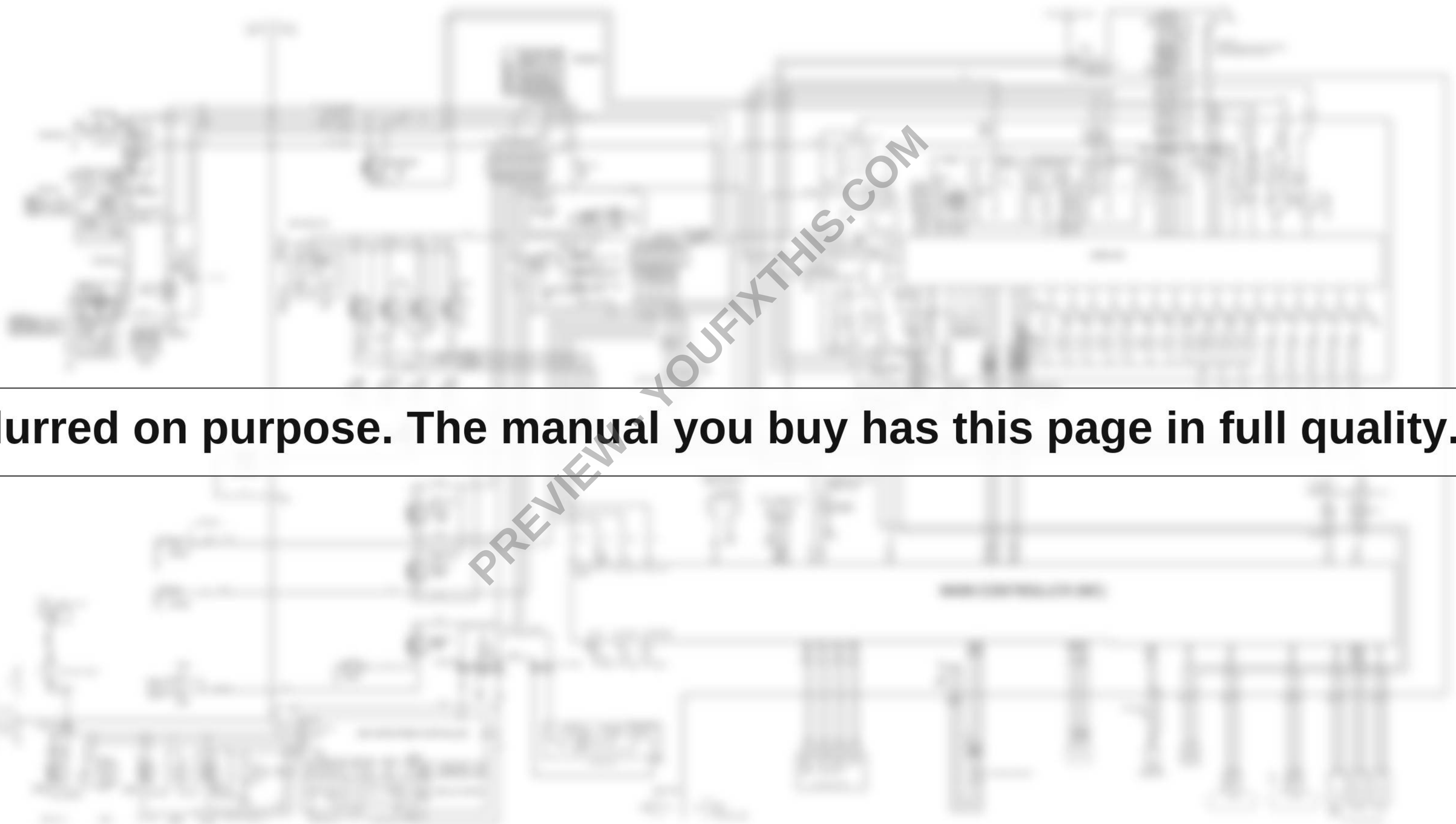
ELECTRICAL CIRCUIT DIAGRAM

EX200-5,EX120-5(Machines produced up to end of July '98)



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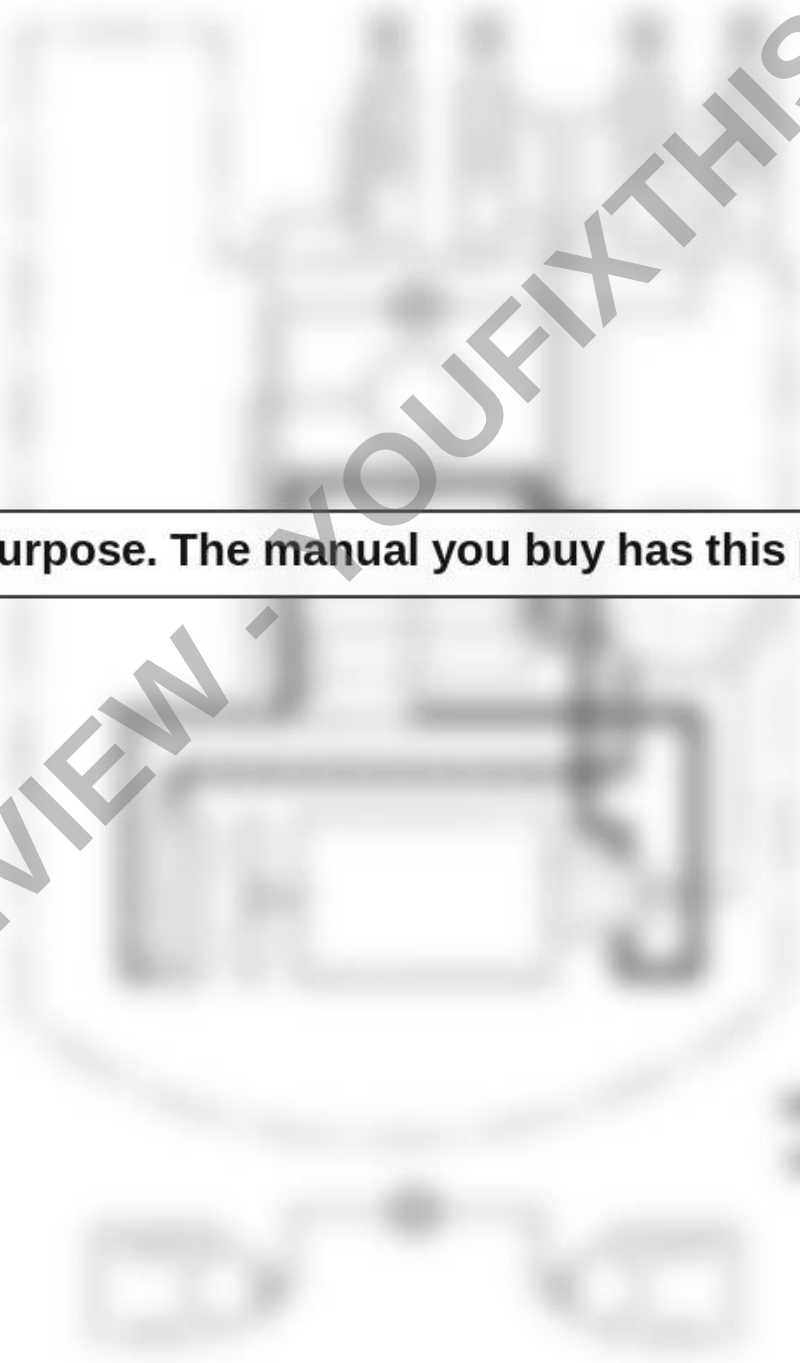
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MAIN CIRCUIT

The main pumps (pump 1 and pump 2) draw hydraulic

Return oil from the motors and cylinders flows back to

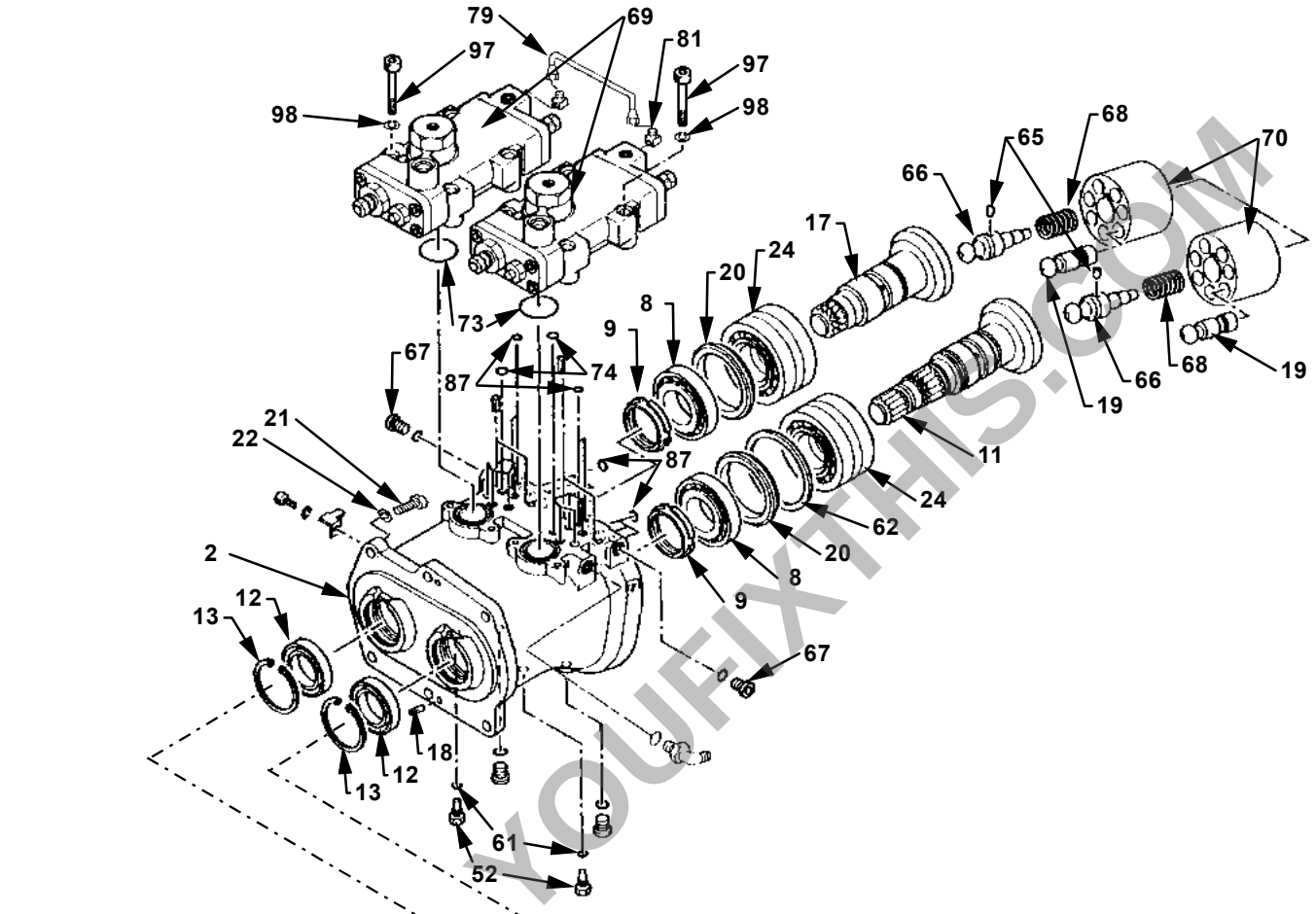


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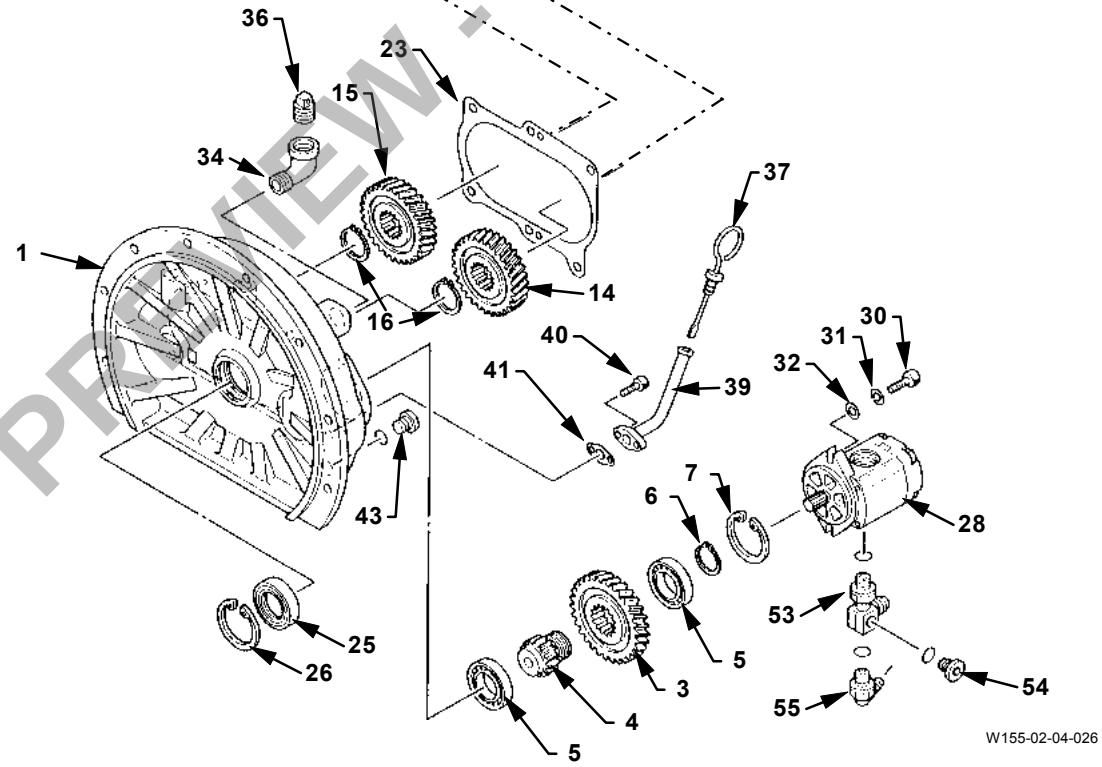
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DISASSEMBLE PUMP DEVICE



W157-02-04-037



W155-02-04-026

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TIGHTENING TORQUE SPECIFICATIONS

No.				Wrench	Torque

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Dr.EX FAULT CODE

Fault Code	Trouble	Corrective Action
01	EC sensor failure	1) Perform “Retrial B.” 2) Check harness. 3) Replace EC sensor.
02 03	Pump 1 delivery pressure sensor failure Pump 2 delivery pressure sensor failure	1) Perform “Retrial B.” 2) Check harness. 3) Replace the pump delivery pressure sensor.
04 05	Pump 1 control pressure sensor failure Pump 2 control pressure sensor failure	1) Perform “Retrial B.” 2) Check harness. 3) Replace the pump control pressure sensor.
06	Arm roll-in pilot pressure sensor failure	1) Perform “Retrial B.” 2) Check harness. 3) Replace the arm roll-in pilot pressure sensor.
07	Engine control dial failure	1) Perform “Retrial B.” 2) Check harness. 3) Replace the engine control dial.

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Disassemble Pump Device

1. Loosen plug (43) to drain gear oil.

   Drain oil: Approx. 0.8 L (0.85 US qt)

   : 8 mm

2. Remove plug (36).

   : 17 mm

CAUTION: Pump device weight: 111 kg (245 lb)

3. Place the pump device with the transmission side positioned to the bottom side and secure it.

4. Remove bolt (58), adapter (53) and fitting plug (55).
   Remove spring washer (59), clamp (57) and servo pipe (56) from selector head (93).

   : 13, 19, 22 mm

CAUTION: Selector head weight: 20 kg (44 lb)

NOTE: Measure the clearance between pump casing (2) and selector head (93) to aid in assembly.

5. Remove socket bolts (60) from selector head (93).
   Remove selector head (93) assembly from the upperstructure.

   : 10 mm

6. Remove pump pressure sensors (64) from selector head (93).

   : 27 mm

7. Remove socket bolts (88), spring washers (96), stopper (90), (51) and O-rings (91), (50), (87) from selector head (93).

   : 6 mm

8. Remove set screw (44), pin (92) and servo piston (42) from selector head (93).

   : 8 mm

IMPORTANT: Be sure to heat set screw (44) to remove it. LOCTITE #829 was applied to set screw (44) when installed.

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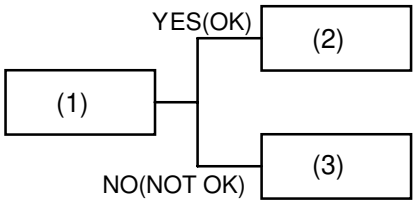
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TROUBLESHOOTING B PROCEDURE

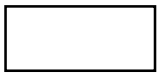
Apply troubleshooting B procedure when no fault code is displayed on the Dr.EX although the machine's operation is abnormal.
On the front section pages of this group T5-4, are tables indicating the relationship between machine trouble symptoms and related parts which may cause such trouble if failed.

Start the troubleshooting with more probable causes selected by referring to these tables.

- How to Read the Troubleshoting Flow Charts



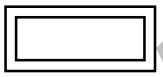
- After checking or measuring item (1), select either Yes (OK) or No (NOT OK) and proceed to item (2) or (3), as appropriate.

- 
  - Key switch: ON

- Special instructions or reference item are indicated in the spaces under the box. Incorrect measuring or checking methods will render troubleshooting impossible, and may damage components as well.

- 

- Explanation of how to use lamp harness kit required. Refer to "Harness Check" Group (Group 7) in this section.

- 

- Use Dr.EX function.

- 

- Causes are stated in a thick-line box. Scanning through thick-line boxes, possible causes can be seen without going through the flow chart.

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Specifications

Model	Std.

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RECOGNIZE SAFETY INFORMATION

- This is the **SAFETY ALERT SYMBOL**.
  - When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.



001-E01A-0688

SA-688

UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER or WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs**.
  - Some safety signs don't use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- **CAUTION** also calls attention to safety messages in this manual.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- ***NOTE*** indicates an additional explanation for an element of information.



SA-1223

002-E01C-1223

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CONNECTORS

EX120-5(Machines produced from beginning Aug. '98)

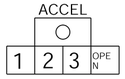
(These connectors are the harness end connectors,unless otherwise specified)

SOLENOID VALVE



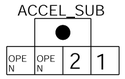
JFC02P-GY
PB185-02326-B

ACCEL



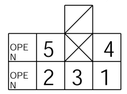
C04FW

ACCEL_SUB



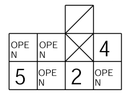
C04MW

MIX_ACTUATOR (AIRCON)



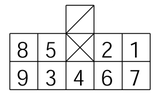
7119_3070

INTAKE_ACTUATOR (AIR-CON)



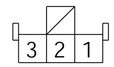
7119_3070

MODE_ACTUATOR (AIR-CON)



7119_3090

THERMOSTAT (AIR-CON)



SDL03F
7123-8335

POWER_TRANSISTOR (AIR-CON)



CN04F

MITUBISHI_N-SLC-4F(N)
MITUBISHI_PH065-04010

7123-2246

BLOWER_MOTOR (AIR-CON)



CN02F

MITUBISHI_N-SLC-2F-(N)
MITUBISHI_PH065-02010

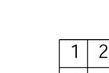
7123-2228

PRESSURE SW (AIR-CON)



7219_3320

DIODE



PH065-02010

SPEAKER

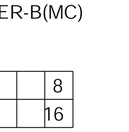


PH065-02010

PILOT PRESSURE SENSER

PACARD12052895

GLOW PLUG RELAY

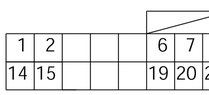


7323-2228 7323-3010

COMP_RELAY MAX_HI_RELAY OFF_RELAY (AIR-CON)

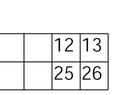
7323_2847_90

HEATER /AIR CONDITIONER



N_SLC_4F(N) C02FB

OPTION POWER

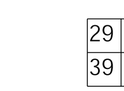


M06_FW

LEARNING SW

C06_FW

PUMP DELIVERY PRESSURE SENSOR



AMP EJ<II>070

PRESSURE SW. (TRAVEL,BOOM-RAISE)



7323-9327
OR
090-2-WP

WIPER

MWP04F_B

WASHER



PH065-02010
(CN.WITHOUT LOCK)

HYD. OIL LEVEL SW. /FUEL GAUGE



GND. SIDE

Z02F-GY

ALTERNATOR



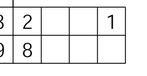
7323-1424-40

WWES (OPTION)



C02_FW

RADIO_CAB/HARNESS



C10FW

RELAY

6098-1493

ENG. OIL LEVEL SW

7323-7414-40

COOLANT LEVEL SW.

N SENSOR (EX200 ONLY)

Z02F-GY

EC SENSOR

Z03F-GY

EC MOTOR

Z04F-GY

KEY SWITCH

7323-2262

RADIO AM-SANYO

7119-3090

{ PA-9P(FEMALE SIDE) }

ENG. CONTROL DIAL

C10FW

MONITOR

AMP-174046-2

RADIO AM-FM FUJITU-TEN

YAZAKI 0902-10P
AUDIO

YAZAKI 7283-1100

CONTROLLER-D(MC)

AMP-174515-6

CONTROLLER-B(MC)

AMP-174514-6

CONTROLLER-A

AMP-174516-6

MONITOR

AMP-174047-2

AIRCON_CONTROLLER

AMP_179054-6

MONITOR

AMP-174045-2

AIRCON_CONTROLLER

AMP_174057-6
040_MULTI_LOCK

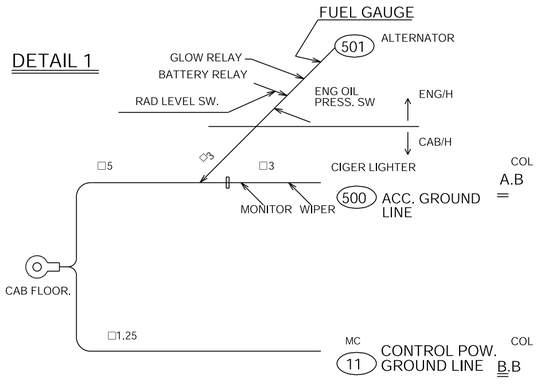
WIRE HARNESS NO.

PARTS	TERMINAL NO.	HARNESS NO.
CONTROLLER-A	1-26	1-26
CONTROLLER-B	1-16	31-46
CONTROLLER-D	1-22	51-72
OTHER		100-199
MONITOR CONTROLLER	1~35	201-235
ACCESSORY		500-600
VALVE_SUB/H		700-800

GROUND WITH HARNESS
INTERNAL GROUND
CONNECTOR
SCREW TERMINAL
WATER PROOF PLUG CONNECTOR
FLAT TERMINAL
RING TERMINAL WITH LOCK AMP 172320-2

The meanings of the ground symbols above are different from the meanings in IEC.

DETAIL 1



DETAIL 2

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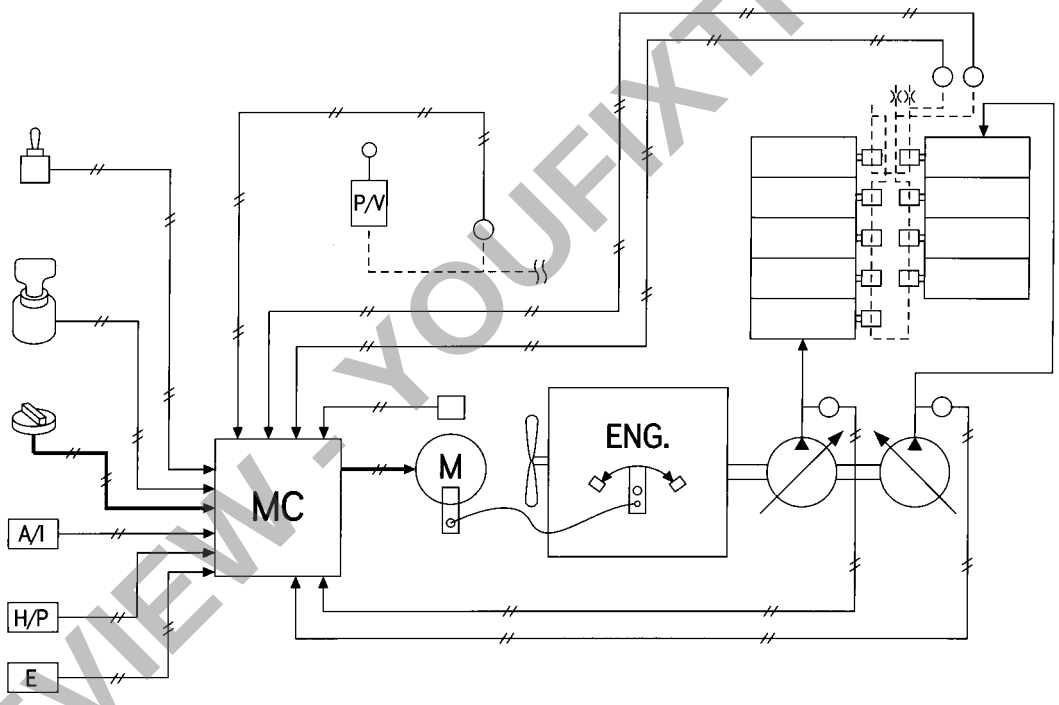
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Normal Control

Purpose: To control engine speed in response to the operation angle of the engine control dial on the switch panel.

Operation: In response to the operation angle of the engine control dial, the MC drives the EC motor, causing the governor lever to move to control engine speed.

NOTE: Normally, the governor lever does not come into contact with the full side stopper even if the engine control dial is turned to the full speed position. (Refer to HP Mode Control)



T157-04-04-028

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HYDRAULIC CIRCUIT

Main Circuit

Pressure oil from pump 1 and from pump 2 is routed to the 4-spool side section in the control valve and to the 5-spool side section in the control valve, respectively. A parallel passage is provided in both right and left main circuits, making combined operations possible.

The main circuit pressure is restricted by the main relief valve. Moreover, two overload relief valves are provided in each of boom, arm, and bucket circuits.

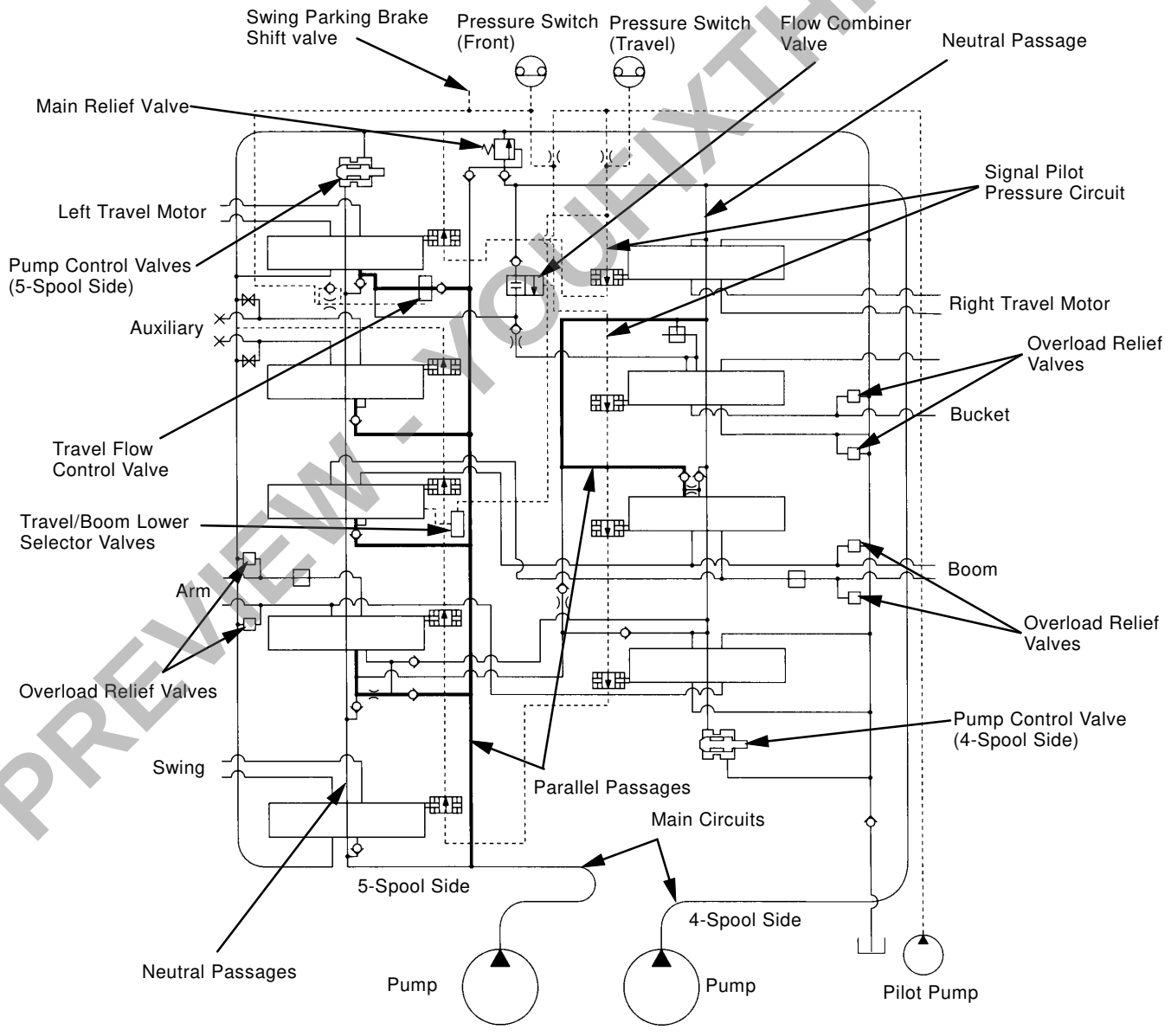
Also, a pump control valve is provided at the most downstream position of each of right and left neutral passages.

Signal Pilot Pressure Circuit

The pilot pressure from the pilot pump flows through the control valve.

When the travel levers are operated, the movement of the travel spool causes the travel signal pilot circuit to be restricted, increasing the pilot pressure, thus turning on the pressure switch (travel) and shifting the travel/boom lower selector valve.

When a control lever other than the travel levers is operated, the pilot pressure in the front att. signal pilot passage increases, thus turning on the pressure switch (front) and shifting the flow combiner valve, travel flow control valve, and swing parking brake shift valve.



T155-02-05-008

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2. When the measurement is started from No.1 cylinder, perform the same measurement to all valves indicated with the mark " › " in the table below. (When the measurement is started from No.4 cylinder, perform the measurement in the valves shown with mark "×".)

Cylinder No.	No.1		No.2		No.3		No.4	
Valve locations	I	E	I	E	I	E	I	I
When the measurement is started from No.1 cylinder	○	○	○			○		
When the measurement is started from No.4 cylinder				×	×		×	×

3. Rotate the crankshaft 360ß. Align the TDC mark with the pointer. Then, continue measurement of other valves in the same way.

Evaluation:
Standard Valve Clearance:
- Intake valve : 0.40 mm (0.0157 in)
- Exhaust valve : 0.40 mm (0.0157 in)

Adjustment:
If the measurement results are out of specification, adjust the valve clearance in the same order of measurement.

1. Loosen the adjusting screw lock nuts for the rocker arms. Insert the thickness gauge set at 0.4 mm, adjust the adjusting screws.

2. After adjusting, retighten the lock nuts to the specification.
   Recheck the valve clearance after the lock nuts are tightened.

   : 25.5±4.9 N·m
   (2.6±0.5 kgf·m, 18.8±3.6 lbf·ft)

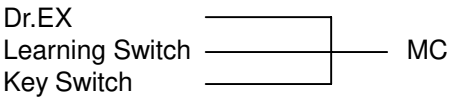
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Dr.EX SPECIAL FUNCTION (SERVICE MODE)

1. Purpose
   Some data in the MC (Main Controller), such as the flow rate in the attachment mode, engine speed in the E mode, can be changed as required.

2. Parts pertaining to the special function.



3. Operation
   - How to Turn Dr.EX in the Service Mode
     1) Turn the key switch OFF. Wait 10 seconds or more.
     2) Connect the Dr.EX.
     3) Turn the learning switch to the Engine Leaning position.
     4) Turn the key switch to the ON position. (Do not start the engine.)
     5) Turn on the switch on the Dr.EX.

   - On the following pages, the service mode panels on the Dr.EX and the service mode operating procedure are shown.

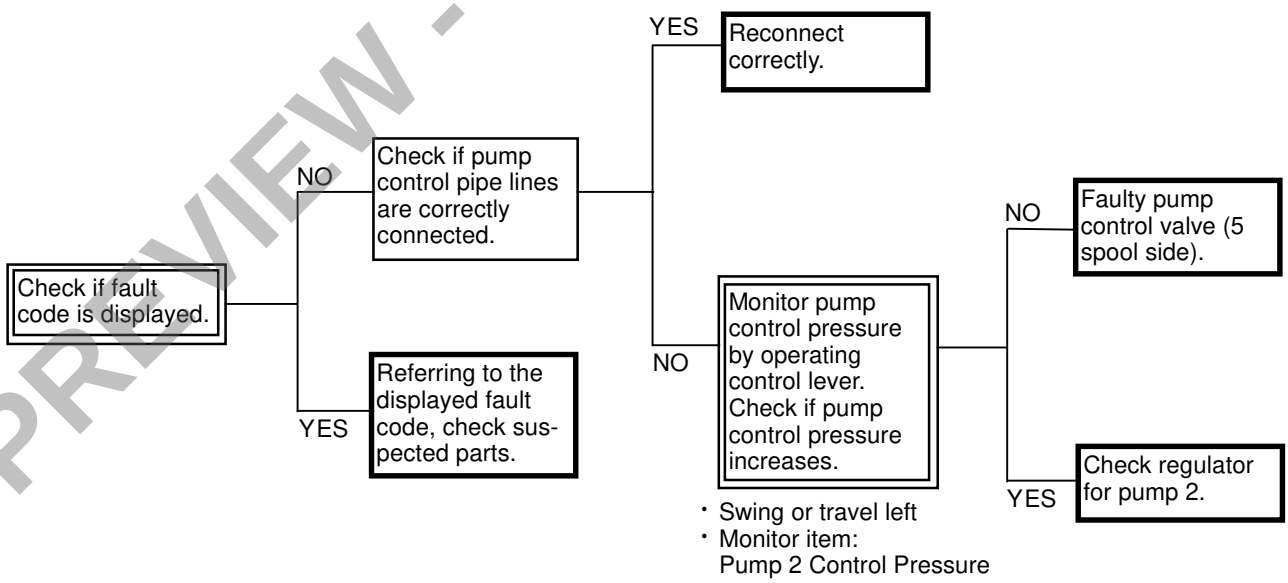
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A-2 When Single Travel Operation is Made, Left Side Track is Slow But Right Side Track is Normal.
Single Swing Operation is Slow. Single Bucket Operation is Normal.
Arm Speed is Slow When Leveling.
(all above symptoms occurred at the same time.)

Related Fault Code: None

- Due to some reasons, pump 2 delivery rate is reduced to the minimum (approx. 20 L/min). Accordingly, left side track and swing function speeds are too slow as they are actuated by pressure oil from pump 2.
- Arm and boom cylinders are also actuated by pressure oil from pump 1 so that arm and boom speed is slightly reduced when the single operation of arm or boom is made. However, when the level crowding operation is made, oil flow to boom cylinders has priority over arm cylinder. Then, almost no oil flow is supplied to arm cylinder, reducing arm speed.
- Refer to “Control Valve” and “Pump Device” groups in COMPONENT OPERATION Section in the Operational Principle book (Technical Manual).



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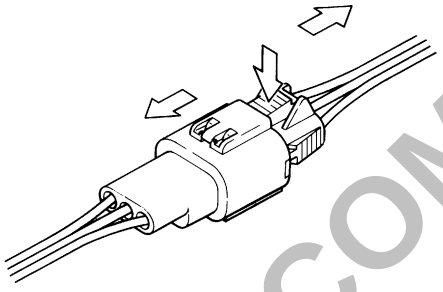
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INSTRUCTIONS FOR DISCONNECTING CONNECTORS

- **Push the lock to disconnect.**

NOTE: 1) Connectors may not be separated if the lock is pushed while the connectors are pulled. Be sure to push the lock first before pulling the connectors.

2) The lock is provide on the female connector (harness side).



T107-04-05-002

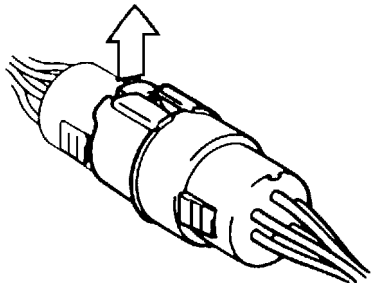
Locations of This Type Connector

Fuel Gauge	Washer	Coolant Level Switch	Radio
Hydraulic Oil Level Switch	Pilot Pressure Switch	Diode	Speaker
Horn	EC Motor	Key Switch	Learning Switch
Cab Harness	EC Sensor	Engine Control Dial	Wiper
Pressure Switch(Travel)	Pump Delivery Pressure Sensor	Relay	Monitor
Starter Relay	Engine Oil Level Switch		

- **Pull up the lock to disconnect.**

Locations of This Type Connector

Pressure Switch (Front)
Pilot Pressure Sensor
Pump Control Pressure Sensor

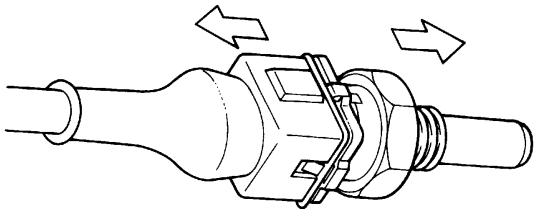


T107-04-05-003

- **Pull to disconnect.**

Locations of This Type Connector

Solenoid Valve Unit
Dr.EX



T107-04-05-004

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Connecting Hose

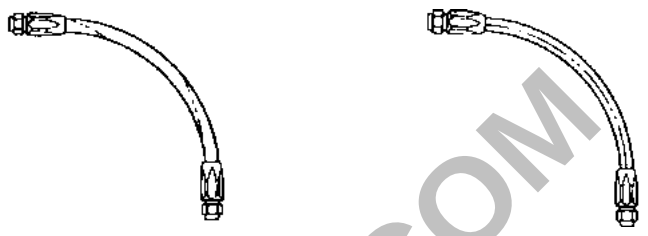
CAUTION:

(1) When replacing hoses, be sure to use only genuine Hitachi service parts. Using hoses other than genuine Hitachi hoses may cause oil leakage, hose rupture or separation of fitting, possibly resulting in a fire on the machine.

(2) Do not install hoses kinked. Application of high oil pressure, vibration, or an impact to a kinked hose may result in oil leakage, hose rupture or separation of fitting. Utilize print marks on hoses when installing hoses to prevent hose from being installed kinked.

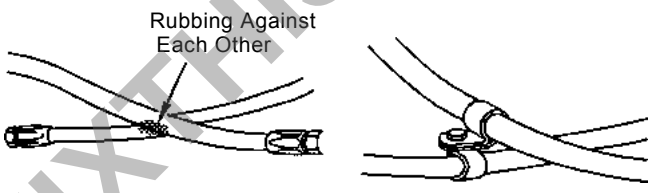
(3) If hoses rub against each other, wear to the hoses will result, leading to hose rupture. Take necessary measures to protect hoses from rubbing against each other.
Take care that hoses do not come into contact with moving parts or sharp objects.

WRONG **RIGHT**



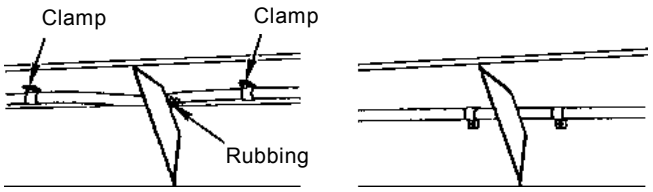
W105-01-01-011

WRONG **RIGHT**



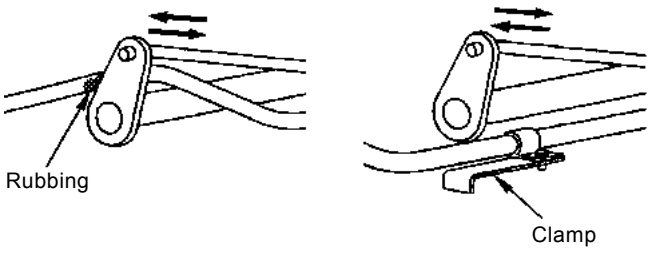
W105-01-01-012

WRONG **RIGHT**



W105-01-01-013

WRONG **RIGHT**



W105-01-01-014

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MAINTENANCE STANDARD

Pump Device

Unit : mm (in)

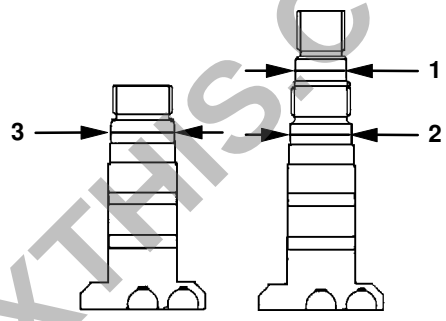
	Standard	Allowable Limit	Remedy
Gear Backlash	0.68 (0.03)	1.5 (0.06)	Replace

Main Pump

1. Tooth thickness (Drive disc splines)

Unit : mm (in)

Standard	Allowable Limit
3.6 (0.14)	2.6 (0.10)

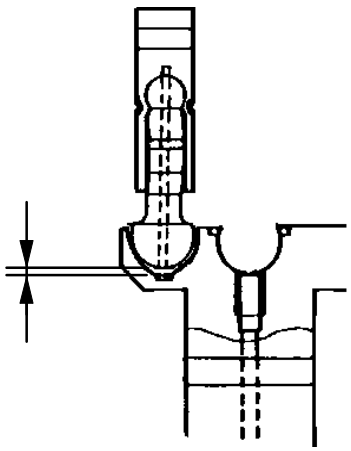


W157-02-04-015

2. Sleeve diameter (Drive disc)

Unit : mm (in)

	Standard	Allowable Limit
(1)	34 (1.34)	33.8 (1.33)
(2)	42 (2.65)	41.8 (1.65)
(3)	42 (2.65)	41.8 (1.16)



W157-02-04-016

3. Clearance between plunger and drive disc

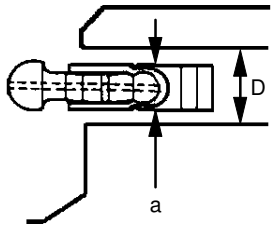
Unit : mm (in)

Standard	Allowable Limit
0.054 (0.002)	0.4 (0.016)

4. Clearance between plunger bore and cylinder block

D |a Unit : mm (in)

Standard	Allowable Limit
0.036 (0.001)	0.08 (0.003)



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Assemble Swing Motor

1. Install roller bearing (23) onto shaft (22) using a press.
2. Install retaining ring (28) onto shaft (22).



3. Apply LOCTITE #572 to the circumference of oil seal (24).
4. Install oil seal (24) into case (26) using a press. Be sure to cover oil seal with a protection plate before applying a press.
5. Apply a coat of grease to the back of plate (13). Install plate (13) into housing (29).
6. Install shaft (22) into housing (29).



7. Install O-ring (25) on housing (29).
8. Apply a coat of grease to the lip of oil seal (24). Then, install case (26) into housing (29).
9. Install retaining ring (27) onto housing (29).



10. Install spring seat (18), wave springs (16) (2 pieces), and spring seat (18) into rotor (17), in that order.
11. Install retaining ring (19) onto rotor (17).



12. Turn over rotor (17). Install wave springs (16) (2 pieces) into rotor (17) and holder (15) onto rotor (17).
13. Assemble plungers (12) (9 used) onto retainer plate (14).
14. Inserts plungers (12) into rotor (17).

IMPORTANT: Be sure to apply a film of hydraulic oil on the bores of rotor (17) before inserting plungers (12).

15. Lay housing (29) on its side. Install rotor (17) onto shaft (22).
16. Install plates (20) and friction plates (11) one by one alternately, aligning notched parts. Be sure that plates (20) are secured to housing (29) and that frinction plates (11) are secured to rotor (17).
17. Install O-ring (3) onto ring (2).

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REMOVE AND INSTALL PILOT RELIEF VALVE UNIT

CAUTION: Escaping fluid under pressure can penetrate the skin, causing serious injury.
Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines.

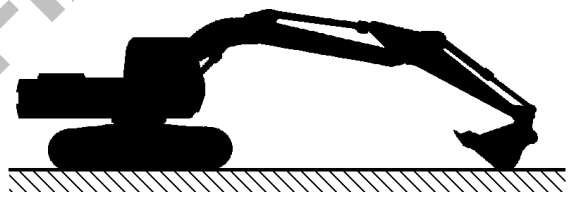
Hydraulic oil may be hot just after operation. Hot hydraulic oil may spout, possibly causing severe burns. Be sure to wait for oil to cool before starting work.

The hydraulic oil tank cap may pop off if removed without releasing internal pressure first. Push the air release valve on top of the hydraulic oil tank to release any remaining pressure.

Preparation

1. Park the machine on a firm, level surface.
2. Stop the engine. Push the air release valve on top of the hydraulic oil tank 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.



M104-07-021

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Unit: mm (in)

	Part Name	Standard	Allowable Limit	Remedy
G	Pin	60 (2.36)	59.0 (2.32)	Replace
	Boss (Arm)	60 (2.36)	61.5 (2.42)	
	Bushing (Bucket Cylinder)	60 (2.36)	61.5 (2.42)	
H	Pin	65 (2.56)	64.0 (2.52)	
	Bushing	65 (2.56)	66.5 (2.62)	
	Bushing (Bucket Cylinder)	65 (2.56)	66.5 (2.62)	
I	Pin	65 (2.56)	64.0 (2.52)	
	Bushing	65 (2.56)	66.5 (2.62)	
J	Pin	65 (2.56)	64.0 (2.52)	
	Bushing	65 (2.56)	66.5 (2.62)	
K	Pin	65 (2.56)	64.0 (2.52)	
	Bushing	65 (2.56)	66.5 (2.62)	

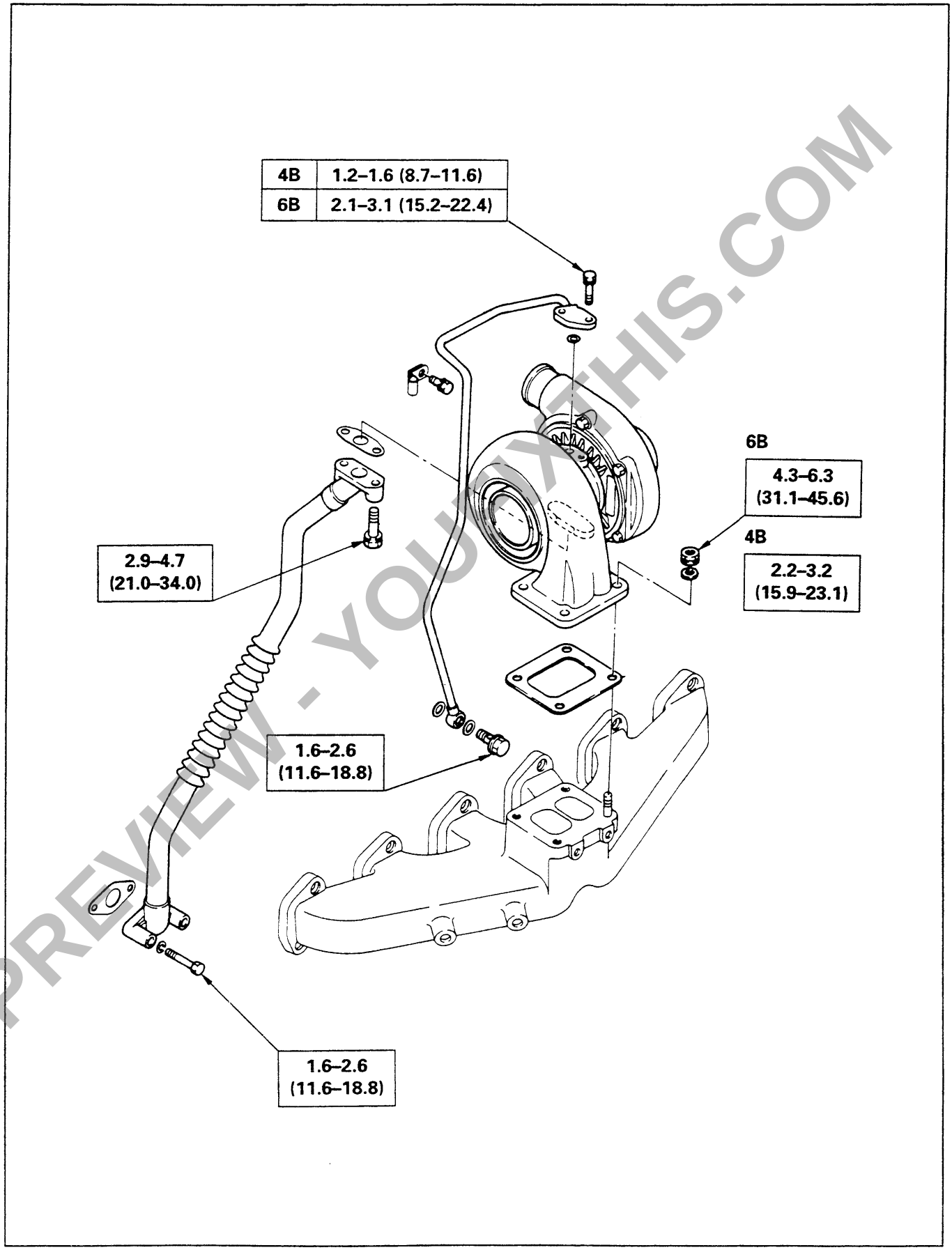
IMPORTANT: Be sure to install front attachment bushings using a press.

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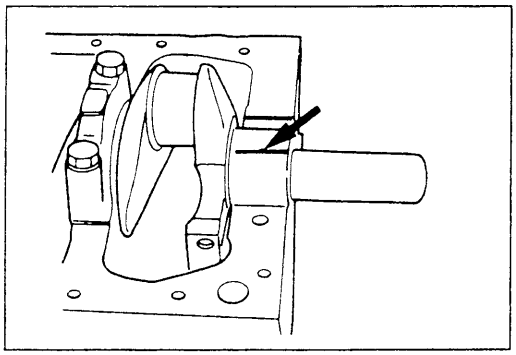
Turbocharger

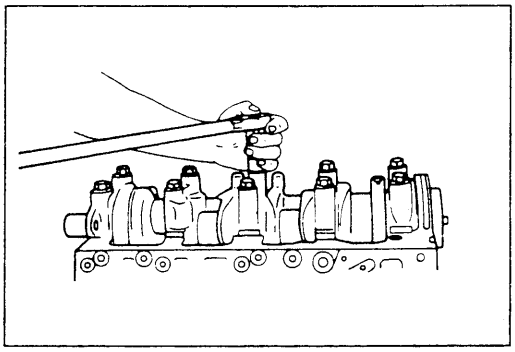
kg·m (lb.ft)

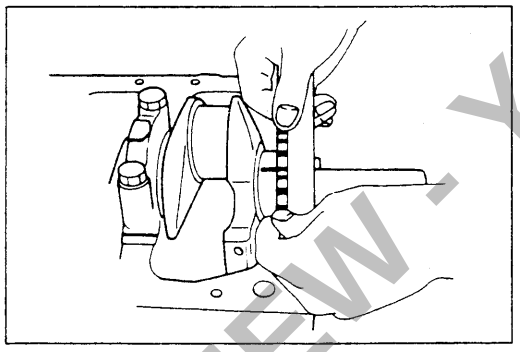


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Plastigage Clearance Measurements

This is another method to measure the crankjournal bearing clearance.

Crankshaft Journal Bearing Clearance

1. Clean the cylinder body, the journal bearing fitting portions, the bearing cap, and the inside the outside surfaces of the bearing.
2. Install the new journal bearing to the cylinder body.
3. Carefully place the crankshaft on the bearing.
4. Rotate the crankshaft approximately 30° to seat the bearing.
5. Place the Plastigage (arrow) over the crankshaft journal across the full width of the bearing.

   Apply engine oil to the Plastigage to keep it from falling.
6. Install the bearing cap with the bearing.
7. Tighten the bearing cap to the specified torque.

   Do not allow the crankshaft to turn during bearing cap installation and tightening.
8. Remove the bearing cap.
9. Compare the width of the plastigage attached to either the crankshaft or the bearing against the scale printed on the plastigage container.

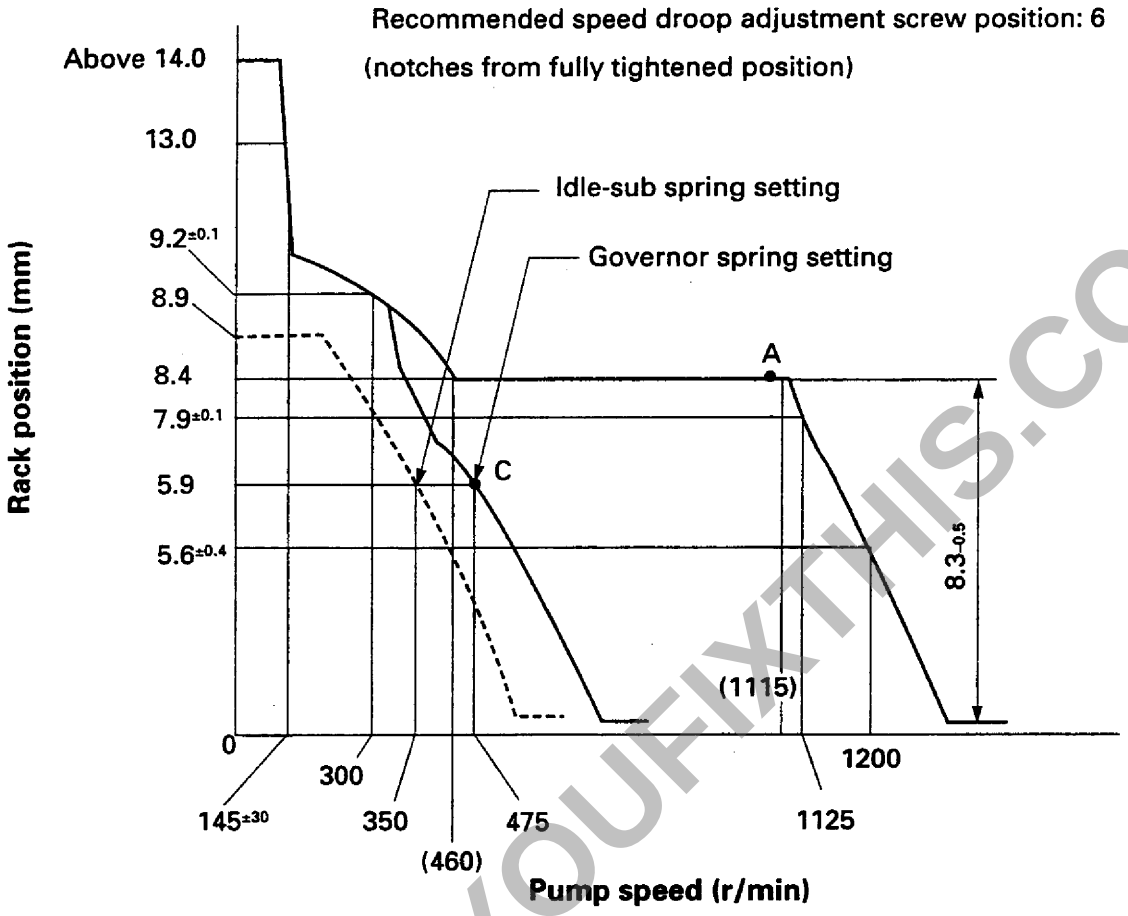
   If the measured value exceeds the limit, perform the following additional steps.

   1) Use a micrometer to measure the crankshaft outside diameter.
   2) Use an inside dial indicator to measure the bearing inside diameter.
   3) Replace the crankshaft and/or the bearing if the measured value(s) exceed the limit.

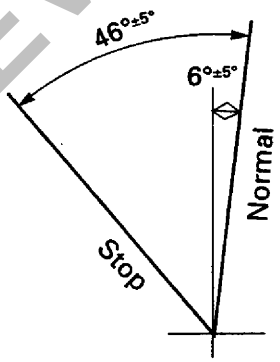
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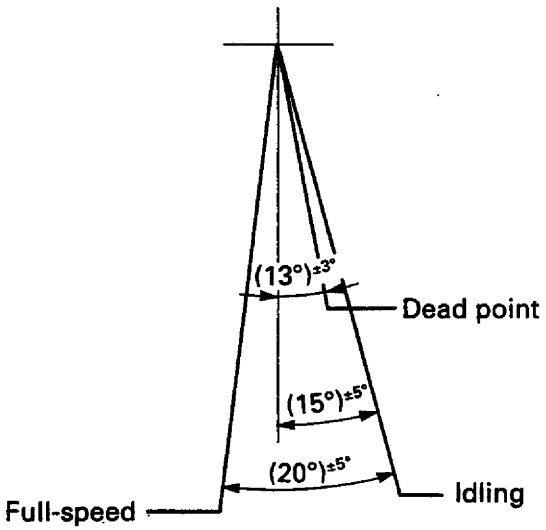
3. Governor adjustment



Stop lever angle



Speed control lever angle



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