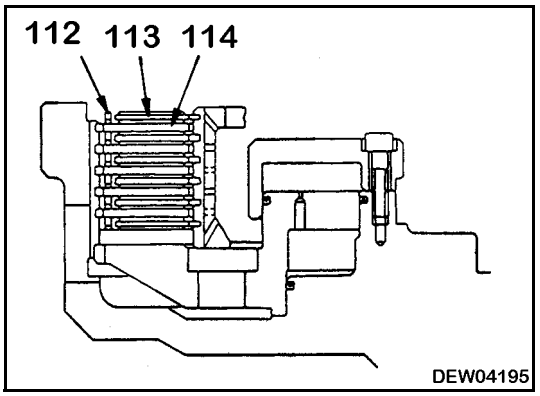
B. Using eyebolts (Dia. = 10 mm, Pitch = 1.5 mm), lift off plate (65).



4. Spring, disc, plate

   Install spring (112), disc (113), and plate (114).

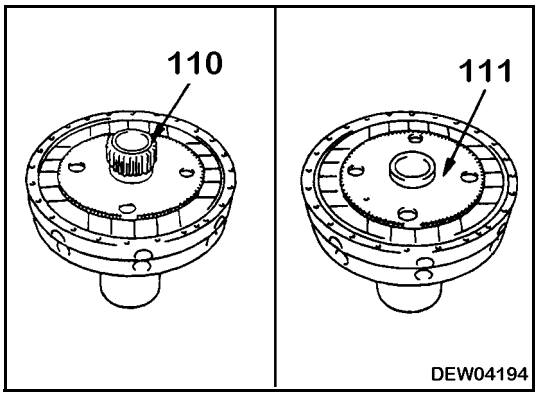
   ★ There are springs between each plate.
   ★ Number of discs: 6
   ★ Number of plates: 5



5. No. 5 ring gear, sun gear

   A. Install ring gear (111).

   B. Install sun gear (110).

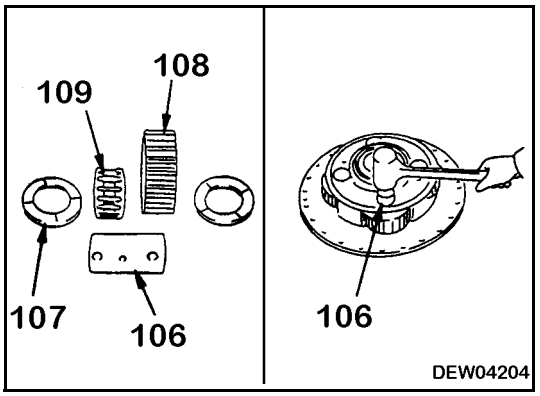


6. No. 5 carrier assembly

   A. Assemble carrier assembly as follows.

      i. Install needle bearing (109), planetary gear (108), and thrust washer (107), then knock in pin (106).

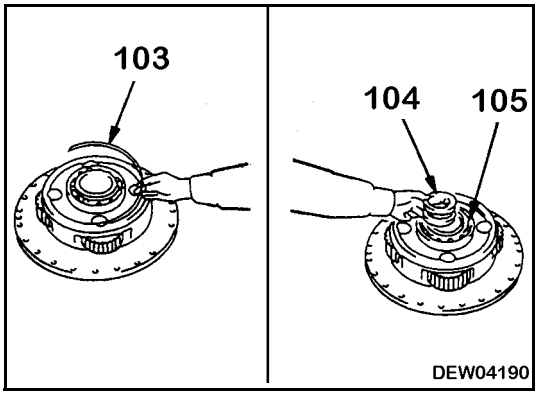
         ★ Be careful not to forget the ball when installing.



      ii. Using push tool (inside diameter = 133 mm), press fit bearing (105).

      iii. Fit two seal rings to collar (104) and install.

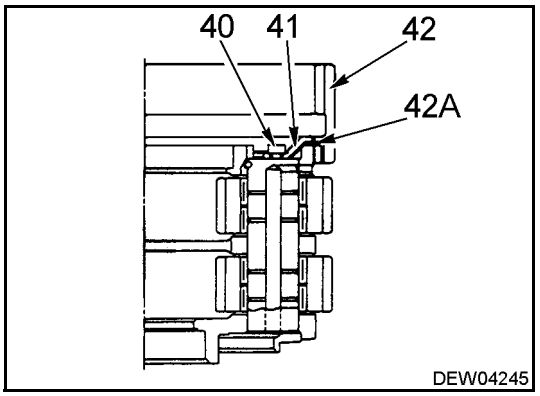
      iv. Install snap ring (103).



B. Fit plate (41), and tighten with mount bolts (40).

★ Check that the snap ring installed to the ring gear is set securely between the plate and the carrier.

N·m Mount bolt: 66.2 ± 7.4 Nm (48.82 ± 5.45 lbf ft)



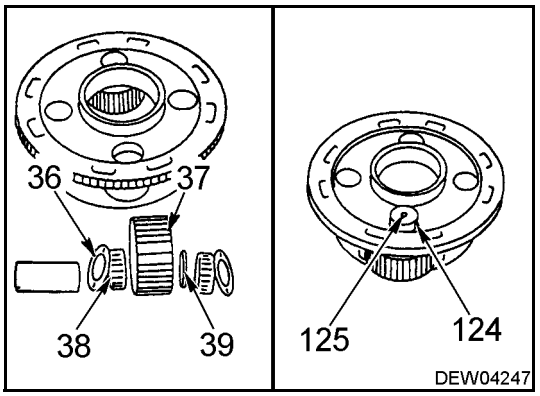
32. Shaft, No. 1 carrier assembly

A. Assemble shaft and No. 1 carrier assembly as follows.

i. Assemble needle bearing (38) and spacer (39) in planetary gear (37), fit thrust washers (36) to both ends and set to carrier.

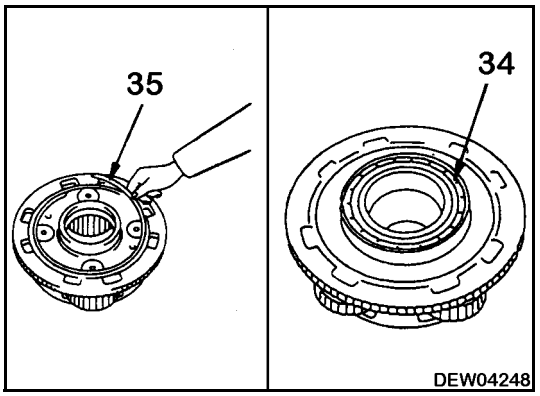
ii. Fit ball (124) and push in pin (125).

★ Be careful not to forget the ball when installing to the shaft.



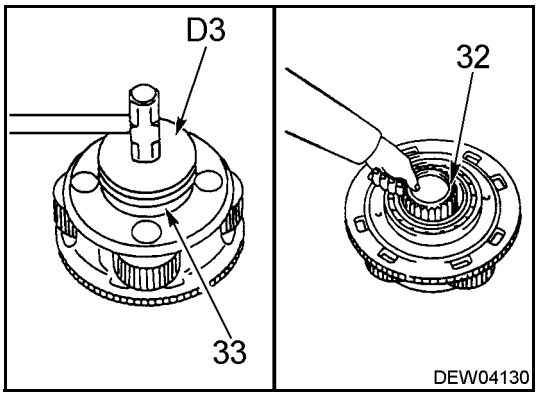
iii. Install snap ring (35).

iv. Using push tool (outside diameter: 155 mm), install bearing (34).



v. Using push tool **D3** (outside diameter: 135 mm), install bearing (33).

vi. Install sun gear (32).



TRANSFER

DISASSEMBLY

★ Clean all parts and repair any burrs.

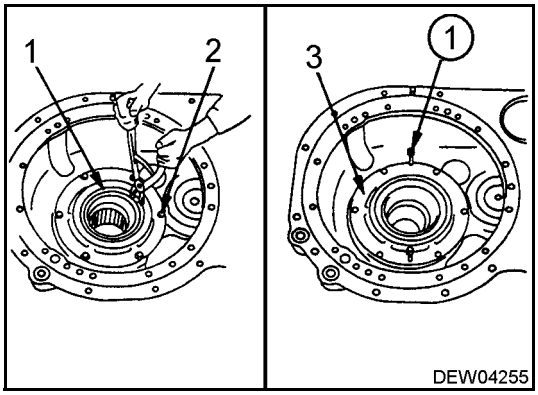
1. Transmission assembly

   Disassemble transmission assembly. For details, see TRANSMISSION, DISASSEMBLY.

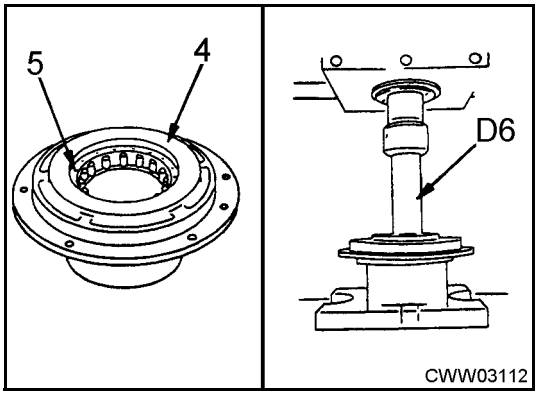
2. Cage

   A. Remove snap ring (1), then remove mount bolts (2).

   B. Using forcing screws ① (Dia. = 12 mm, Pitch = 1.75 mm), remove cage assembly (3).



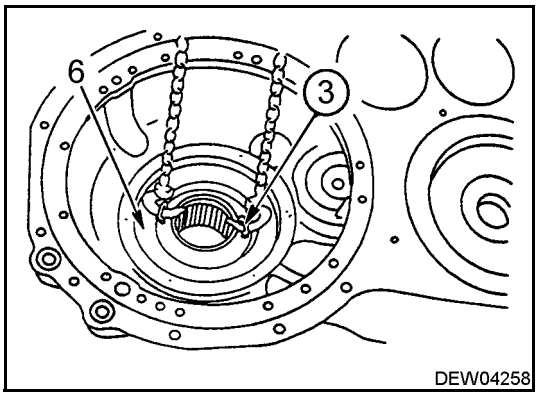
   C. Set in press, then using push tool **D6** (outside diameter: 185 mm), remove bearing (5) from cage (4).



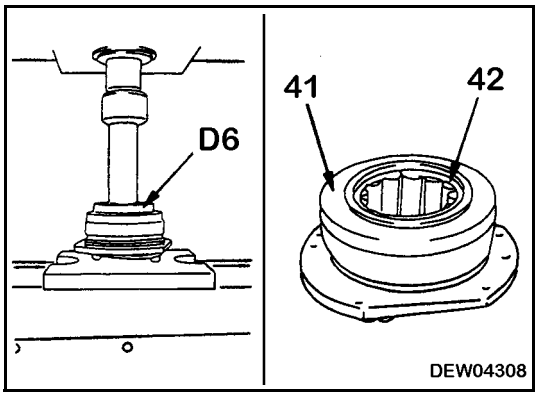
3. No. 1 gear

   Using eyebolts ③ (Dia. = 12 mm, Pitch = 1.75 mm), lift off gear (6).

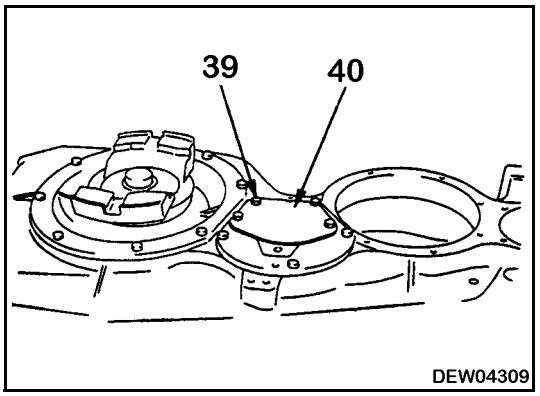
   kg Gear: 40 kg (88.18 lb)



B. Using push tool **D6** (outside diameter: 165 mm), press fit bearing (42) in cage (41).

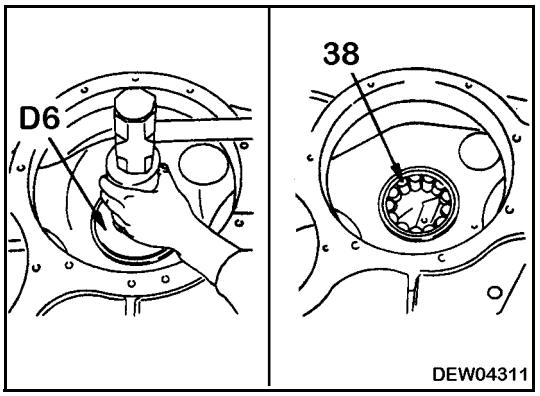


C. Fit cage assembly (40) and tighten with mount bolts (39).



5. Bearing

Using push tool **D6** (outside diameter: 165 mm), press fit bearing (38).

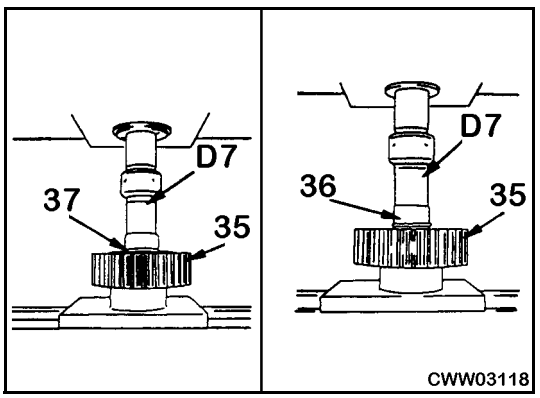


6. No. 2 gear assembly

A. Set in press, then using push tool **D7** (inside diameter: 85 mm), press fit inner race (37) in gear (35).

B. Set in press, then using push tool **D7** (inside diameter: 85 mm), press fit inner race (36) in gear (35).

Inner race: Adhesive (LT-2)

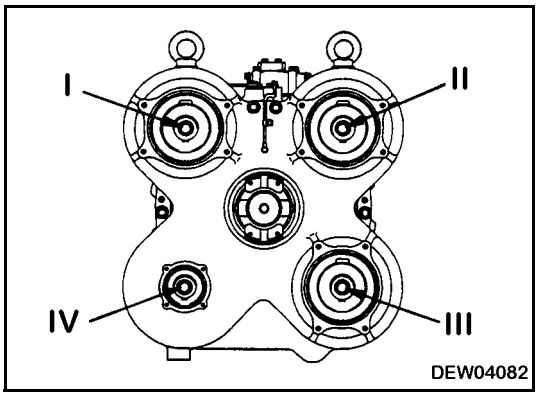


ASSEMBLY

Preparatory work

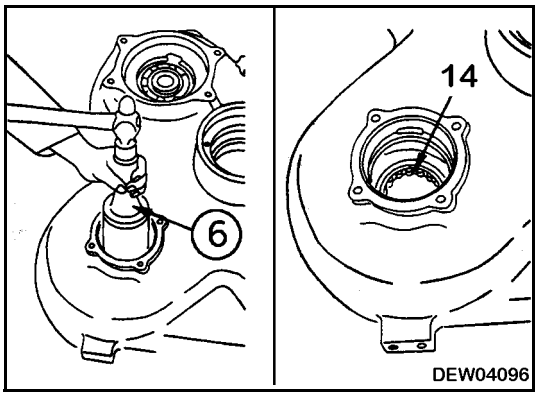
- Clean all parts, and check for dirt or damage.
- Coat the sliding surfaces of all parts with engine oil before installing.

★ The procedure for disassembly and assembly of the gear and shaft assemblies is the same, but for gear and shaft assemblies I, II, III and IV, the shaft and bearing are different.

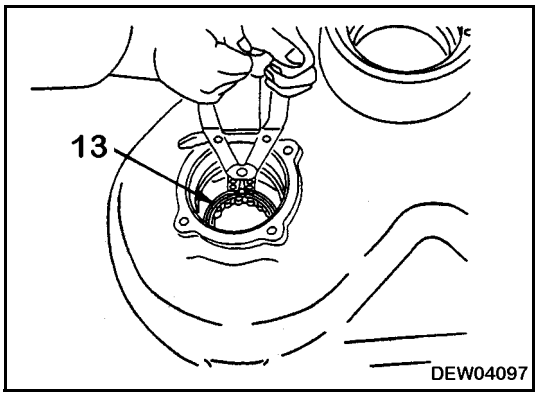


1. Bearing, snap ring

   A. Using push tool ⑥ (outside diameter = 115 mm), press fit bearing (14).



   B. Install snap ring (13).

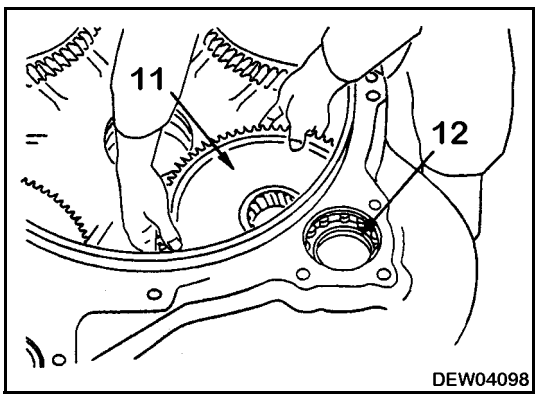


2. Spacer, gear

   A. Install spacer (12).

   B. Set gear (11) in position.

      ★ Be careful to install gear (11) facing in the correct direction.

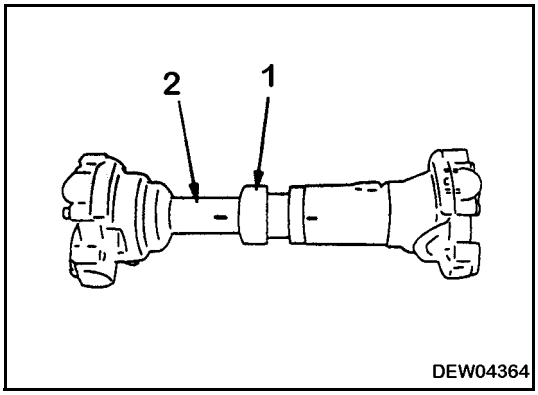


DRIVE SHAFT

DISASSEMBLY

1. Splined yoke

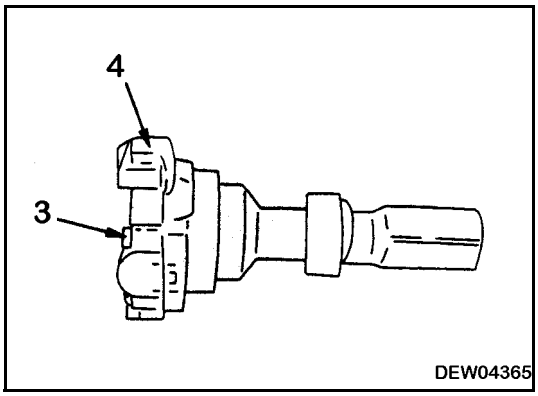
   Loosen retainer (1) and remove splined yoke (2).



2. Bearing

   Remove mount bolts (3), then remove bearing assembly (4).

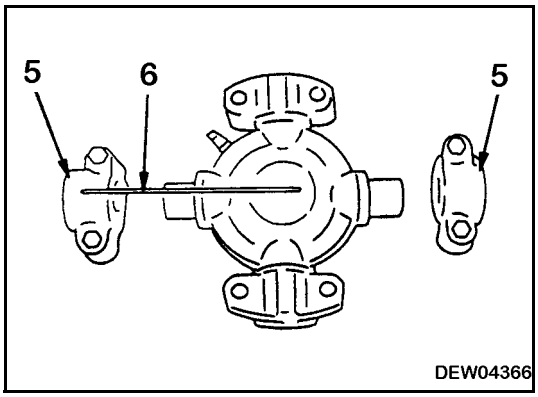
   ★ Make match marks on the yoke and bearing.



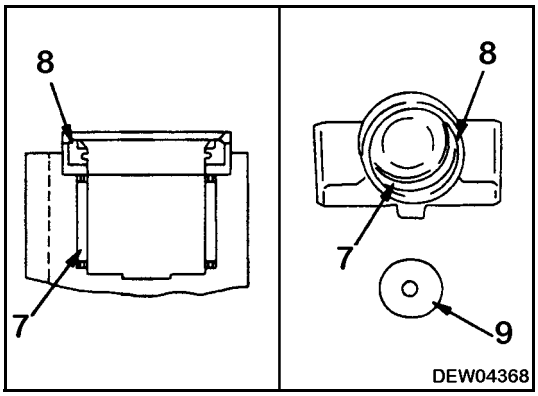
3. Bearing cap

   A. Remove bearing cap (5) from bearing assembly.

   ★ Remove strap (6) of cap.



   B. Remove bearing (7), seal (8) and Delrin washer (9) from bearing cap.



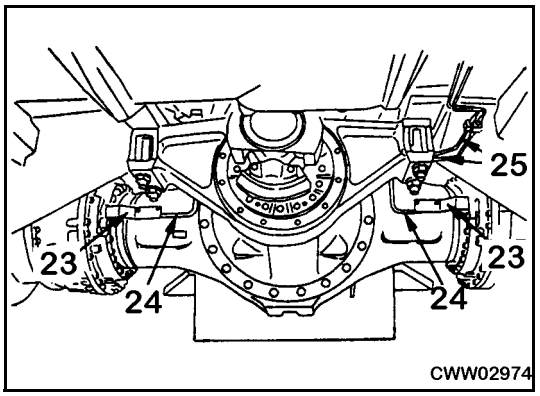
6. Brake piping

※6

A. Remove cover (23).

B. Disconnect tube (24) from slack adjuster.

C. Remove support lubrication tube (25).



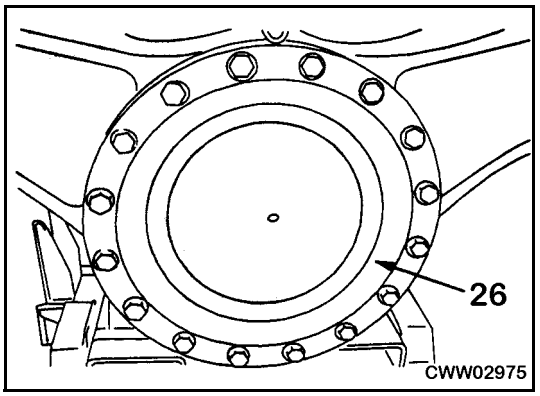
7. Rear axle, support

A. Remove mount bolts, then remove thrust cover (26).

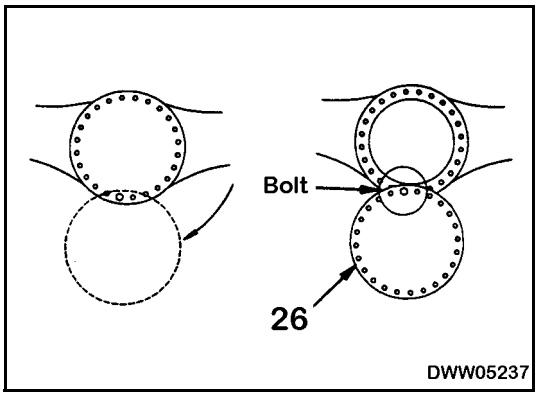
※7

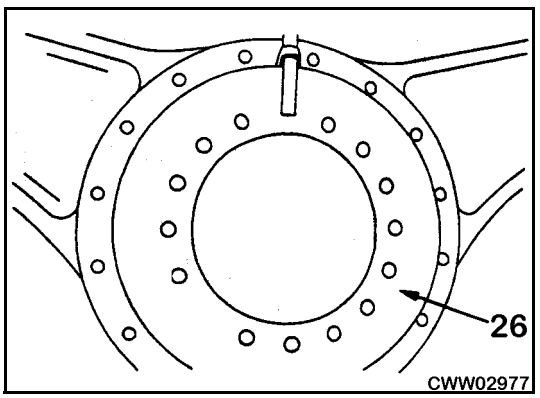
kg Thrust cover: 119 kg (262.35 lb)

★ Remove grease tube.



★ Thrust cover (26) is heavy, so handle it as follows and use fixed signals when removing.
- Leave one bolt in position at the bottom, and use this bolt as a pivot to rotate the cover carefully.
- Hold the cover with a pallet, remove the 1 remaining bolt, then remove the cover carefully.

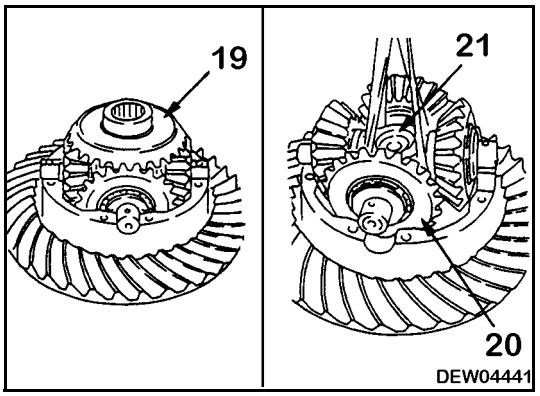




C. Remove bevel gear (19).

D. Remove pinion gear assembly (20) together with cross shaft (21).

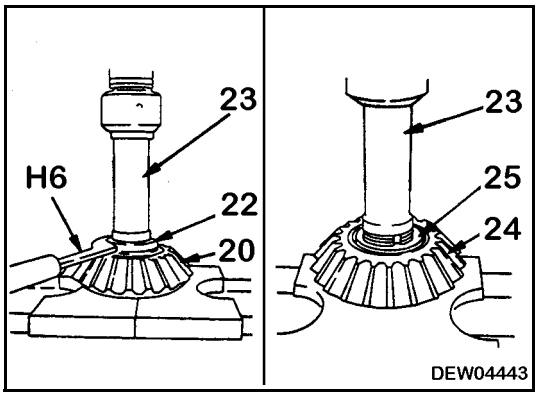
kg Pinion gear, cross shaft: 110 kg (242.50 lb)



9. Disassemble pinion gear assembly as follows.

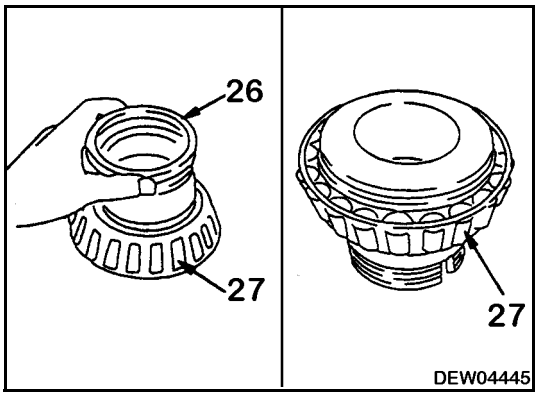
A. Raise lock plate, hold pinion gear assembly (20) with press, then using wrench **H6**, loosen lock nut (22) and remove.

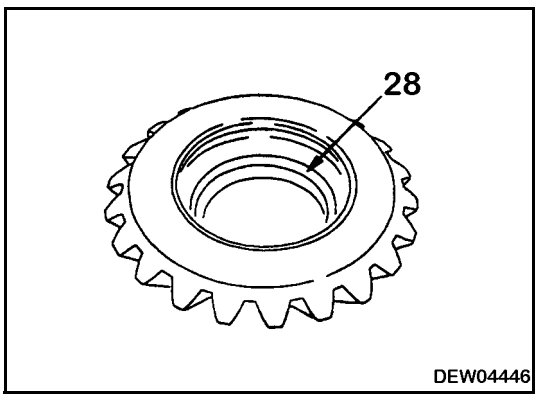
B. Push shaft (23) with press, and remove pinion gear (24) and bearing (25).



C. Remove collar (26).

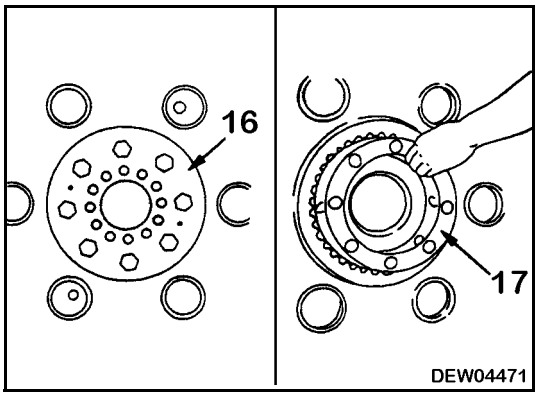
D. Remove bearing (27) from shaft.





10. Remove retainer (16), then remove shim (17).

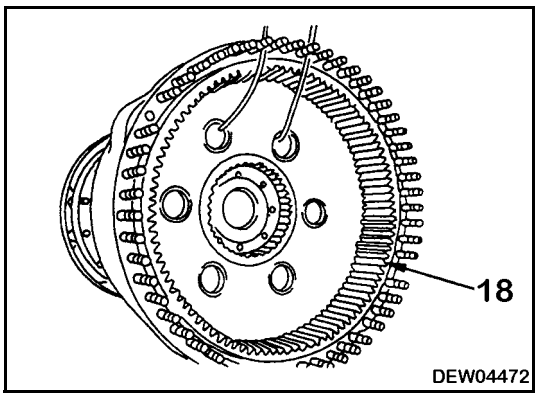
    ★ Check the number and thickness of the shims, and keep in a safe place.



11. Lift off ring gear assembly (18).

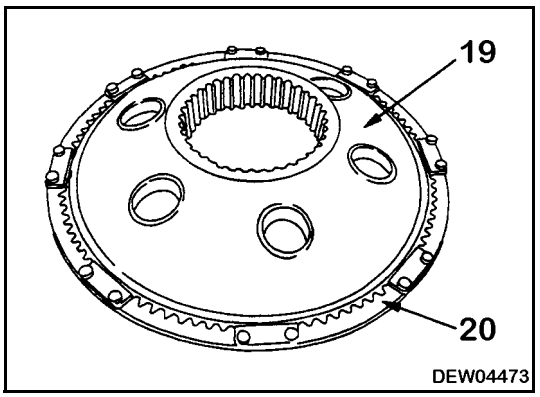
    ★ When pulling out the ring gear assembly, insert a bar in the casting hole at the bottom of the case, and adjust the balance when pulling out.

kg Ring gear assembly: 240 kg (529.10 lb)



12. Remove lock plate, then remove ring gear (20) from ring gear hub (19).

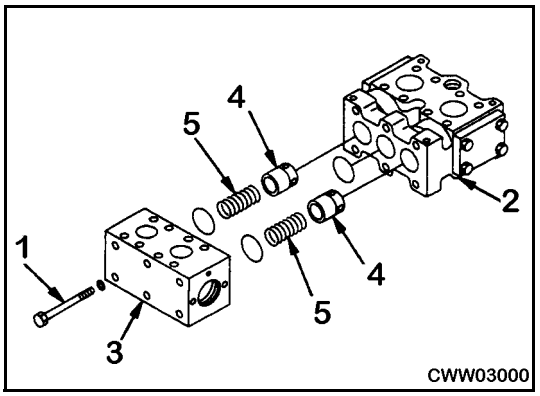
kg Ring gear hub: 95 kg (209.43 lb)
Ring gear: 150 kg (330.69 lb)



E. Assemble check valve (4) and spring (5) to valve body (2).

F. Install the O-ring to selector valve body (3), then install bolt (1) to check valve (2).

N·m Mount bolt: 98.1 Nm (72.35 lbf ft)

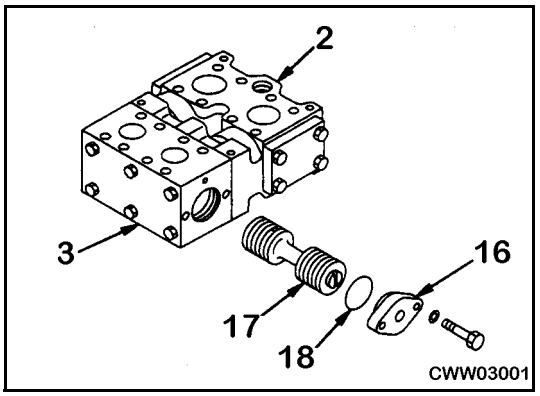


2. Assembly of selector valve

A. Install spool (17) to valve body (3).

B. Install O-ring (18) to valve body (3), then install cover (16).

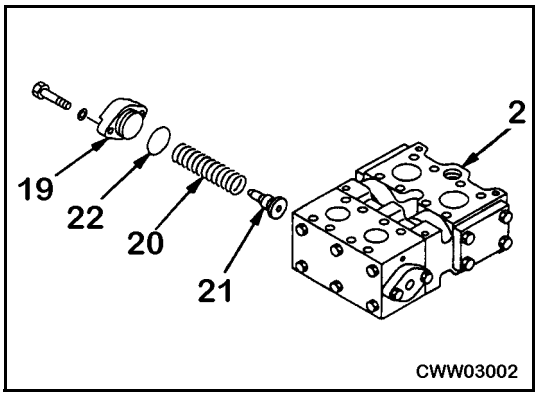
N·m Mount bolt: 98 - 123 Nm (72.28 - 90.72 lbf ft)



C. Assemble retainer (21) and spring (20) to valve body (3).

D. Install O-ring (22) to cover (19), then install them to valve body (3).

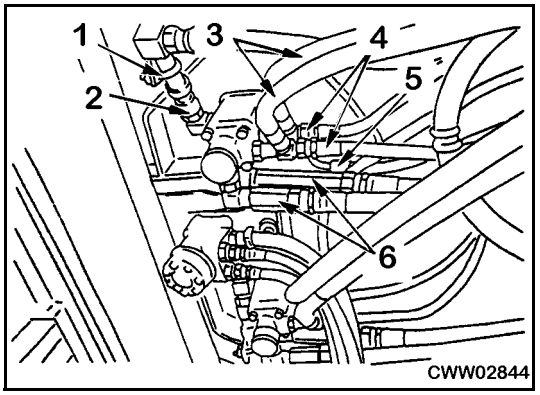
N·m Mount bolt: 58.8 - 73.6 Nm (43.36 - 54.28 lbf ft)



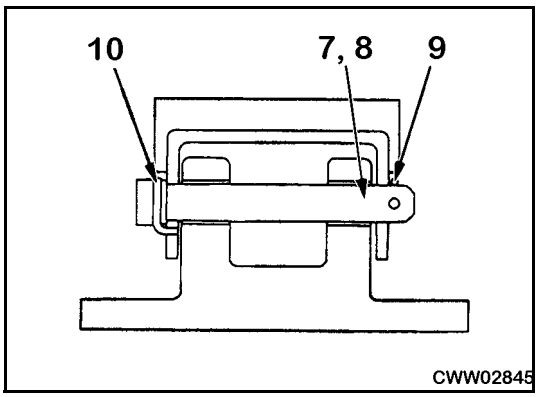
BRAKE VALVE

REMOVAL

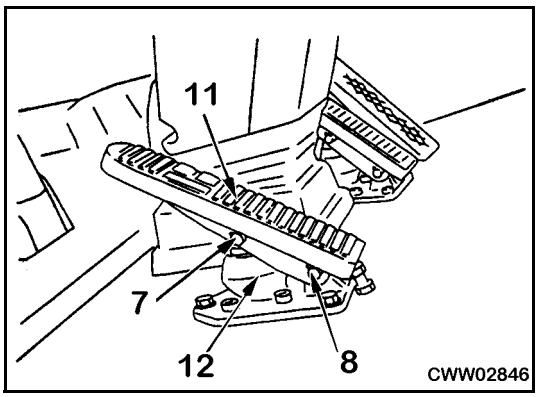
WARNING! Stop the machine on level ground and lower the work equipment completely to the ground, then put blocks under the wheels to prevent the machine from moving.

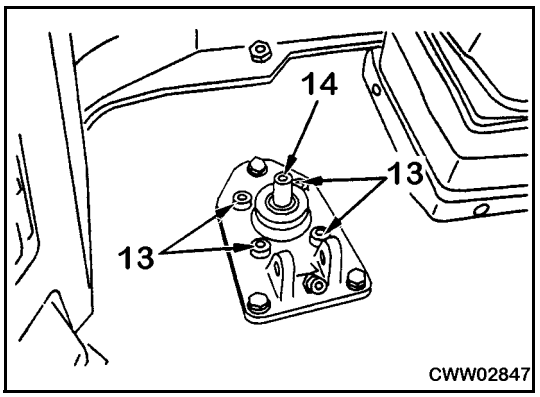


1. Remove the U-bolt, then disconnect drain tube (2).
   ★ Move the drain tube and hose toward the frame.
2. Disconnect hose (3) of the front brake.
3. Disconnect hose (4) of the shuttle valve.
4. Disconnect pilot hose (5) (of the shuttle valve).



5. Disconnect hose (6) of the accumulator.
6. Pull out snap pin (9), then pull out pins (7) and (8).
   ★ Be careful not to lose L-pin (10).
7. Remove pedal (11).
8. Remove boot (12).
9. Remove 4 bolts (13), then remove brake valve (14).
   ★ This work must be done by two workers. Remove the valve under the floor frame.



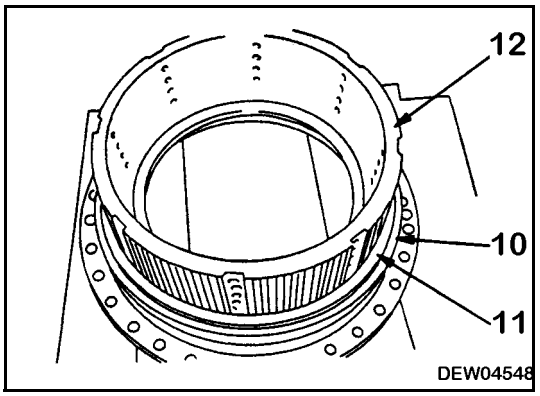


INSTALLATION

- Carry out installation in the reverse order to removal.
- Bleeding air
  Bleed air from the circuit. For details, see TESTING AND ADJUSTING, Bleeding air from each portion.

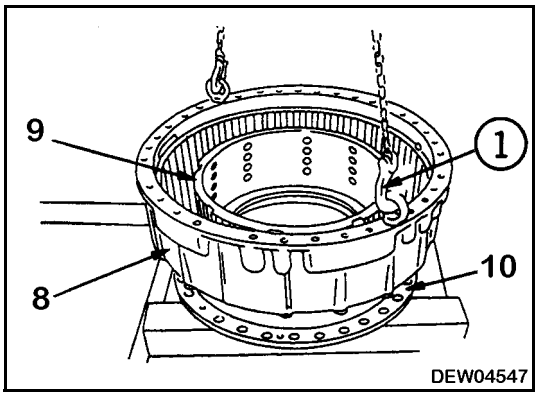
5. Fit O-ring to inner gear (9), align with dowel pin and install retainer (10) together with floating seal (11).

   ★ When installing the retainer to the inner gear, tap the end of face of the retainer with a copper hammer to install.
   ★ Use a new part for the O-ring.



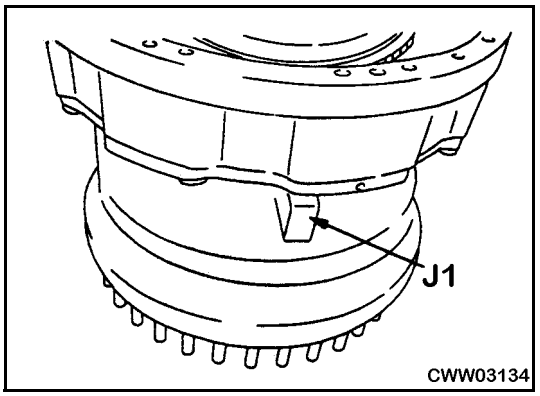
6. Using eyebolts ① (Dia. = 16 mm, Pitch = 2.0 mm), install outer drum (8) to inner gear.

   ★ Coat the sliding surface of the floating seal thinly with engine oil, and be careful not to damage the floating seal when installing the outer drum.
   ★ Center the inner gear and outer gear, and tighten with tool **J1**.



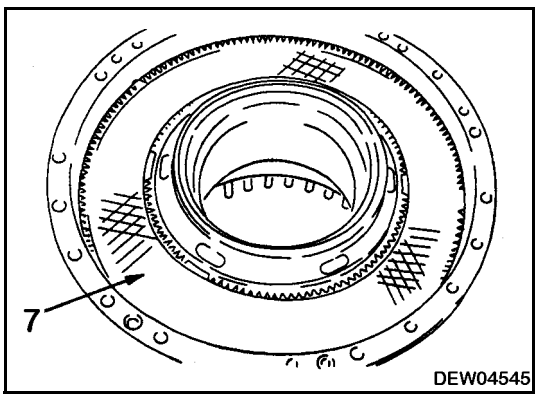
7. Using tool **J1**, fix inner gear and outer gear.

   ★ Center the inner gear and outer gear, and tighten with tool **J1**.



8. Assemble disc (7) and plate (6).

   ★ Align the notched teeth at 6 places around the circumference of the disc and plate when assembling.



INSTALLATION

- Carry out installation in the reverse order to removal.

※1

Mount bolt: Adhesive (LT-2)

Mount bolt: 490 - 608 Nm (361.40 - 448.437 lbf ft)

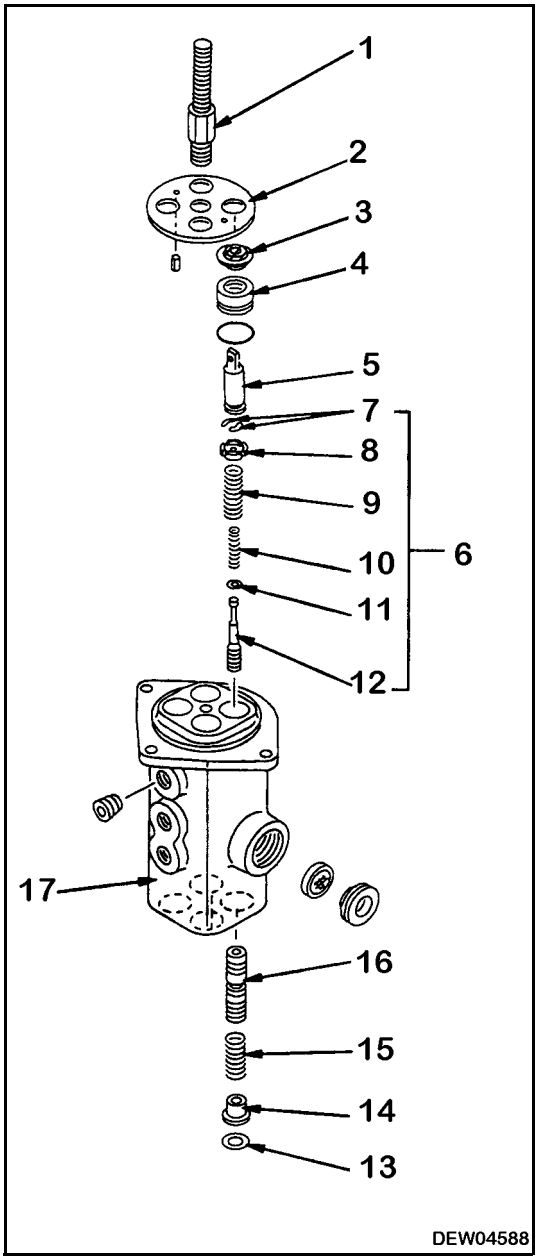
※2

Mount bolt: Adhesive (LT-2)

Mount bolt: 820 - 1030 Nm (604.8 - 759.68 lbf ft)

- Bleeding air
  Bleed air from the parking brake circuit. For details, see TESTING AND ADJUSTING.

DISASSEMBLY



1. Remove bolt (1), then remove plate (2).
2. Remove seal (3), then remove collar (4).
3. Remove piston (5).
4. Disassembly of piston

   Remove the following parts from piston assembly (6).

   A. Push down retainers (8), and remove collar (7).

   B. Remove retainers (8), main spring (9), spring (10), shim (11), and piston (12).
5. Remove snap ring (13).
6. Remove retainer (14), spring (15), and valve (16) from body (17).

ASSEMBLY

1. Assembly of piston

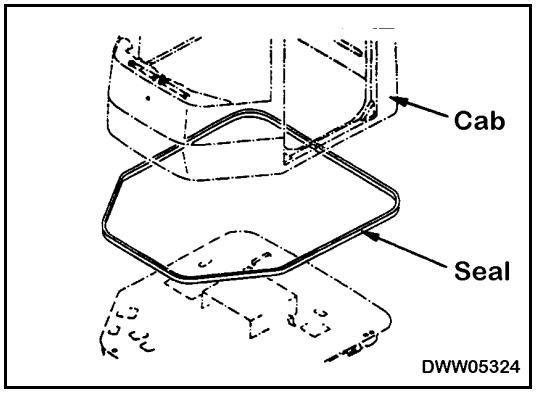
   Assemble the following parts to piston (12).

   A. Assemble shim (11), spring (10), and main spring (9).

   B. Push down retainer (8), and install collar (7).
2. Assemble valve (16), spring (15), and retainer (14) to body (17).
3. Install snap ring (13).
4. Assemble piston assembly (6) into PPC valve body.
5. Install piston (5), then install collar (4) and seal (3).
6. Align with dowel pin, and install plate (2), then install bolt (1).

N·m Bolt: 44.1 ± 4.9 Nm (32.52 ± 3.61 lbf ft)

INSTALLATION



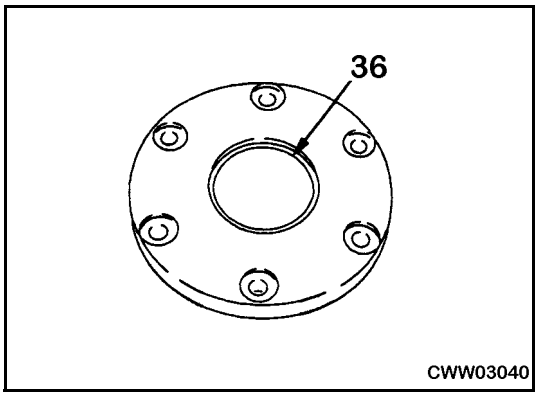
- Carry out installation in the reverse order to removal

※1

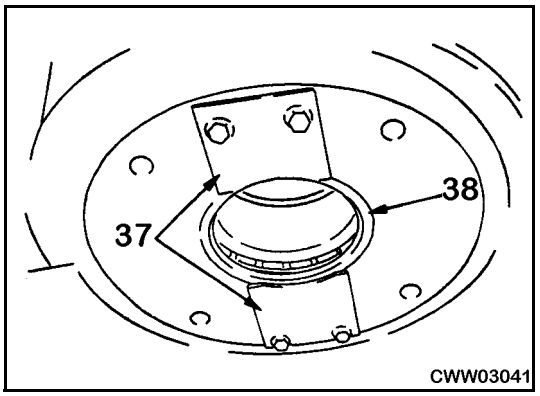
- When installing the cab assembly, do not forget to install the seal.
  - ★ Coat the seal uniformly with adhesive.

Seal: Adhesive (Cemedyne 366E)

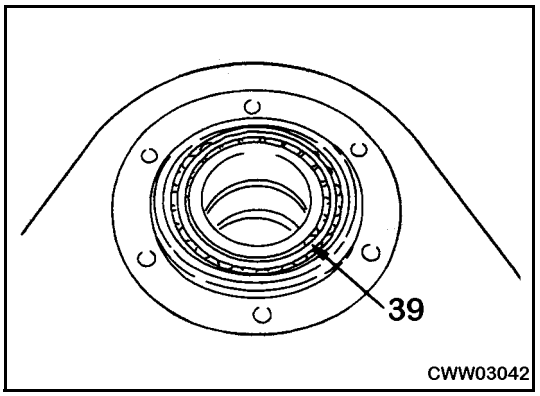
B. Remove dust seal (36) from retainer.



C. Remove plate (37) from front frame, then remove dust seal (38).



D. Remove bearing (39).



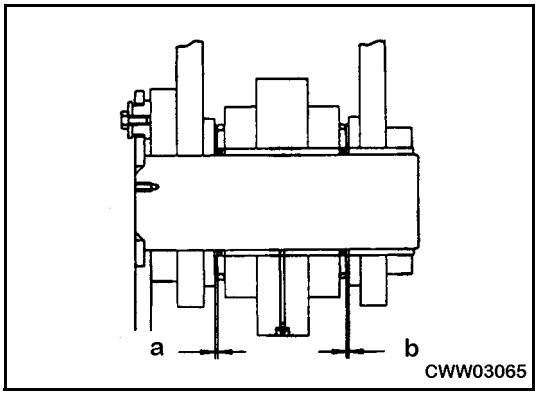
INSTALLATION

- Carry out installation in the reverse order to removal.

WARNING! When aligning the position of the pin hole, use a bar. Never put your fingers on the pin hole.

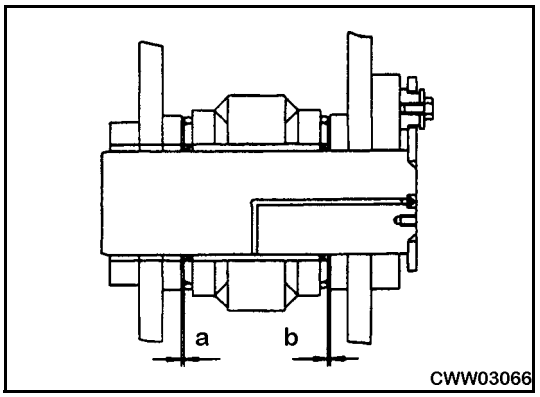
★ When installing the pins and bushings, apply grease to them.

Pin, bushing: Lubricant (G2-LI)



※1

★ Assemble shims evenly in **a** and **b**.
★ Reduce the clearance to below 1.5 mm.



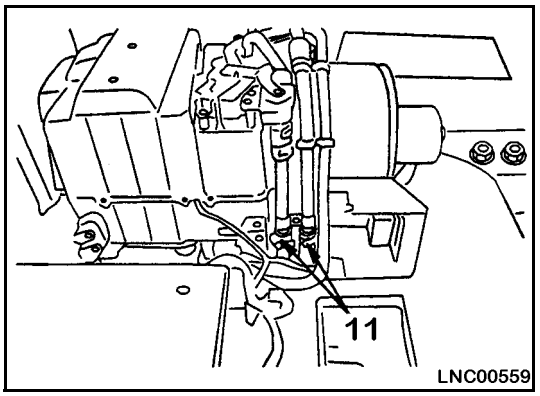
※2

★ Assemble shims evenly in **a** and **b**.
★ Reduce the clearance to 1.5 mm or less.

- Supplying grease
  Supply grease to each mounting portion.

11. Disconnect two heater hoses (11).

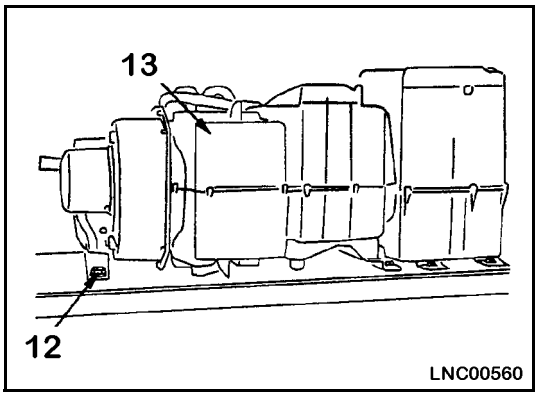
    ★ Be careful, since the tube on the unit side is soft.



12. Remove mount bolt (12), then remove air conditioner unit (13).

    ★ Remove the air conditioner unit by pulling it out to the left.

kg Air conditioner unit: 12.4 kg (27.33 lb)

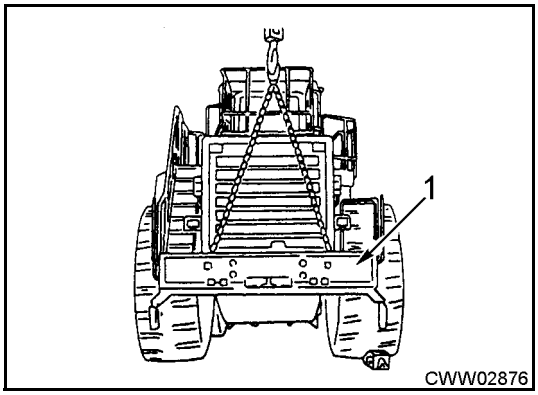


INSTALLATION

- Carry out installation in the reverse order to removal.
- Charging with gas
  Charge the air conditioner circuit with new Freon gas (R134a) by using refrigerant charger **X1**.

COUNTERWEIGHT

REMOVAL



WARNING! Stop the machine on level ground, install the safety bar on the frame, and put blocks under the wheels to prevent the machine from moving.

1. Sling counterweight (1), then remove mount bolts (2), and lift off. Keep spacers (3) for re-assembly.

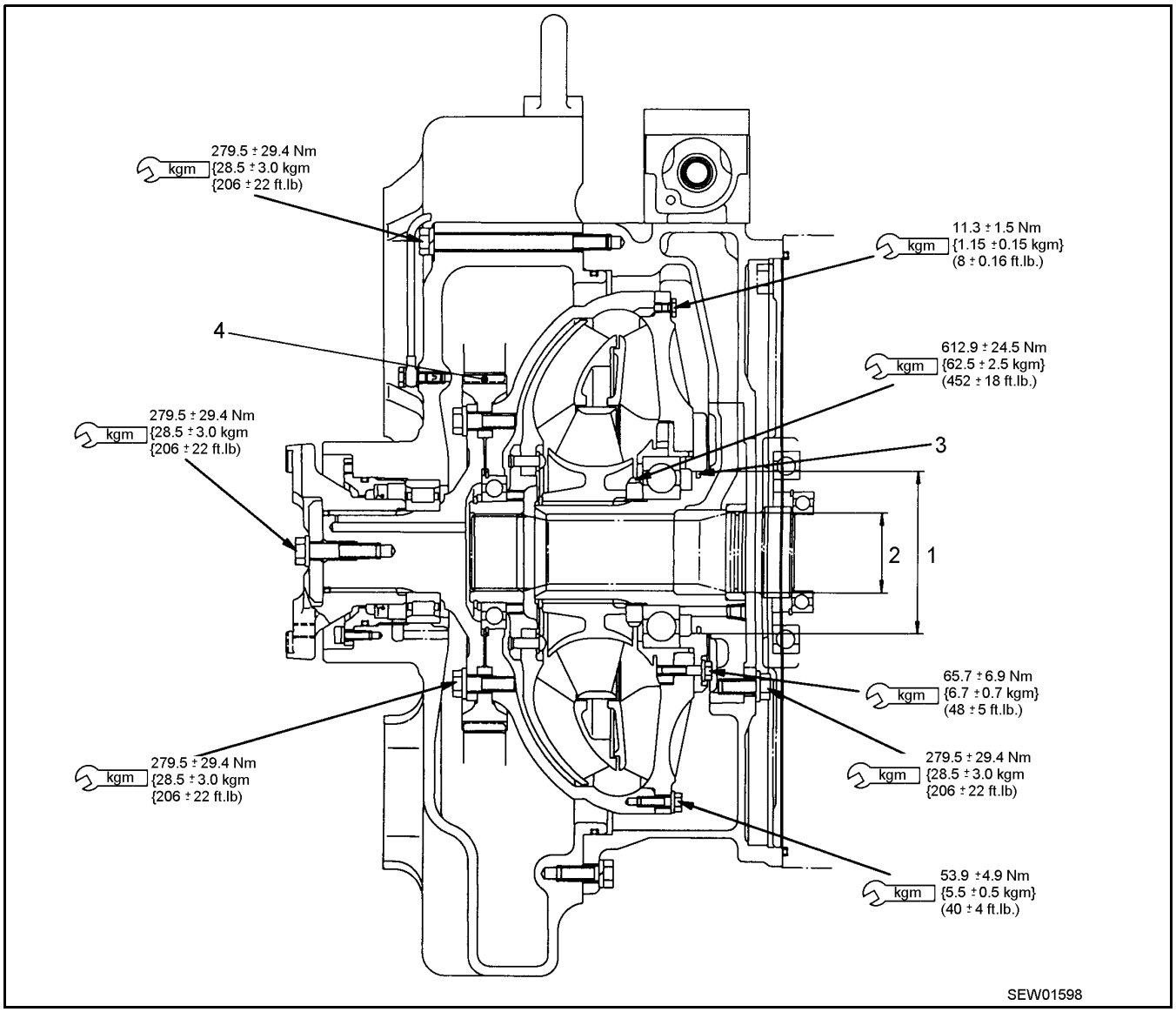
1

- When lifting off the counterweight, be careful to maintain balance.

kg

Counter204weight (1): 1600 kg (3527.4 lb)

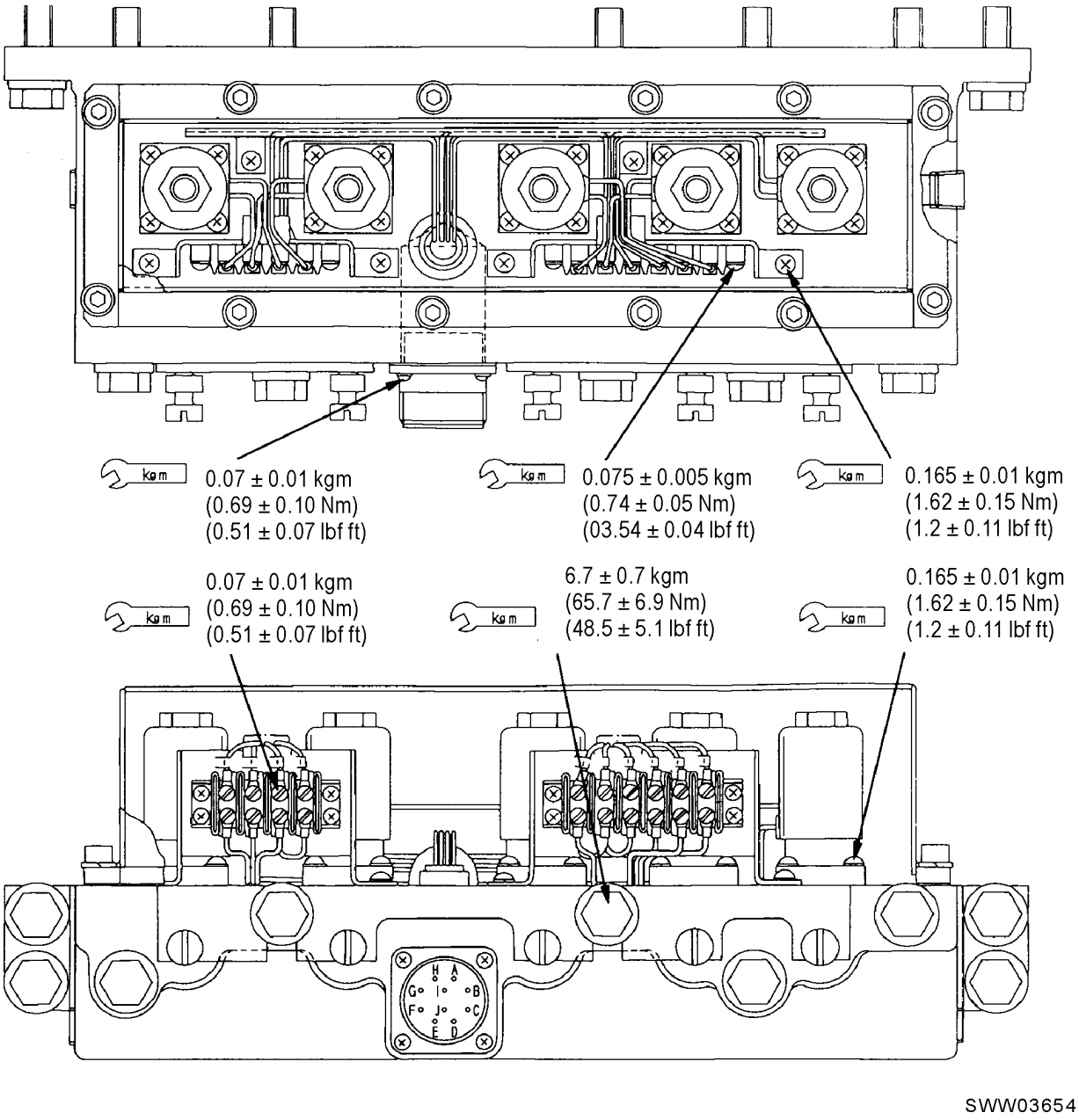
TORQUE CONVERTER



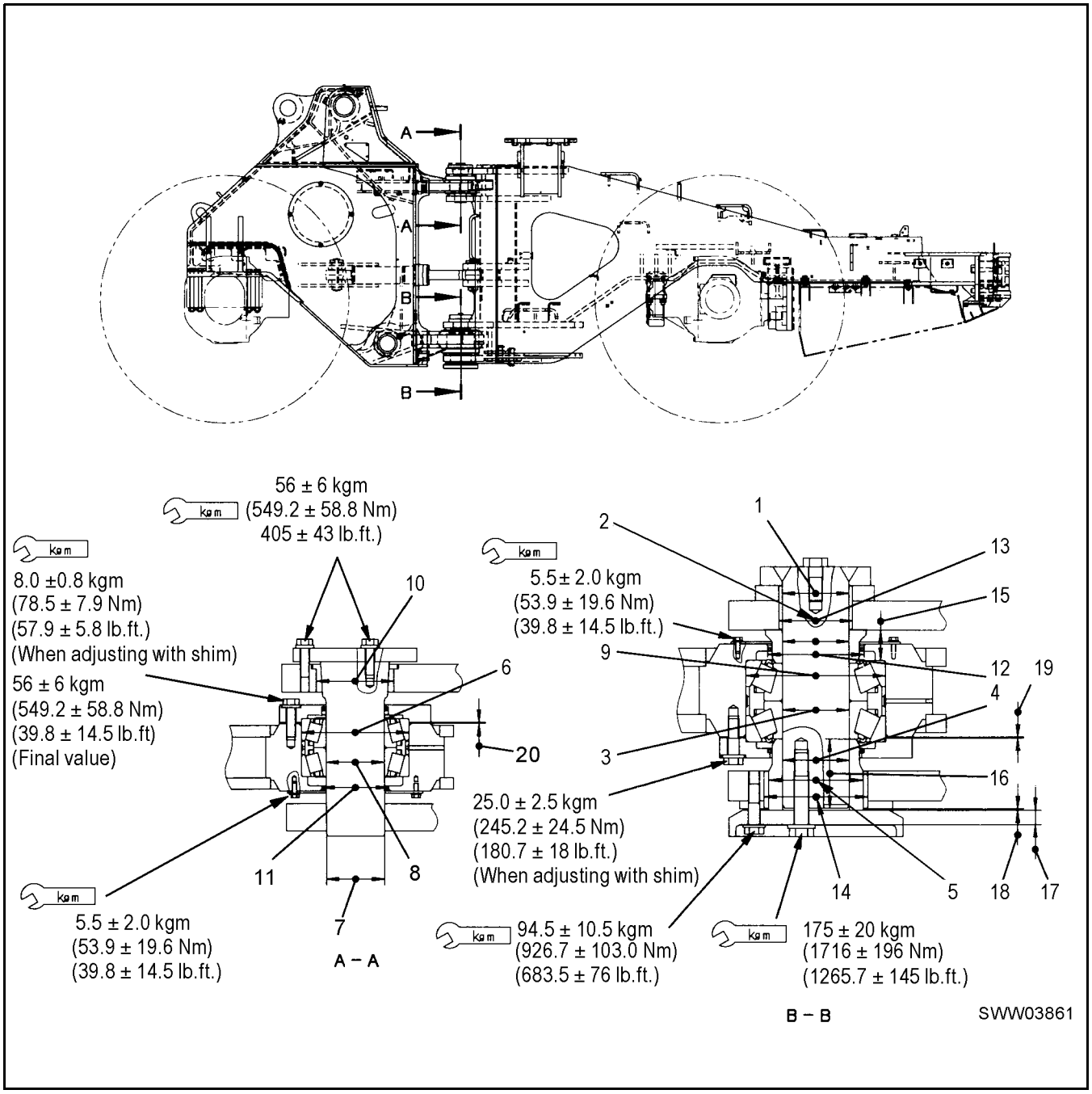
Unit: mm

	Check item		Criteria			Remedy
			Standard size	Tolerance	Repair limit	
1	Inside diameter of seal ring surface of retainer		170	+0.040 0	170.5	Repair chrome plating or replace
2	Inside diameter of seal ring surface of sleeve		85	+0.035 0	85.1	
3	Width and thickness of seal ring	Width	4.45	0 -0.1	4.05	Replace
		Thickness	6.0	±0.1	5.5	
4	Backlash of PTO gear (drive gear)		0.20 - 0.52			

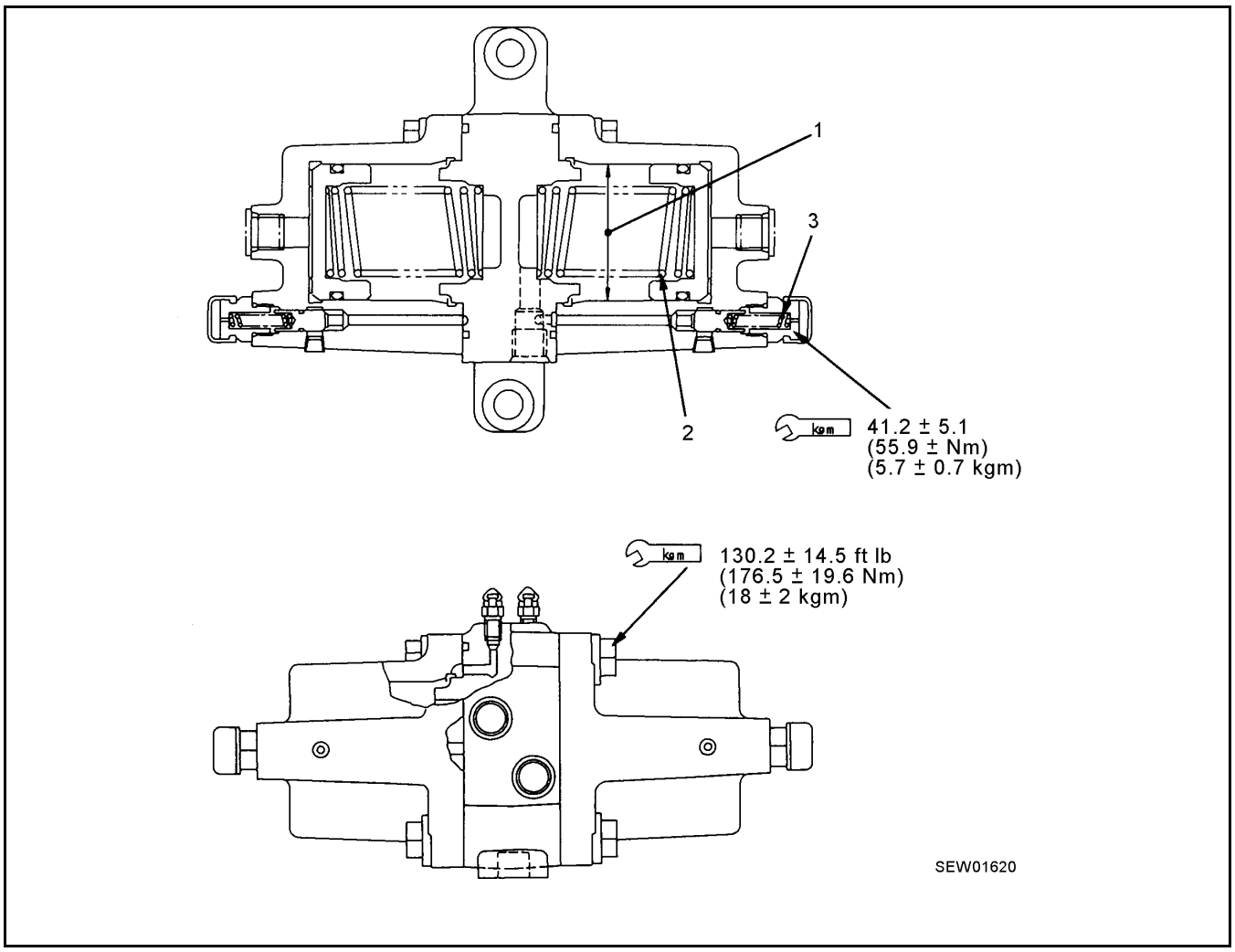
SOLENOID VALVE



CENTER HINGE PIN



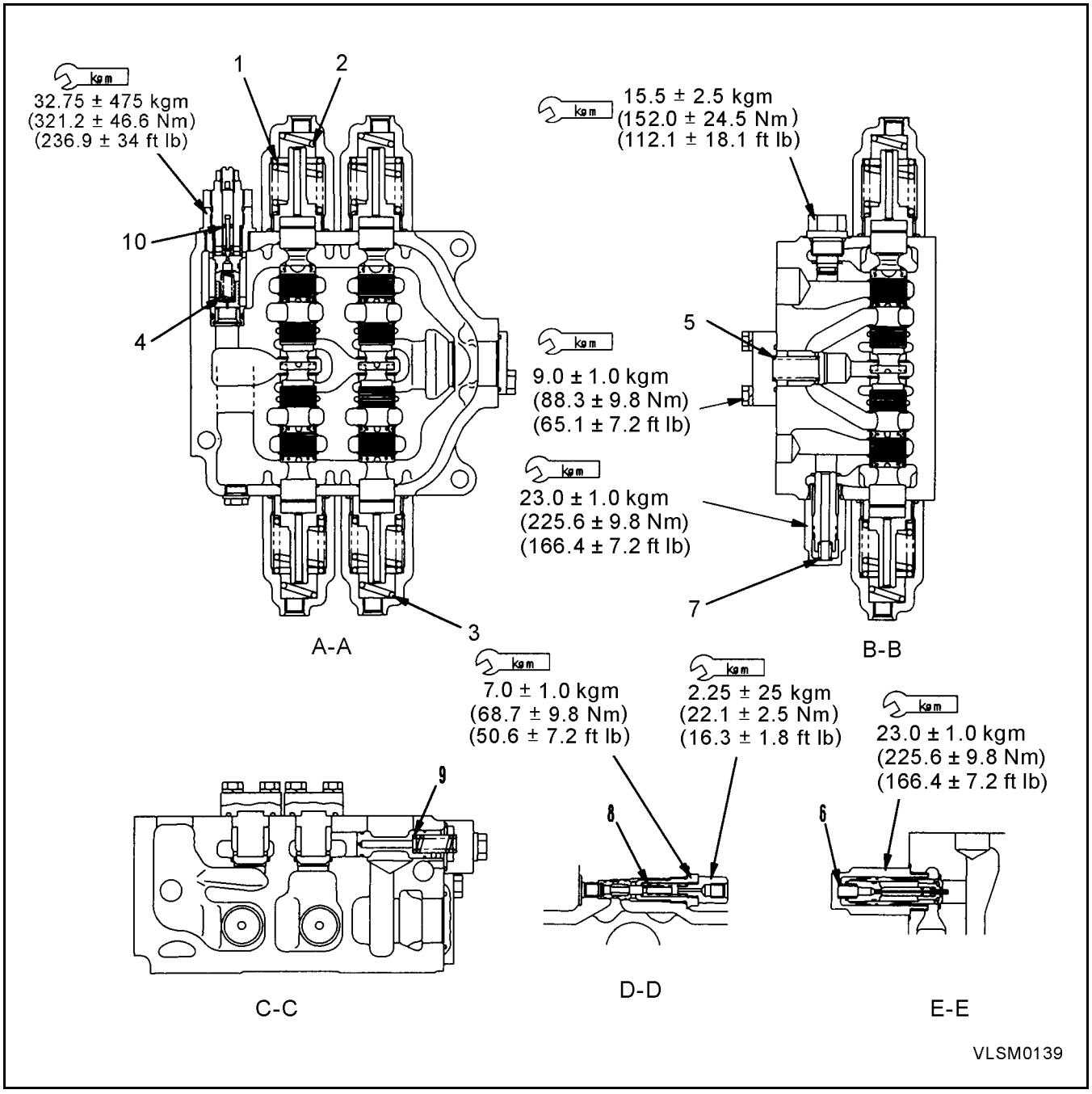
SLACK ADJUSTER



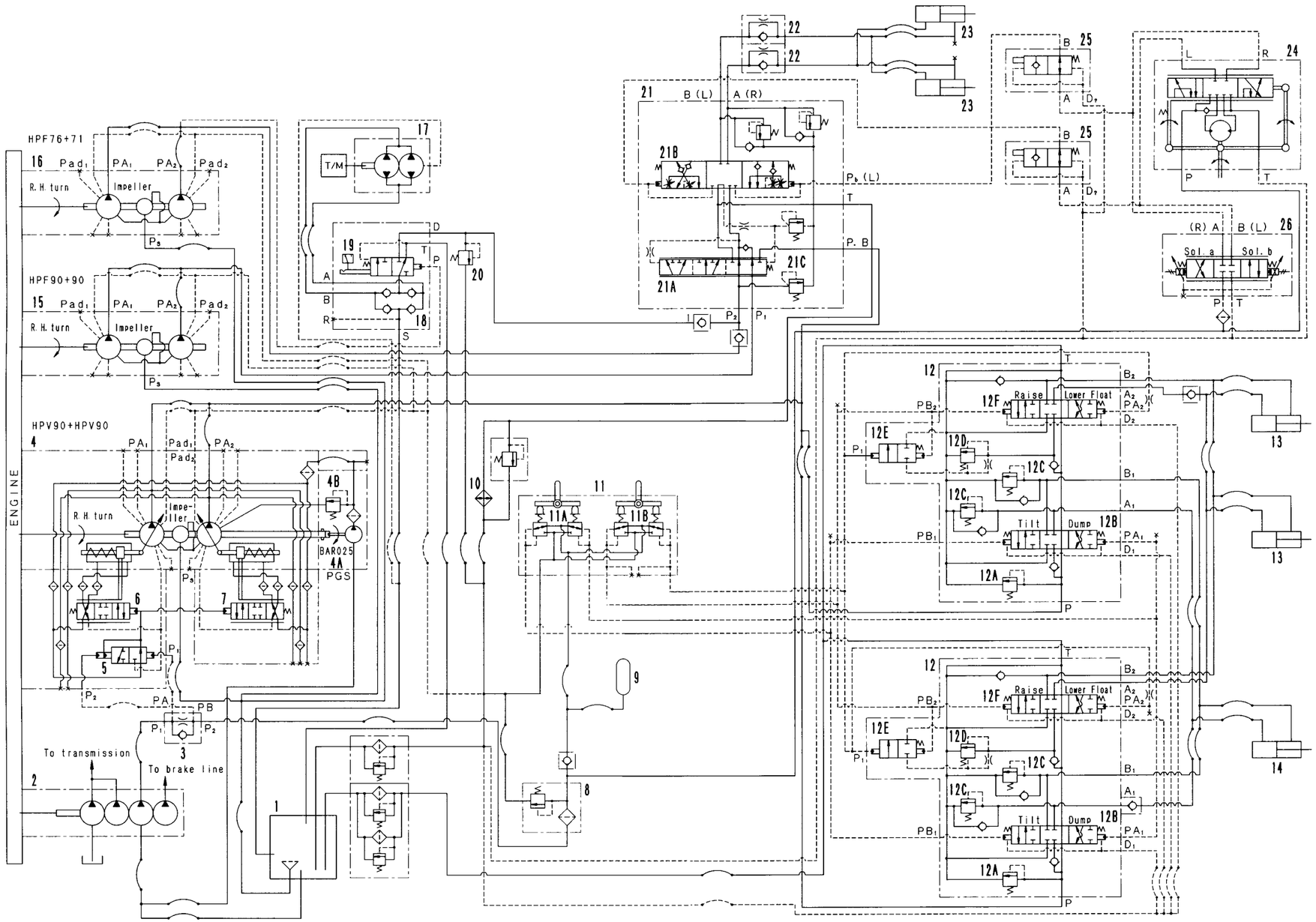
Unit: mm

	Check item	Criteria					Remedy
1	Clearance between body and piston	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		80	-0.030 -0.076	+0.074 0	0.030 - 0.150	0.250	
2	Slack adjuster spring	Standard size			Repair limit		
		Free length	Installation length	Installation load	Free length	Installation load	
		246	88	12 kg (117.7 N) (26.5 lb)	-	-	
3	Check valve spring	44.8	38	12.6 kg (123.6 N) (27.8 lb)	-	-	

MAIN CONTROL VALVE



FOLDOUT 10-107 HYDRAULIC CIRCUIT DIAGRAM



1. Hydraulic tank
2. Torque converter charging, PPC and brake pump
3. Differential pressure regulating valve
4. Main pump (HPV90 + HPV90)
   - 4A. Control pump (BAR025)
   - 4B. Relief valve
     (set pressure 30 kg/cm^2 (427 psi)
5. ES valve
6. Servo valve
7. Servo valve
8. PPC relief valve
   (set pressure 38 kg/cm^2 (540 psi)
9. Accumulator
10. Hydraulic oil cooler
11. PPC valve
12. Main control valve
    - 12A. Main relief valve
      (set pressure 320 kg/cm^2 (4551 psi))
    - 12B. Bucket spool
    - 12C. Safety valve (with suction valve)
      (set pressure 375 kg/cm^2 (5334 psi))
    - 12D. Unloader valve
    - 12E. Float selector valve
      (set pressure 33.5 ± 0.5 kg/cm^2
      (475.4 ± 7.1 psi))
13. Boom cylinder
14. Bucket cylinder
15. Switch pump (HPF90 + HPF90)
16. Steering pump (HPF76 + HPF71)
17. Ground driven steering pump (SAM(3)100 + 100)
18. Diverter valve
19. Emergency lamp switch
20. Emergency relief valve
    (set pressure 210 kg/cm^2 (2987 psi))
21. Steering demand valve
    - 21A. Demand spool
    - 21B. Steering spool
    - 21C. Steering relief valve
22. Two-way restrictor valve
23. Steering cylinder
24. Steering unit (Orbit-roll valve)
25. Stop valve
26. Solenoid valve (with joystick steering)

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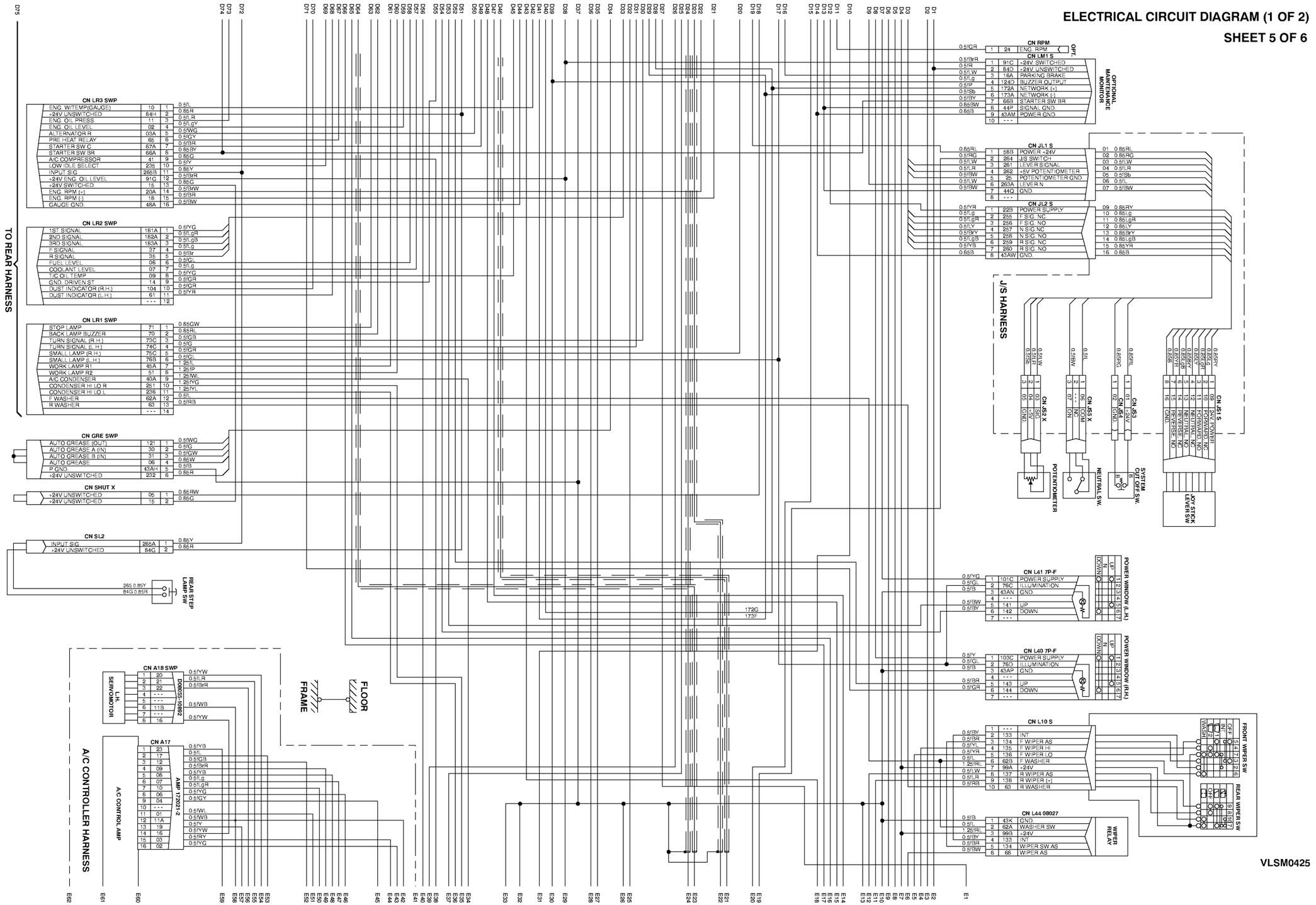
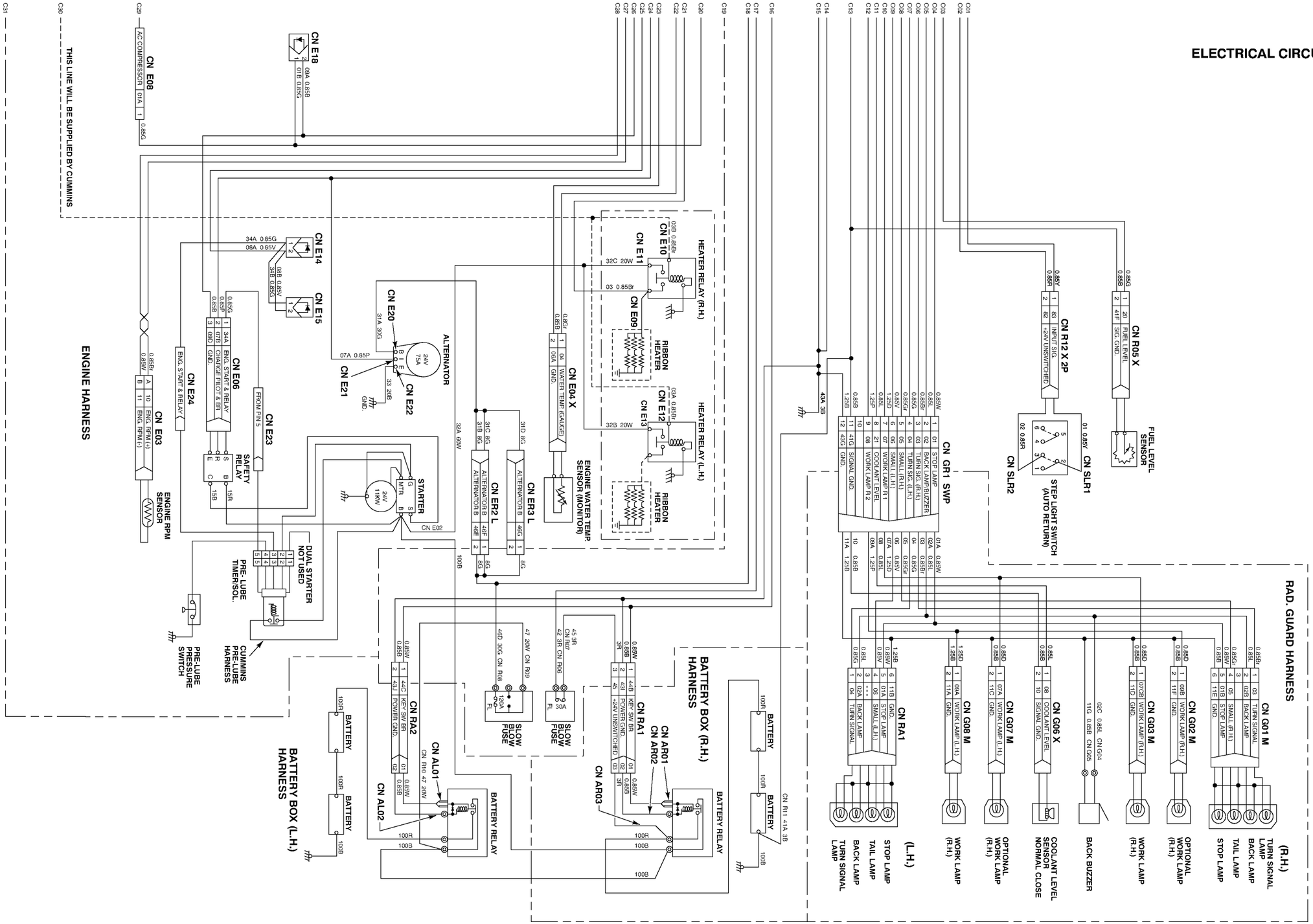
ELECTRICAL CIRCUIT DIAGRAM (1 OF 2)

SHEET 5 OF 6



ELECTRICAL CIRCUIT DIAGRAM (2 OF 2)
SHEET 4 OF 4



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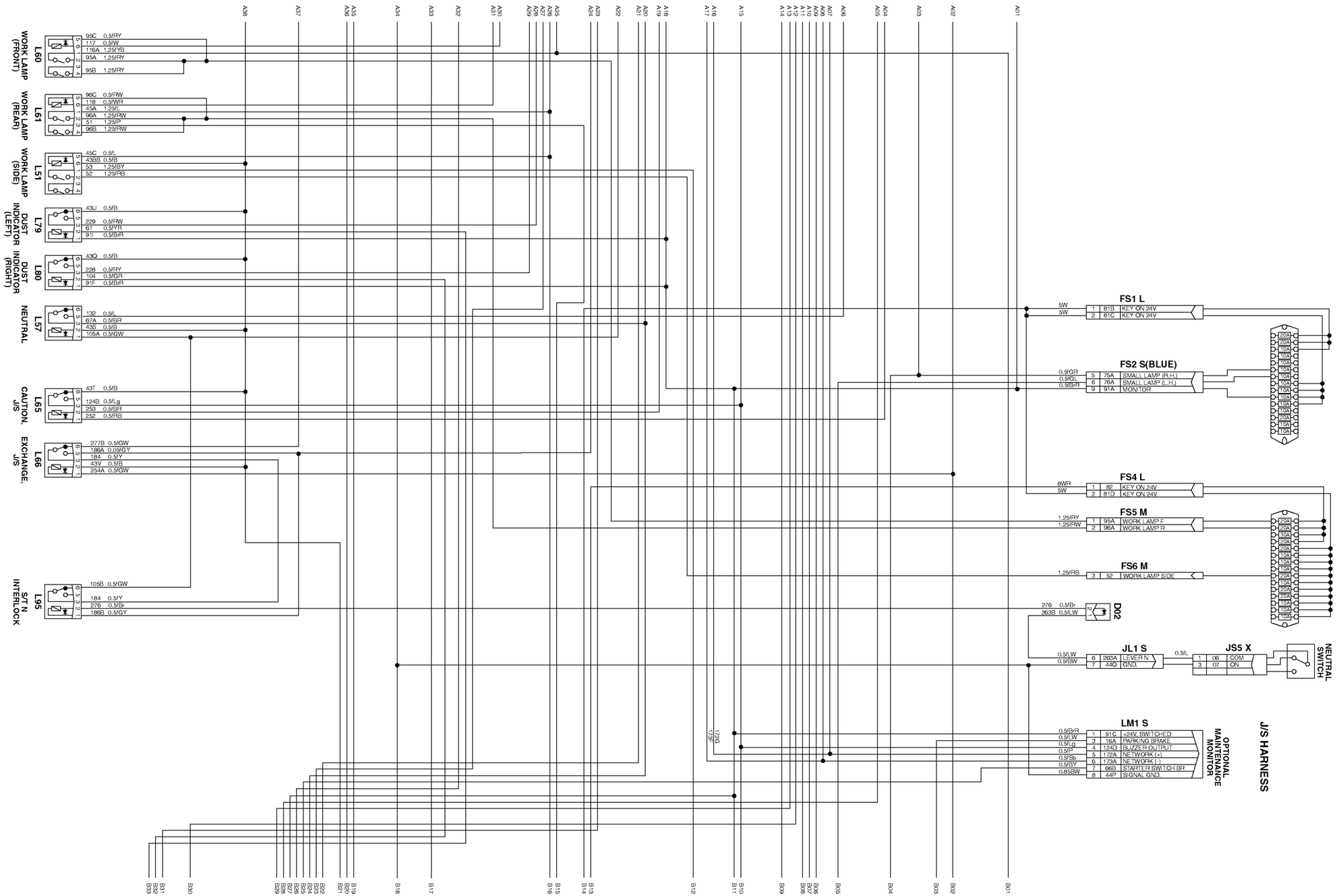
FOLDOUT 20-505 ELECTRCIAL CIRCUIT DIAGRAM FOR MAIN MONITOR SHEET 2 OF 4



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