SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

⚠ This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

- ⚠ **CAUTION:**
  Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
  Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

- *NOTE:*
  Indicates supplementary technical information or know-how.

UNITS USED

- SI Units (International System of Units) are used in this manual.
  MKS system units and English units are also indicated in parenthheses just behind SI units.
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

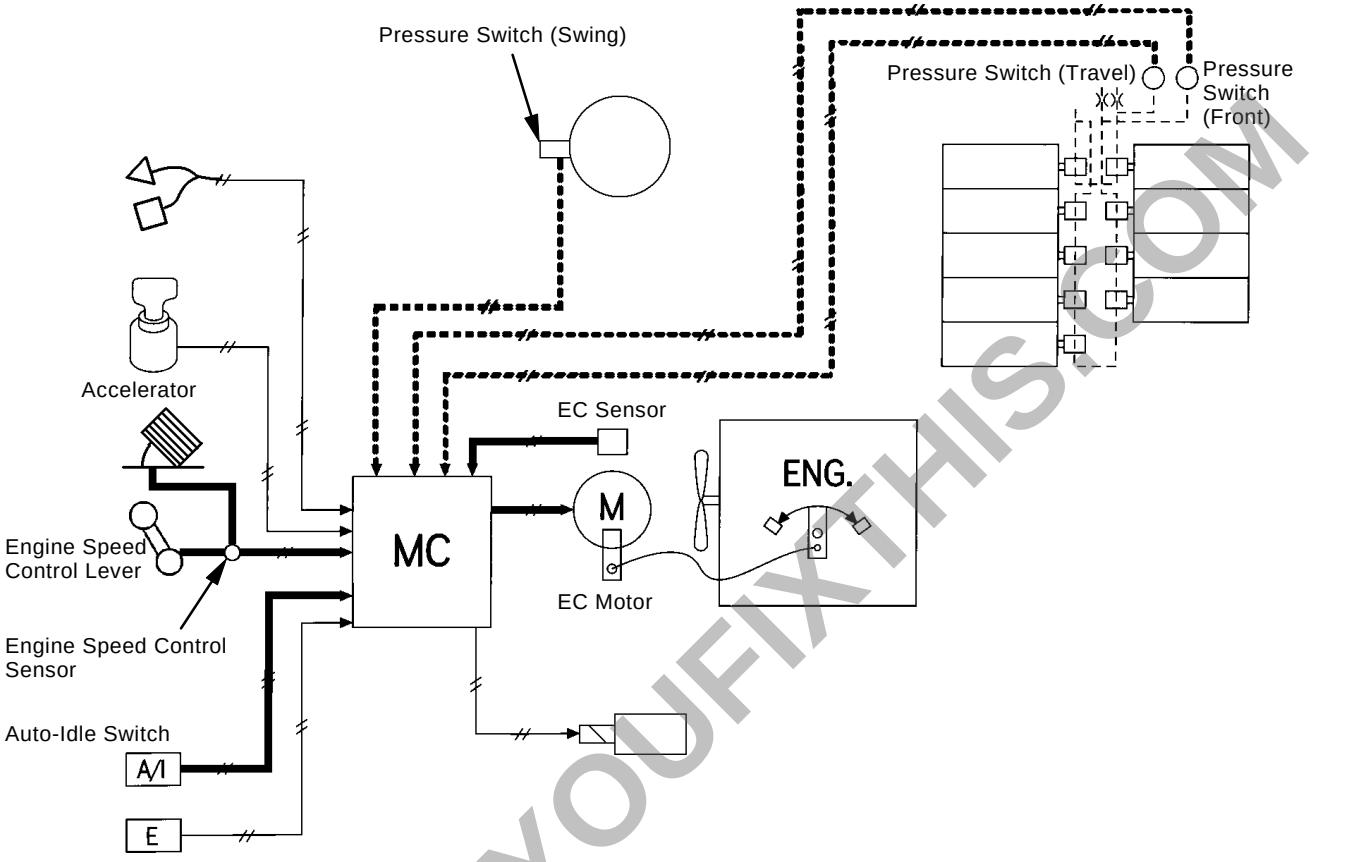
  A table for conversion from SI units to other system units is shown below for reference purposees.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm^2	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m^3	yd^3	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min^{-1}	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

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EX75UR-3 and EX75URLC-3:



T192-02-01-004

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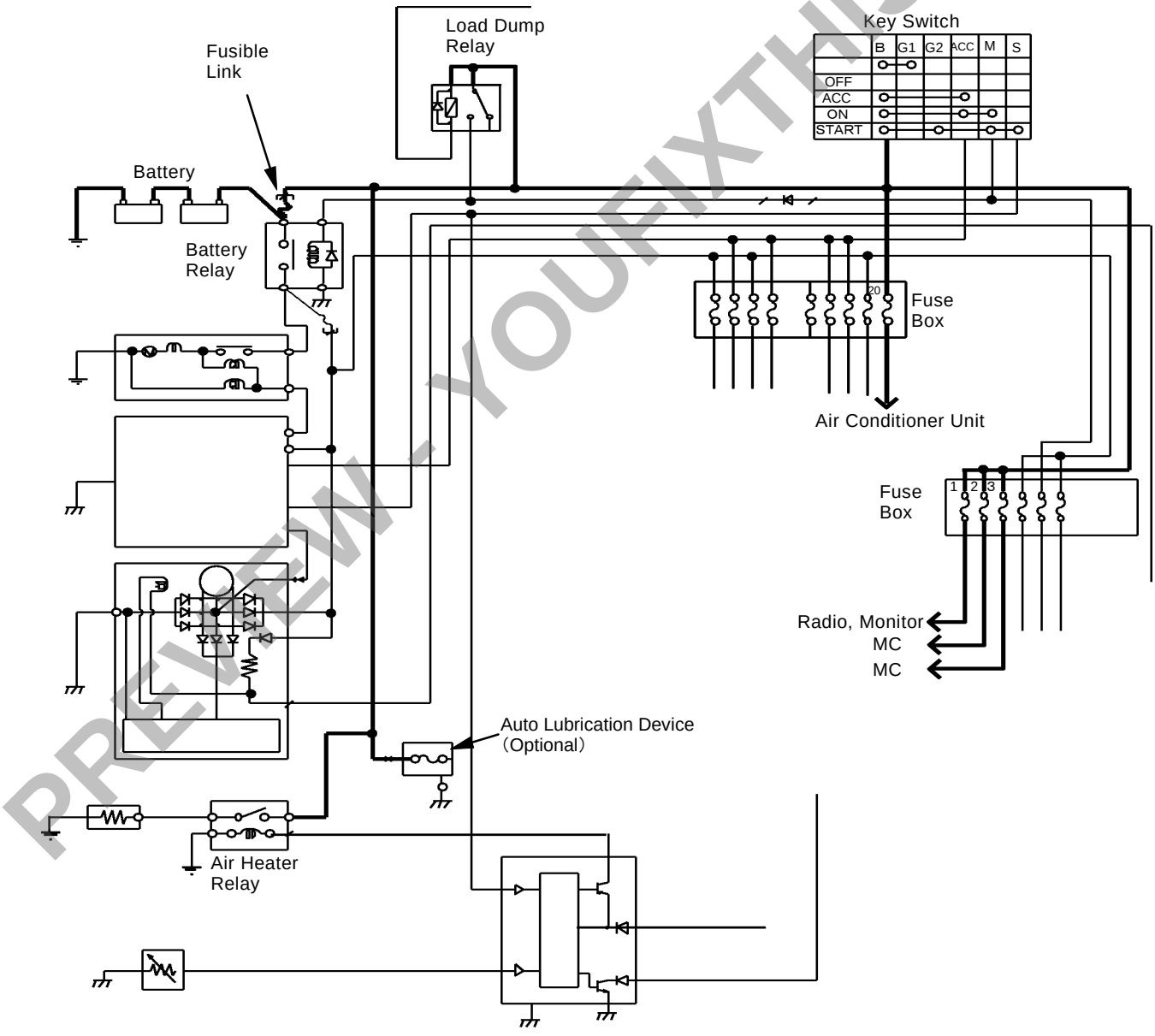
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POWER CIRCUIT (Key Switch: OFF)

The battery negative terminal is grounded to the vehicle frame. With the key switch turned in the OFF position, electrical current from the battery positive terminal flows as follows:

- EX60-5:

Battery→Fusible Link → {→Air Heater Relay (Power Source); →Key Switch Terminal B; →Load Dump Relay; →Fuse Box} → {Terminal #1→ Radio (back-up power source), Monitor (back-up power source); Terminal #2→ MC power source; Terminal #3→ MC (EC Motor); Terminal #20→ Air conditioner unit}

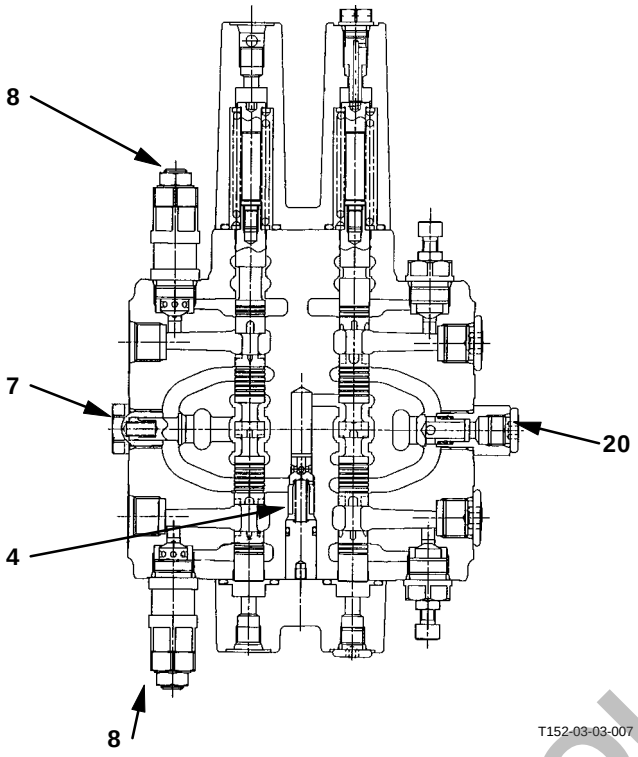


T152-02-03-001

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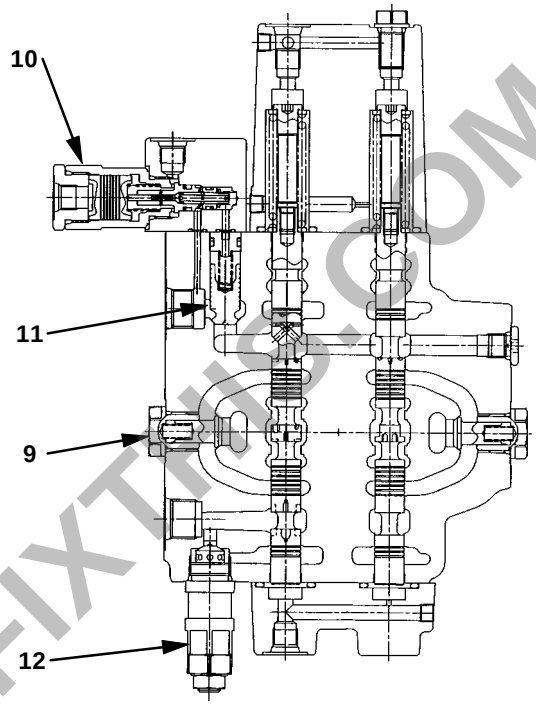
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Section D



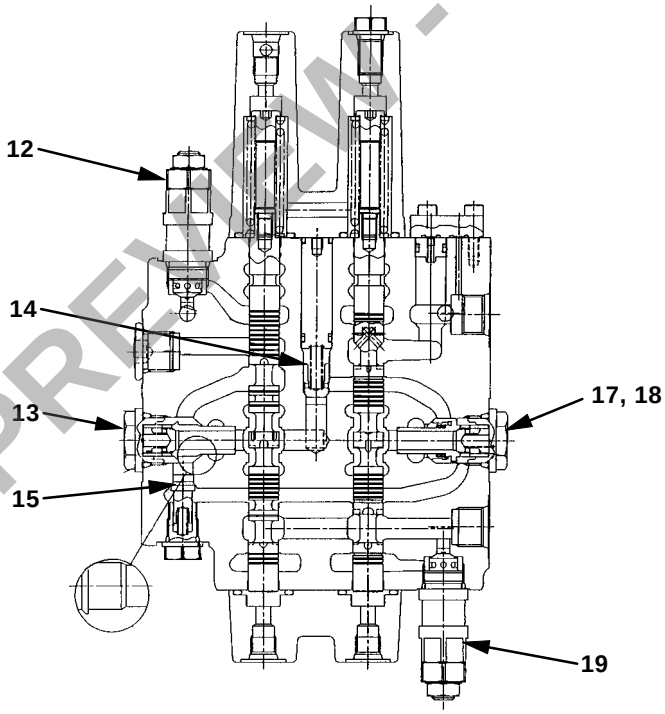
T152-03-03-007

Section E



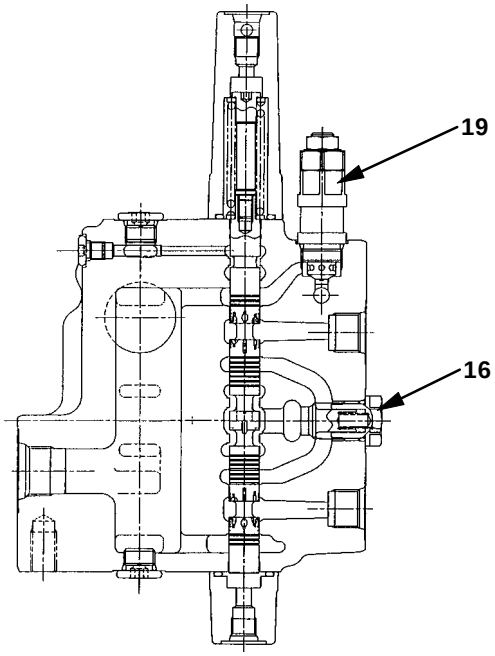
T152-03-03-006

Section F



T152-03-03-008

Section G



T152-03-03-009

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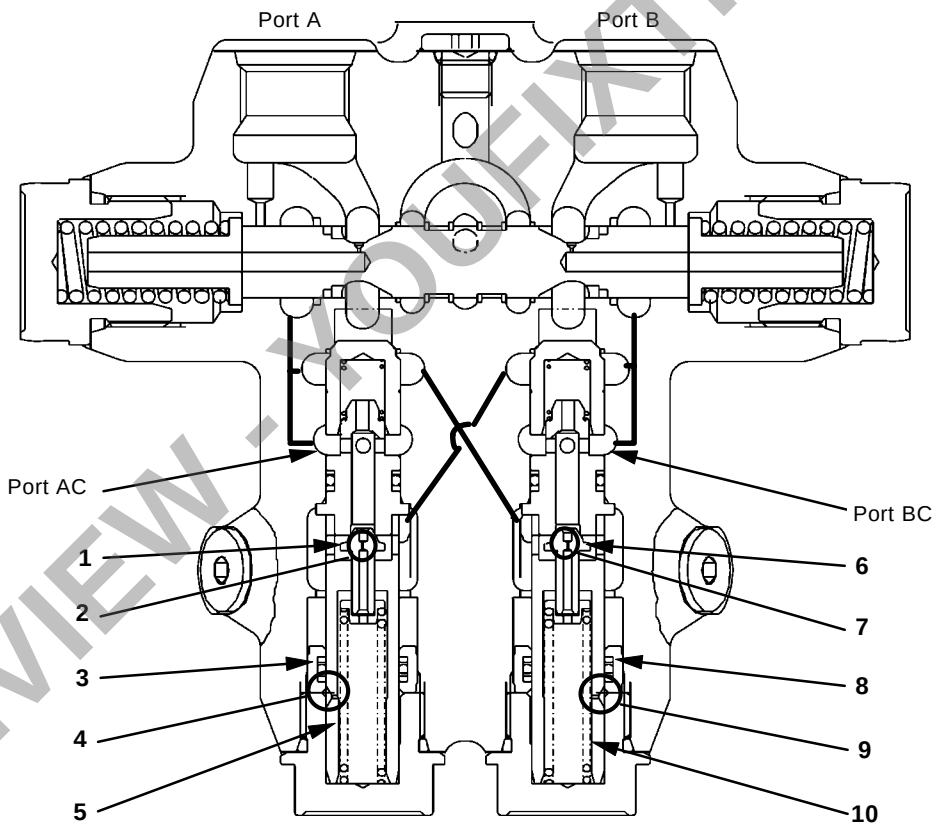
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Circuit Protection

Hydraulic pressure oil in the travel circuit is guided to poppet 1 via port AC (EX75UR-3: port AM). Pressure oil is further routed to the bottom side of piston (3) through orifices (2 and 4) to move piston (3) upward. As long as piston (3) is moving, a pressure difference arises between the upper and lower sides of poppet (1). When the pressure difference overcomes spring (5) force, poppet (1) opens, allowing hydraulic oil pressure to relieve to port B side. When piston (3) moves full stroke and the pressure difference between the upper and lower sides of poppet (1) is reduced, poppet (1) closes until the hydraulic circuit pressure reaches the relief set pressure.

When the circuit pressure reaches the relief set pressure (spring (5) set pressure), poppet (1) opens to relive the hydraulic oil.
As described above, the system relief functions in two stages, reducing shocks developed when the travel motor starts or stops.

- EX60-5, EX75URLC-3:



T152-03-05-004

1 - Poppet
2 - Orifice
3 - Piston
4 - Orifice
5 - Spring
6 - Poppet
7 - Orifice
8 - Piston
9 - Orifice
10 - Spring

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SECONDARY PILOT PRESSURE

Preparation:

1. Stop the engine.
2. Press the air release valve on the filler cap to release any remaining pressure.
3. Install tee (ST 6450) and pressure gauge (ST 6942) to the control valve spool pilot port located in the pilot circuit to be measured.
   : 14 mm, 17 mm
4. Start the engine and check the pressure gauge connection for oil leaks.
5. Maintain hydraulic oil temperature at 50±5 °C (122±9 °F).

Measurement:

CAUTION: Before measuring, check that there are no obstacles or personnel within the swing radius. When measuring the boom lower pilot pressure, raise the machine off the ground while paying attention not to allow the base machine (counterweight) to contact with the ground. Be careful not to tip-over due to a loss of balance.

1. Select the following switch positions:

Engine Control Dial / Lever	E Mode Switch	Auto-Idle Switch
Fast Idle / Max. Position	OFF	OFF
Slow Idle / Min. Position	OFF	OFF

2. Measure the pilot pressure with the corresponding control lever operated full stroke.

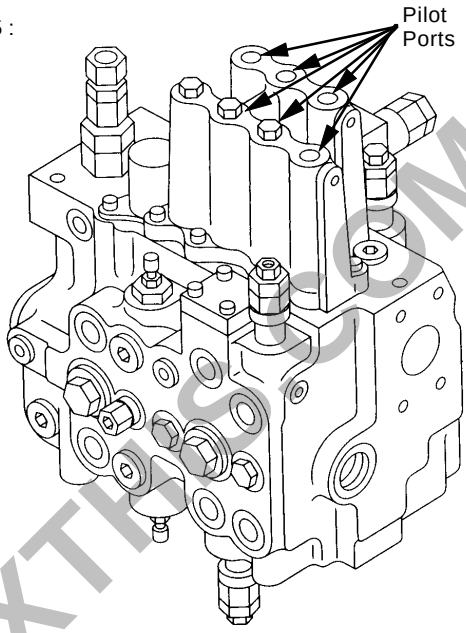
NOTE: The travel spools are not actuated by the pilot pressure oil.

3. Repeat the measurement three times and calculate the average values.

Evaluation:
Refer to Performance Standard Table in Group T4-2.

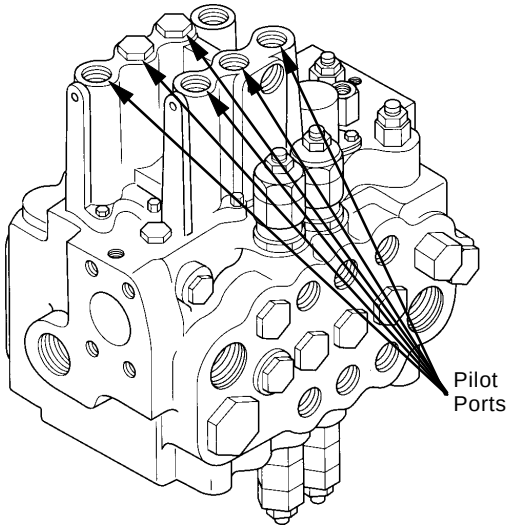
Remedy:
Refer to Troubleshooting B in Groupe T5-4.

EX60-5 :

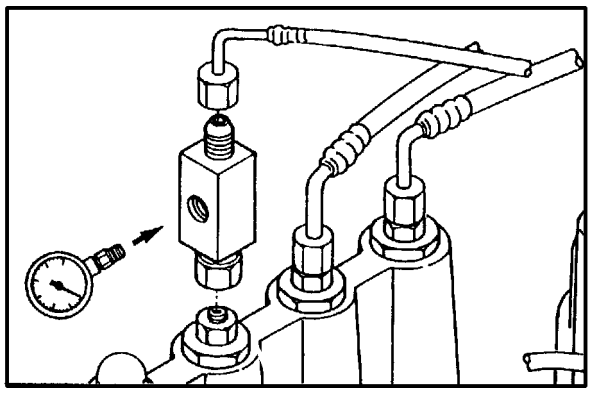


T152-03-03-016

EX75UR-3, EX75URLC-3 :



T192-03-03-001



T157-05-04-011

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NOTE: The trouble symptoms in this table are described provided that each trouble occurs independently.
In case more than one trouble occurs at the same time, find out all faulty components while checking all suspected components in each trouble symptom.

E-5	E-6	E-7	E-8	E-9
Even if key switch is turned OFF, engine doesn't stop.	Auto-idle system is inoperable.	Even if E mode switch is depressed engine speed remains unchanged.	Engine stalls within several seconds after engine has started.	Engine is difficult to start at low temperature.
○	○	●		
				●
○	○	○		
○		○		
	●			
	●			
	●			
○				
○				
	●			
		●		
○			●	
				●
				●
○				

● : Related, required to check
○ : Related. However, in case this component fails, other trouble symptom will be more noticeable so that this component will not be the direct cause of the trouble concerned.

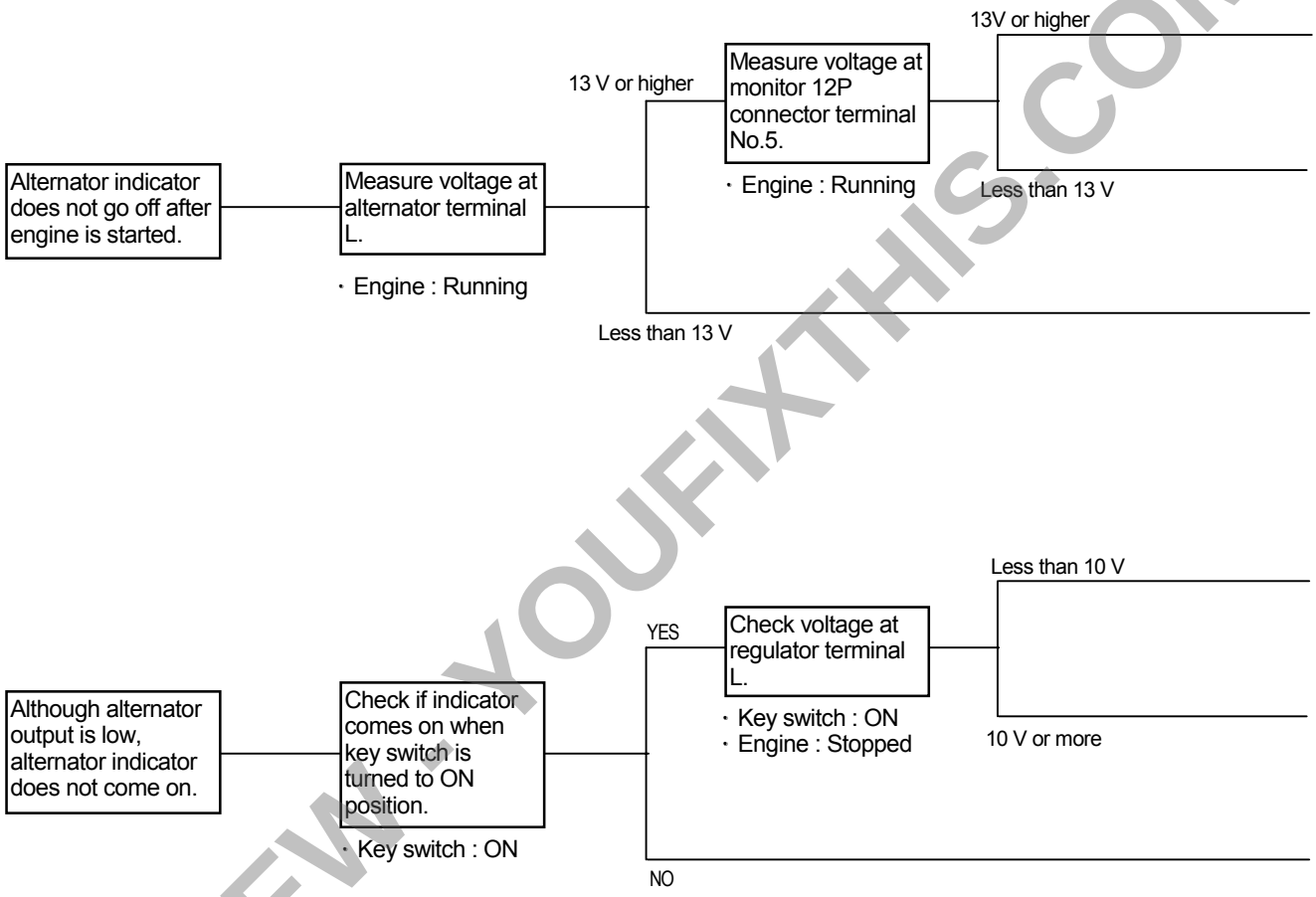
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MALFUNCTION OF ALTERNATOR INDICATOR

- Check for loose harness connections beforehand.

EX60-5



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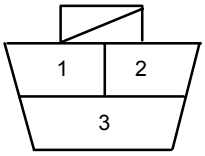
FAULT CODE 80 (BOOM ANGLE SENSOR DEVIATION)
FAULT CODE 81 (ARM ANGLE SENSOR DEVIATION)
FAULT CODE 82 (OFFSET ANGLE SENSOR DEVIATION)

- Fault code 80 is displayed when signal voltage sent out of the boom angle sensor to the auto-MARCCINO control unit is in the range of either 0.1 to 0.222 V or 4.778 to 4.9 V.
- Fault code 81 is displayed when signal voltage sent out of the arm angle sensor to the auto-MARCCINO control unit is in the range of either 0.2 to 1.079 V or 3.921 to 4.8 V.
- Fault code 82 is displayed when signal voltage sent out of the offset angle sensor to the auto-MARCCINO control unit is in the range of either 0.2 to 0.817 V or 4.183 to 4.8 V.
- Check for loose harness connections beforehand.

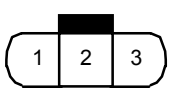


Connectors (Harness End Connector Viewed from the Open Side.)

Boom Angle Sensor



Arm Angle Sensor, Offset Angle Sensor



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BEWARE OF EXHAUST FUMES

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

- If you must operate in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.

509-E01A-0016



SA-016

AVOID HEATING NEAR PRESSURIZED FLUID LINES

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders.

- Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.
- Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fire-resistant guards to protect hoses or other materials before engaging in welding, soldering, etc..



SA-030

AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

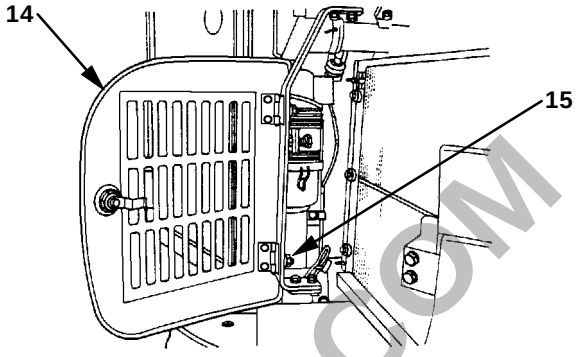
- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Clean them thoroughly with nonflammable solvent before welding or flame cutting them.

510-E01B-0030

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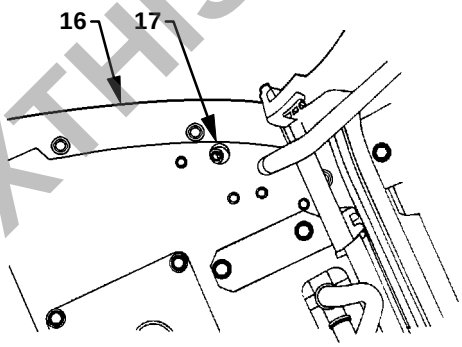
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9. Remove cover-mounting bolts (15) (2 used) to remove cover (14), located in front of the radiator.
   : 17 mm



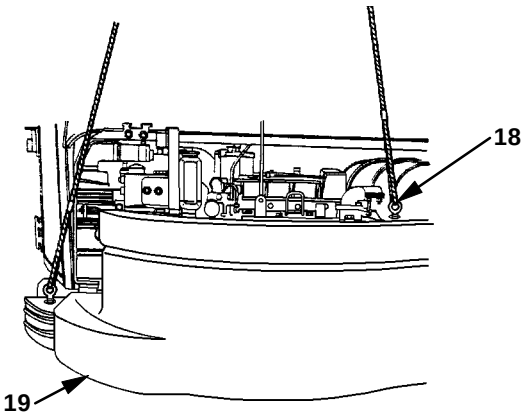
W190-02-02-009

10. Remove cab-side-cover-mounting bolts (17) (7 used; upper 3 used and lower 4 used) to remove cab-side cover (16).
    : 8 mm



W190-02-02-010

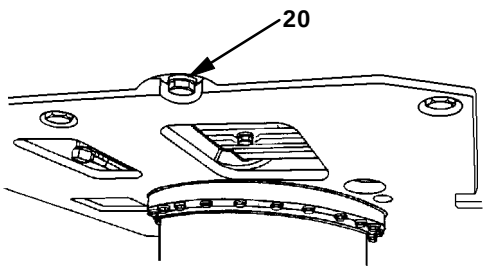
11. Attach eye-bolts (18) onto counterweight (19). Attach wire ropes to the eye-bolts. Use a crane to support the counterweight.



W190-02-02-012

CAUTION: Counterweight weight: 1100 kg (2425 lb).

12. Remove counterweight-mounting bolts (20) (3 used). By crane, lift the counterweight slightly, slide it rearward to remove it.
    : 41 mm



W190-02-02-013

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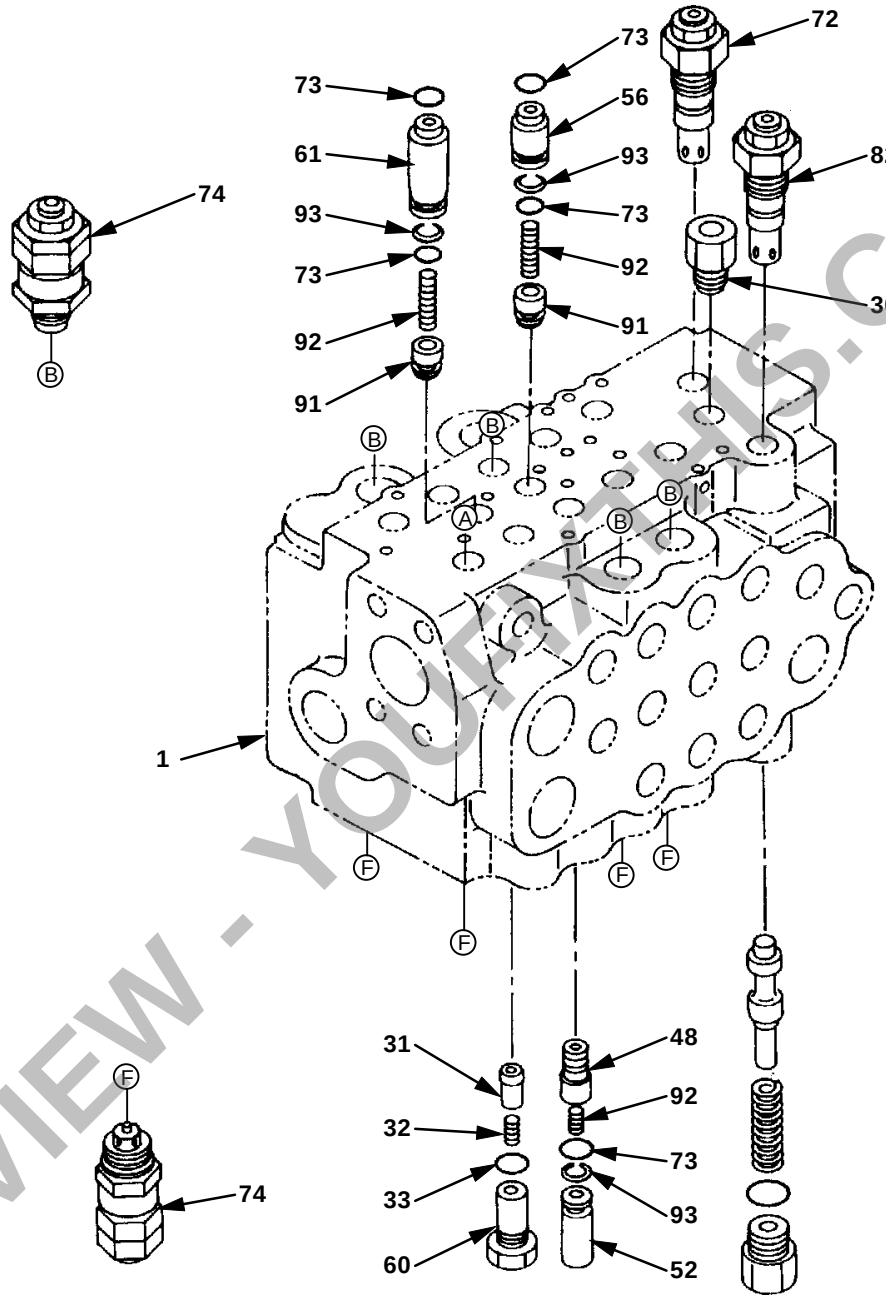
Key No.	Parts Name	Q'ty	Width Across Flats	Tightening Torque			Note
				N·m	(kgf·m)	(lbf·ft)	
1	Coupling	1					
2	Bushing	1					
3	O-Ring	1					
4	Frame	1					
5	Pin	4					
6	Ring	2					
7	Joint	2					
8	Side Frame	2					
9	Metal	4					
10	Drive Gear	1					
11	Side Frame	2					
12	Guide	2					
13	Casing	1					
14	O-Ring	2					
15	Plate	1					
16	Driven Gear	1					
17	Socket Bolt	2	: 8 mm	55 to 69	(5.6 to 7.0)	(41 to 51)	
18	Socket Bolt	2	: 6 mm	28 to 35	(2.9 to 3.6)	(21 to 26)	
19	Metal	4					
20	Backup Ring	1					
21	Ring	1					
22	Drive Gear	1					
23	Pin	2					
24	Socket Bolt	4	: 6 mm	29.0	(3.0)	(22)	
25	Housing	1					
26	Driven Gear	1					
27	Side Frame	1					
28	O-Ring	1					
29	Frame	1					
30	O-Ring	1					
31	Coupling	1					
32	Socket Bolt	4	: 8 mm	69.0	(7.0)	(51)	
33	Plate	1					

Clean the exterior of the gear pump before disassembling.

Before assembling, clean each part with a cleaning solvent and dry with compressed air. Apply a film of hydraulic oil to inner parts. Especially, be sure to apply hydraulic oil to sliding surfaces to prevent seizure.
Always replace O-rings and oil seals with new ones when reassembling.

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W192-02-05-010

1 - Housing
30 - Plug
31 - Poppet
32 - Spring
33 - O-Ring (3 Used)
48 - Poppet
52 - Plug
56 - Plug
60 - Plug
61 - Plug
72 - Main Relief Valve (High Pressure)
73 - O-Ring (5 Used)
74 - Overload Relief Valve (8 Used)
82 - Main Relief Valve (Low Pressure)
91 - Poppet (2 Used)
92 - Spring (3 Used)
93 - Backup Ring (3 Used)

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Disassemble Swing Motor (EX60-5)

- Be sure to thoroughly read all precautions for disassembly/assembly work on page W1-1-1 before starting any repair work.

1. Remove level gauge (18) and pipe (19) from housing (50). Remove relief valve (21) from cover (25).
   : 27 mm
2. Remove plug (13), spring (16), and poppet (17) from cover (25).
   : 14 mm
3. Remove socket bolts (10) to remove block (11) from housing (50).
   : 5 mm
4. Remove plug (1), spring (3), and seat (4) from block (11).
   : 5 mm
5. Remove plug (9), spring (7), spring seat (6), and spool (5) from block (11).
   : 5 mm
6. Remove socket bolts (22) to remove cover (25).
   : 10 mm
7. Remove retaining ring (46), needle bearing (45), and valve plate (43) from cover (25).

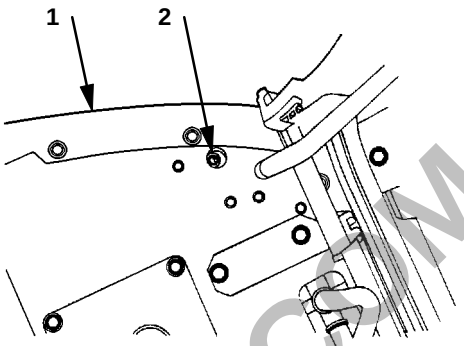
NOTE: Put matching marks on valve plate (43) and cover (25).

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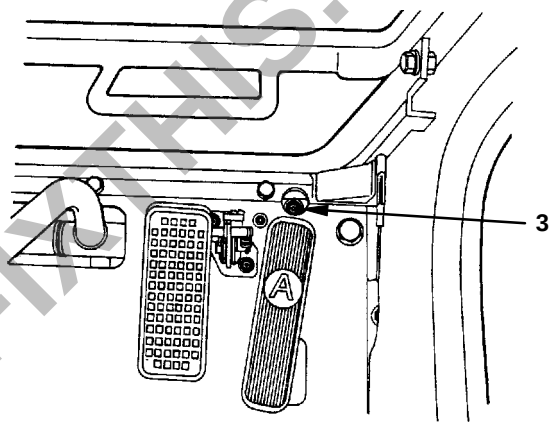
Remove Offset Pilot Valve (EX75UR-3 Only)

1. Remove side-cover-mounting bolts (2) (top side: 3 used, bottom side: 4 used) to remove side cover (1) from the side of the cab.
   : 8 mm



W190-02-02-010

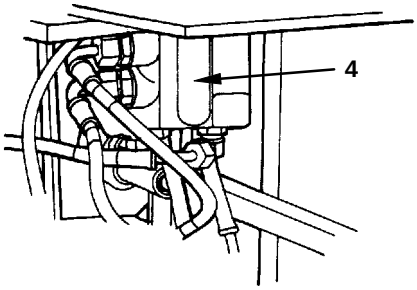
2. Remove cab-front-side-cover-mounting bolts (3) (top side: 2 used, bottom side:2 used) to remove the cab-front-side cover.
   : 17 mm
   : 8 mm



W190-02-07-011

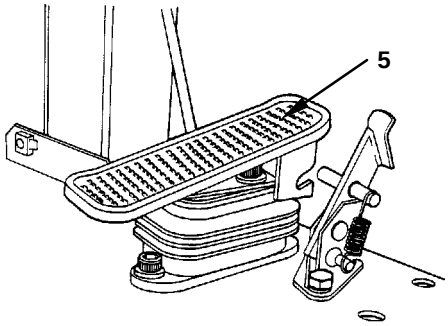
IMPORTANT: Place a cap on each hose end. Attach a tag to each hose identifying the part of the pilot valve from which the hose was disconnected to aid in reassembly.

3. Disconnect all hoses from pilot valve (4).
   : 22 mm



W554-02-07-030

4. Remove cover (5).



W554-02-07-029

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REMOVE AND INSTALL SOLENOID VALVE UNIT (EX75UR-3 ONLY)

CAUTION: Escaping fluid under pressure can penetrate the skin, causing serious injury.
Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines.
Hydraulic oil may be hot after operation. Hot hydraulic oil may spout, possibly causing severe burns. Be sure to wait for oil to cool before starting any repair work.
The hydraulic oil tank cap may fly off by remaining pressure if removed quickly. Slowly loosen the cap to completely release any remaining pressure.

Preparation

1. Park the machine on a firm, level surface. Lower the front attachment to the ground with the arm cylinder fully retracted and the bucket cylinder fully extended.

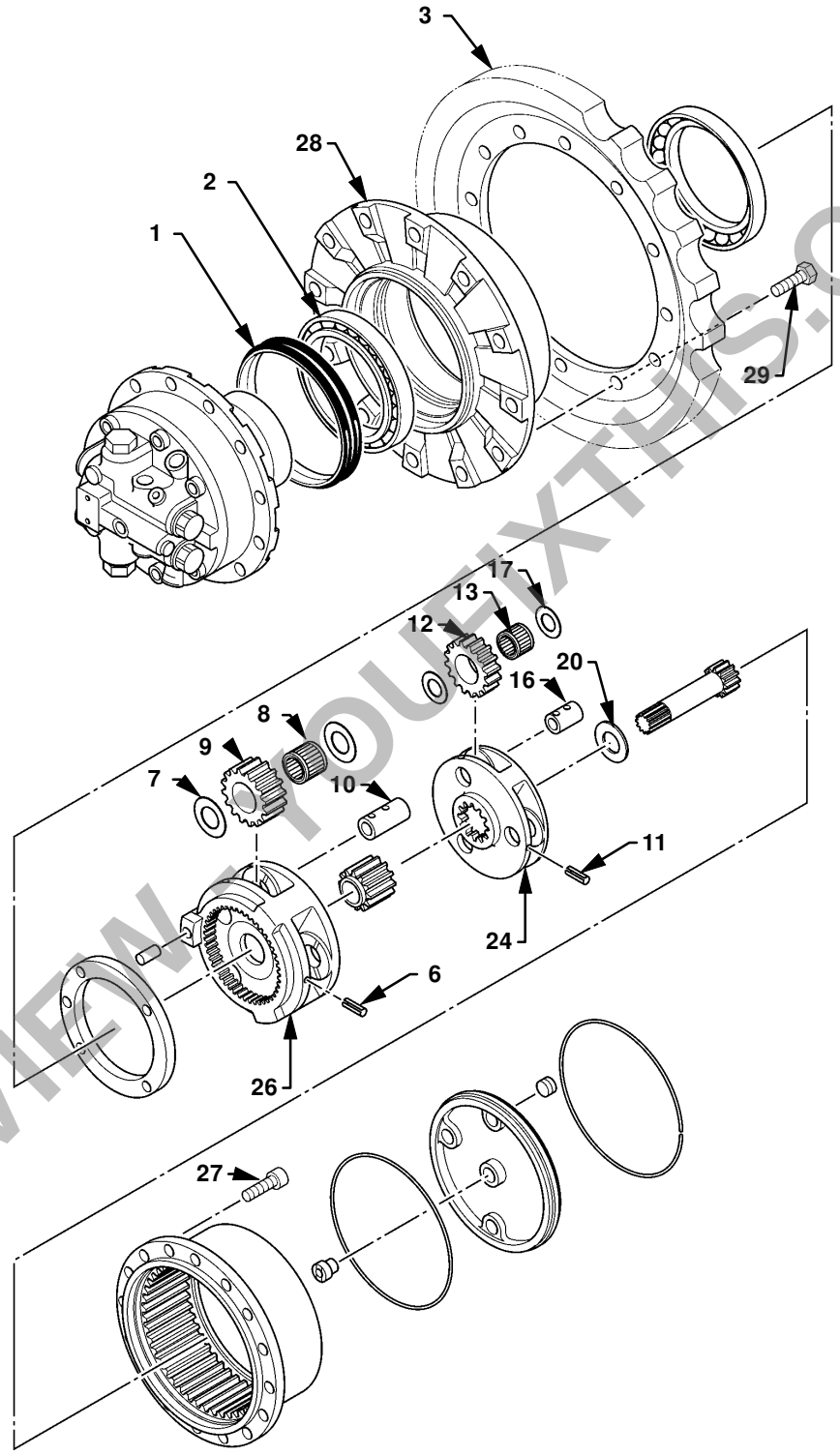
2. Stop the engine. Move all control levers to release pressure remaining in the system. Push the air release valve on top of the hydraulic oil tank cap to release any remaining pressure

3. Remove hydraulic oil tank cap. Connect a vacuum pump to maintain negative pressure in the hydraulic oil tank.

NOTE: Be sure to run the vacuum pump continuously while working.

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W152-03-02-006

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Assemble Center Joint

- Be sure to thoroughly read all precautions for disassembly/assembly work on page W1-1-1 before starting any repair work.

IMPORTANT: Apply a film of grease to oil seal (11) and dust seal (3).

1. Install oil seals (11), O-ring (12), and dust seal (3) in body (5).

IMPORTANT: Take care to avoid damaging spindle (1) when installing cover (13).

2. Install O-ring (12) on cover (13). Press cover (13) onto spindle (1).

3. Press spindle (1) into body (5) with a minimum clearance between cover (13) and body (5) left enough to allow balls (4) to be installed.

4. Correctly install spindle (1) into body (5).

IMPORTANT: Install retaining ring (7) with the chamfered edge facing ring (6).

5. Install O-ring (10) and ring (6) to body (5). Install retaining ring (7) to spindle (1).

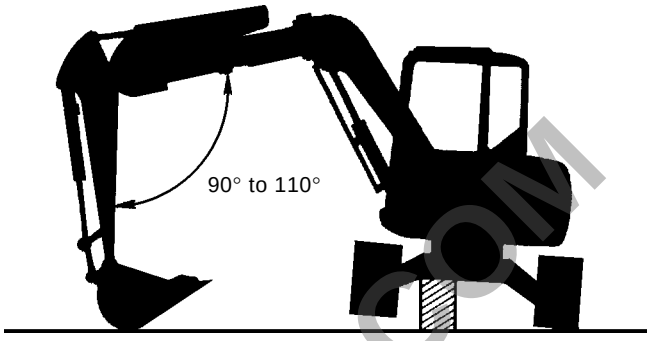
6. Secure cover (8) to body (5) with bolts (9).
   : 17 mm
   : 49 N·m (5 kgf·m, 36 lbf·ft)

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Installation

1. Using the front attachment, raise one side of the machine off the ground, and place solid blocks under track frame to securely support machine.

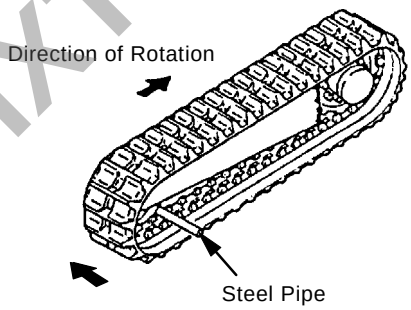


SA-325

2. Re-install the rubber track on the sprocket and hang the other end of the rubber track over the front idler. Rotate the sprocket in the reverse direction until the rubber track meshes with the sprocket.

CAUTION: Check that the rubber track is securely installed onto both the sprocket and front idler.

3. After inserting pieces of steel pipe into gaps between the rubber track and track frame, rotate the sprocket again. Then, install the rubber track onto the front idler.



M503-07-063

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Install Blade Cylinder (EX75UR-3)

CAUTION: Blade cylinder (3) weight: 46 kg (101 lb)

1. While slinging blade cylinder (3) by crane, align pin holes on the tube and blade (7), rod and track frame. Insert thrust plate (8), install pins (6) (2 used).

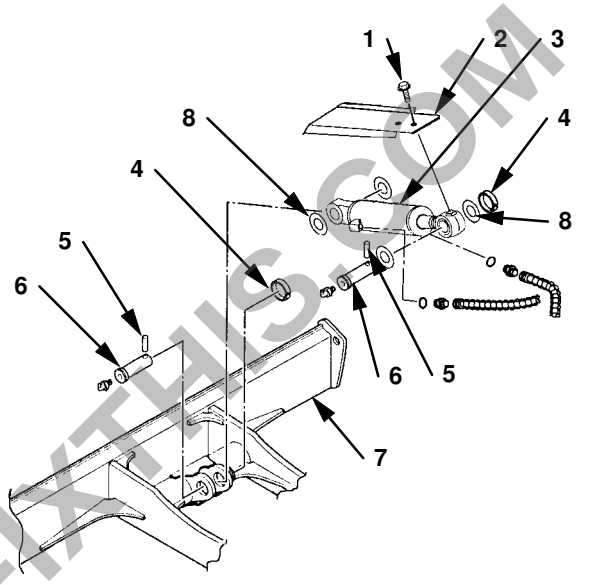
CAUTION: Prevent personal injury. Metal debris may fly off when a hammer is used to remove pins. Be sure to wear necessary protections, such as goggles, hard-hat, etc.

2. Align pin holes of stopper and pin (6), tap stop pin (5) in, and then install ring (4).

3. Connect hoses (2 used) to blade cylinder (3).
   : 22 mm
   : 59 N·m (6 kgf·m, 43 lbf·ft)
   : 27 mm
   : 118 N·m (12 kgf·m, 87 lbf·ft)

4. Install cover (2) to blade cylinder (3), then secure with bolts (1) (2 used).
   : 17 mm
   : 49 N·m (5 kgf·m, 36 lbf·ft)

IMPORTANT: After completing work, fully stroke each cylinder several times to bleed any air remaining in the circuit.



W152-04-02-006

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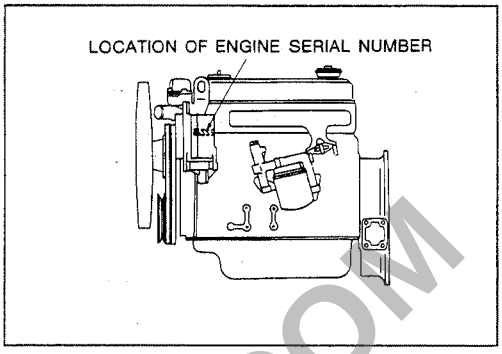
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IDENTIFICATION

ENGINE SERIAL NUMBER

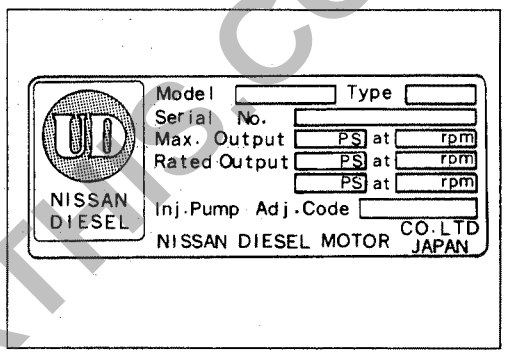
The engine serial number is stamped on the upper front right portion of the cylinder block.

BD30 - XXXXXX
- XXXXXX: Engine serial number
- BD30: Engine model



ENGINE NAME PLATE (INDUSTRIAL USE)

The engine name plate is attached to the engine rocker cover. Engine serial number, engine performance data, etc. are stamped on the plate.



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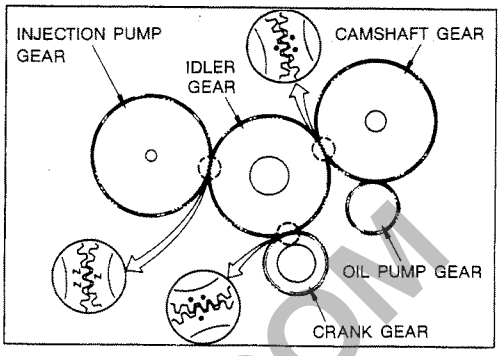
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[Point 7] Installing the gears

- Install the gears by aligning the alignment marks.

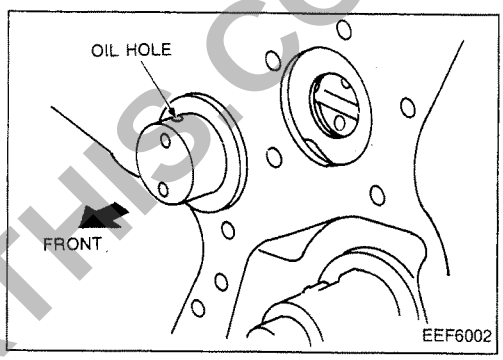
Unit: kg-m (ft-lb)

Name	Tightening torque
Injection pump gear mounting nut	6.0 - 7.0 (43 - 51)
Idler gear mounting bolt	2.3 - 3.1 (17 - 22)
Camshaft gear mounting bolt	4.5 - 5.0 (33 - 36)

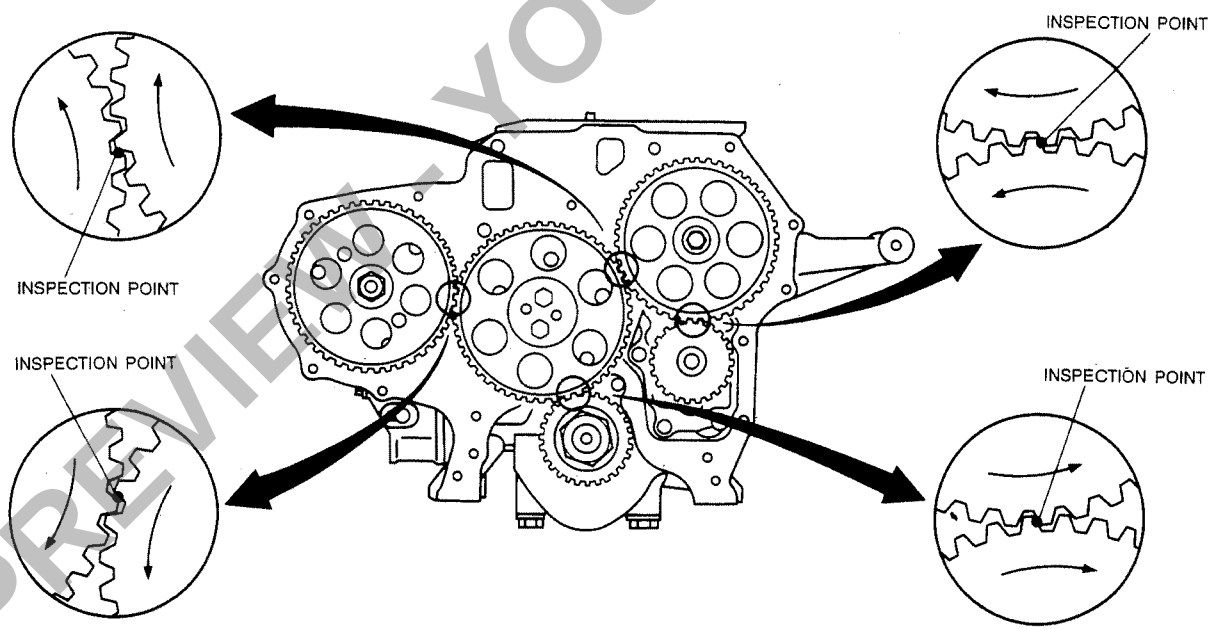


[Point 8] Installing idler gear shaft

- Install the idler gear shaft to the cylinder block with the oil hole of the shaft facing upward.



<Inspection of gear backlash>
Inspection using fuse wire



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SERVICE DATA

ENGINE MAJOR COMPONENT TIGHTENING TORQUE

Application	Torque kg-m (ft-lb)
[Engine main body]	
Cylinder head bolt	① 4.0 - 4.5 (29 - 33) ② 5.5 - 6.0 (40 - 43) ③ 90° ± 10°
Rocker shaft bracket bolt	2.0 - 2.5 (14 - 18)
Main bearing cap bolt	17 - 17.5 (123 - 127)
Connecting rod cap nut	8.0 - 8.5 (58 - 61)
Flywheel bolt	15.0 - 17.0 (108 - 123)
Flywheel housing bolt (Industrial use)	2.9 - 3.5 (21 - 25)
Rocker cover bolt	0.9 - 1.1 (6.5 - 8.0)
Oil pan bolt	0.7 - 0.9 (5.1 - 6.5)
Oil pan drain plug	5.5 - 6.0 (40 - 43)
Crank pulley nut	30.0 - 33.0 (217 - 239)
Front cover bolt	1.3 - 1.9 (9 - 14)
Gear case cover bolt	1.3 - 1.9 (9 - 14)
[Valve train, lubricating system, intake and exhaust systems]	
Camshaft gear bolt	4.5 - 5.0 (33 - 36)
Camshaft locating plate bolt	0.5 - 0.7 (3.6 - 5.1)
Gear oil jet	0.8 - 1.1 (5.8 - 8.0)
Valve adjusting screw lock nut	1.5 - 2.0 (11 - 14)
Oil pump bolt	1.3 - 1.9 (9 - 14)
Oil cooler bolt	1.3 - 1.9 (9 - 14)
Water pump nut	1.3 - 1.9 (9 - 14)
Thermostat housing bolt	1.3 - 1.9 (9 - 14)
Water outlet bolt	1.3 - 1.9 (9 - 14)
Intake manifold bolt	1.3 - 1.9 (9 - 14)
Air heater	1.3 - 1.9 (9 - 14)
Exhaust manifold nut	2.5 - 3.0 (18 - 22)
[Fuel system]	
Injection pump idler gear bolt	2.3 - 3.1 (17 - 22)
Injection pump drive gear bolt	6.0 - 7.0 (43 - 51)
Timer nut (Industrial use)	6.0 - 7.0 (43 - 51)
Injection pump nut	2.0 - 2.5 (14 - 18)
Nozzle support bolt	4.5 - 5.0 (33 - 36)
Retaining nut	3.0 - 4.0 (22 - 29)
Nozzle tube nut	2.0 - 2.5 (14 - 18)
[Electrical units, engine mounting]	
Front engine mount bracket bolt	5.4 - 7.2 (39 - 52) (Industrial use) 4.2 - 5.3 (30 - 38) (Automotive use)
Starting motor bolt	4.0 - 4.5 (29 - 33)

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