TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.

  - Be sure to thoroughly read this manual for correct information concerning the service procedures.

  - If you have any questions or comments, or if you found any errors regarding the contents of this manual, please contact:

NEW HOLLAND KOBELCO
CONSTRUCTION MACHINERY S.p.A.
Strada Settimo, 323
San Mauro Torinese (TO)
10099 ITALIA
PRODUCT SUPPORT
Fax. ++39 011 0077357

ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this service manual:

  - **Operation and Maintenance Instruction Manual**
  - **Parts Catalog**

WORKSHOP MANUAL COMPOSITION

- The Workshop Manual consists of five parts:
  - **“Safety Precautions”**
  - **“Operational Principle”**
  - **“Operational Performance Test”**
  - **“Troubleshouting”**
  - **“Repair Instructions”**

- The “Safety Precaution” part includes the recommended procedures that, if followed, can avoid the risk of accident for operator and for staff related to the work and maintenance machine operations.

- The “Operational Principle” part includes the technical information concerning the operation of main devices and systems.

- The “Operational Performance Test” part includes the information needed to carry out the machine operational performance test.

- The “Troubleshooting” part includes the technical information needed for troubleshooting and malfunction detection.

- The “Repair Instruction” part includes information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, removal/installation and assembly/disassembly procedures.

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WELDING REPAIR INTERVENTIONS



- Welding repair interventions must be performed only by a certified welder with sufficient experience. Also, appropriate safety rules must be implemented by all the personnel involved in the operations. The duration through time of the welding depends upon the quality and the accuracy with which the operation is performed.
  - Identify first all the fracture points and the zones in which welding is required.
  - Clean accurately the zones involved.
  - Remove all paint and inspect the parts with penetrating liquid or a magnetic particle tester.
  - Move the starter switch into position "**OFF**" and wait for 4 seconds to cut-off electricity from the system.
  - Disconnect the negative terminal (-) from the battery.
  - Connect the ground cable of the welder at least 1 m from the component to be welded.
  - Make sure that the ground cable is NOT connected to a seal or bearing and that there are noo seals or bearings between the ground cable and the part to be welded.
  - Avoid welding pieces at low temperature i. e. below 16 °C. If necessary, warm-up the part involved prior to welding it.
  - Remove paints from all surfaces prior to warming-up or welding. Painted surfaces, when warmed-up or when welded, can generate toxic fumes.
  - Use appropriate masks or protective glasses.
  - Wear gloves and adequate clothing to protect the skin.

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1. Recirculation and conflux (Low loading)
   1) On starting arm-in operation, arm-in operating pilot secondary pressure is input to arm 1 spool, arm 2 spool and low pressure sensor.
   2) The output voltage of low pressure sensor is input to mechatro controller and the mechatro controller processes pilot signal and outputs command according to the input voltage to P1 and P2 proportional valves, P1 and P2 unload proportional valves and reverse proportional valve for arm-in 2 spool.
      In case of combined operation, the pilot pressure other than arm-in operation is input to low pressure sensor and the output voltage is input to mechatro controller. And the mechatro controller processes pilot signal according to the combined operation and outputs command, which is different from the arm-in independent operation, to P1 pump proportional valve, P1 unload proportional valve and reverse proportional valve for arm-in 2 spool.
   3) Primary pressure of reverse proportional valve for arm-in 2 spool is arm-in pilot secondary pressure and it switches arm 2 spool by proportional secondary pressure according to command. (Arm 2 spool controls recirculation rate and conflux rate.)
      The other proportional valves output proportional secondary pressure according to command from mechatro controller. These proportional valves change the delivery rate of P1, P2 pump, and switch P1, P2 unload valve.
   4) The arm 1 spool is switched according to original oil pressure command, and P1, P2 pumps, P1, P2 unload spools and arm 2 spool are switched according to the command output by mechatro controller, and consequently the return oil from the arm cylinder rod side is recirculated in P1 and P2 pumps delivery oil during arm operation.
2. Recirculation cut
   The voltage output by high pressure sensor on P2 side is input to mechatro controller, and when the load is raised during arm operation the mechatro controller processes pilot signal processing according to the pressure detected by high pressure sensor and outputs command to cut recirculation into reverse proportional valve for arm-in 2 spool.
   The reverse proportional valve for arm-in 2 spool outputs pilot secondary pressure according to the command output by mechatro controller and switches arm 2 spool to recirculation cut position, and consequently recirculation passage is blocked.

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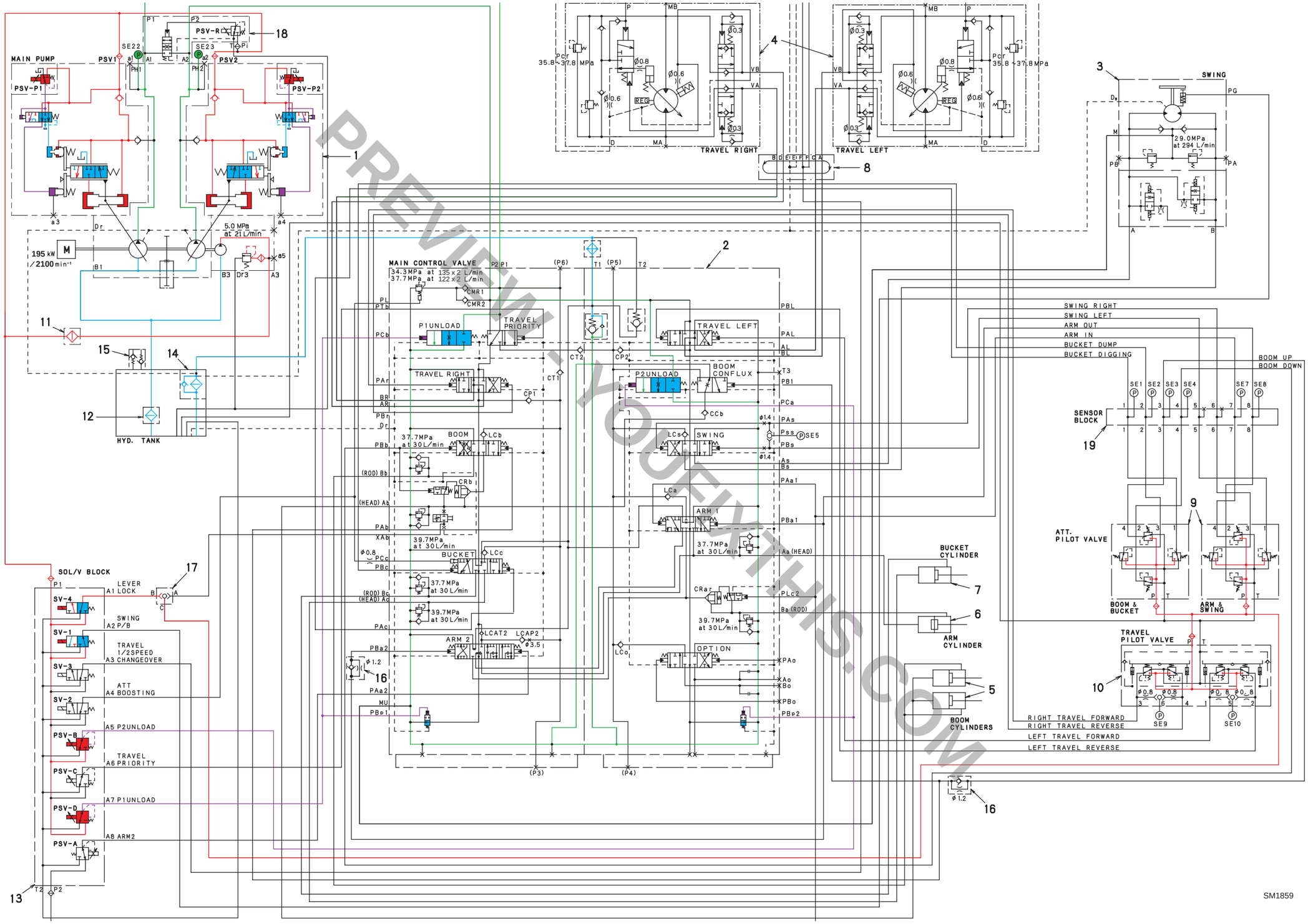
Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN104	1	GA	Boom head	Input	0V
	2	A17			0.5~4.5V
	3	+5VA			Power output 5V
	4	+5VA	Spare	Input	Power output 5V
	5	A18			0.5～4.5V
	6	GA			0V
	7	GA	Extra pressure source	Input	0V
	8	A19			0.5~4.5V
	9	+5VA			Power output 5V
	10	+5VA	Spare	Input	Power output 5V
	11	A20			0.5~4.5V
	12	GA			0V
	13	A21	Spare	Input	0V
	14	GA			0,5~4,5V
	15	A22	Fuel level	Input	0V
	16	GP			0,5~4,5V
	17	A23	Spare	Input	0V
	18	GA			0,5~4,5V
	19	GA	Selector detection	Input	0V
	20	A24			0.5~4.5V
	21	+5VA			Power output 5V
	22	+5VA	Spare	Input	Power output 5V
	23	A25			0.5~4.5V
	24	GA			0V
	25	GA	Spare	Input	0V
	26	A26			0.5~4.5V
	27	+5VA			Power output 5V
	28	DI 1	Spare	Input	GND / OPEN

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN105	1	+24V	Battery relay output side		20~32V
	2	+24V			20~32V
	3	+24V	Battery relay output side		20~32V
	4	DO 7	Travel 1,2 speed select valve	Output	24V/OPEN
	5	DO 8	Swing P/B select valve	Output	24V/OPEN
	6	DO 9	Power boost select valve	Output	24V/OPEN
	7	DO 11	Selector opt.	Output	24V/OPEN
	8	GND	Battery (-)		0V
	9	GND	Battery (-)		0V
	10	D10+	OPT changeable relief 1	Output	+0~800mA
	11	D1+	P1 unload	Output	+0~800mA
	12	D1-			-0~800mA
	13	D2+	P2 unload	Output	+0~800mA
	14	D2-			-0~800mA
	15	D3+	Travel straight	Output	+0~800mA
	16	D3-			-0~800mA
	17	D4+	Arm in	Output	+0~800mA
	18	D4-			-0~800mA
	19	D5+	P1 pump	Output	+0~800mA
	20	D5-			-0~800mA
	21	GND	Battery (-)		0V
	22	D10-	OPT changeable relief 1	Output	-0~800mA
	23	D6+	P2 pump	Output	+0~800mA
	24	D6-			-0~800mA
	25	D7+	Spare	Output	+0~800mA
	26	D7-			-0~800mA
	27	D8+	Spare	Output	+0~800mA
	28	D8-			-0~800mA
	29	D9+	Spare	Output	-0~800mA
	30	D9-			+0~800mA
	31	+24V	Battery direct connection		20~32V

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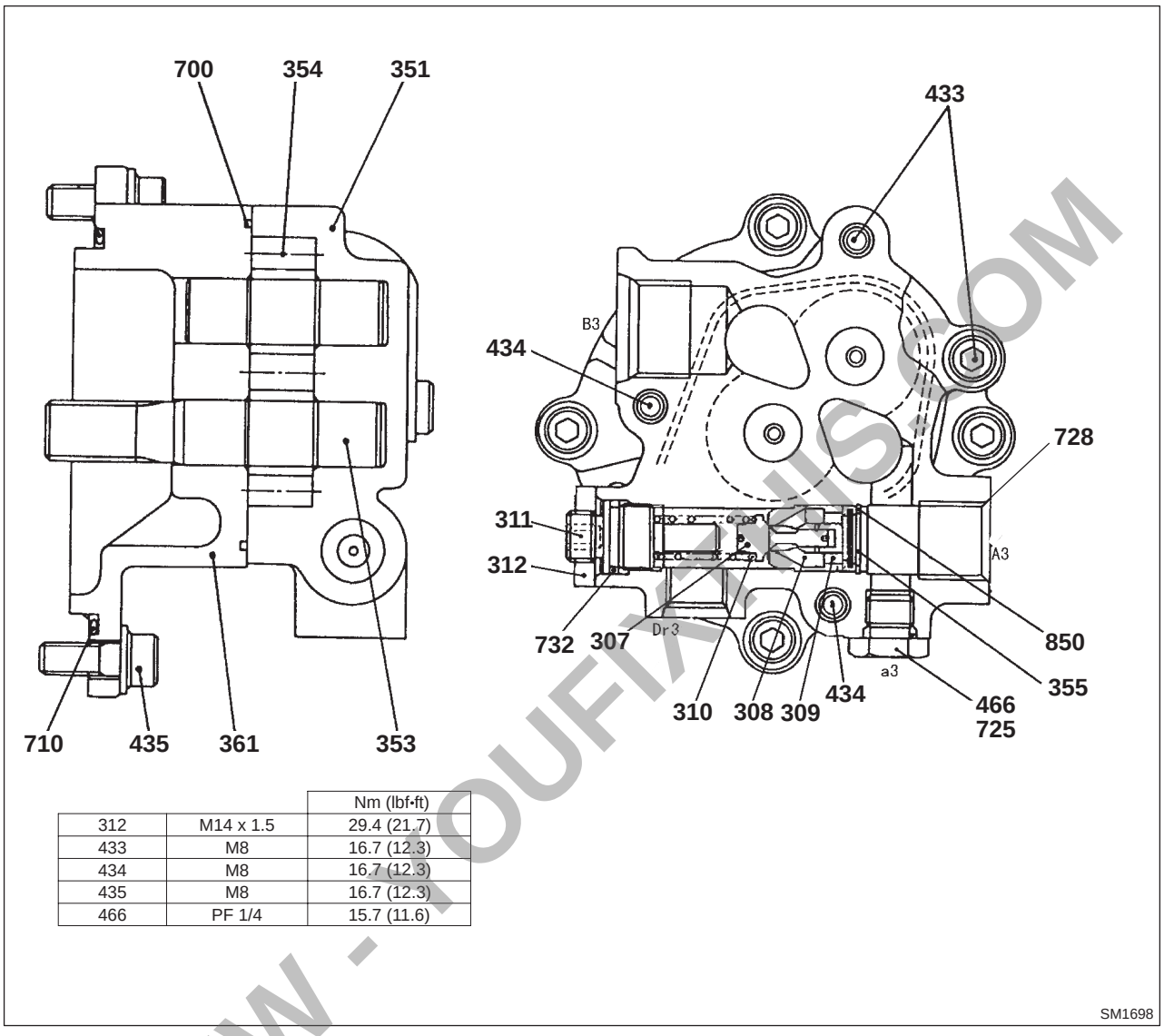
PRESSURE DRAINING (RELEASING) CIRCUIT: at pressure release mode



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GEAR PUMP (FOR PILOT)



		Nm (lbf·ft)
312	M14 x 1.5	29.4 (21.7)
433	M8	16.7 (12.3)
434	M8	16.7 (12.3)
435	M8	16.7 (12.3)
466	PF 1/4	15.7 (11.6)

SM1698

307 - Poppet
308 - Seat
309 - Ring
310 - Spring
311 - Adjust screw
312 - Lock nut; M14×1.5
351 - Gear case
353 - Drive gear
354 - Driven gear
355 - Filter
361 - Front case
433 - Flange socket; M8×40 (Q.ty 2)
434 - Flange socket; M8×55 (Q.ty 2)
435 - Flange socket; M8×20 (Q.ty 4)
466 - Vp plug; PF1/4
700 - Ring
710 - O-Ring
725 - O-Ring
728 - O-Ring
732 - O-Ring
850 - Locking ring
a3 - Gauge port; PF1/4 16 Nm (11.8 lbf·ft)
A3 - Delivery port; PF3/8 34.3 Nm (25.3 lbf·ft)
B3 - Suction port; PF3/4 73.5 Nm (54.2 lbf·ft)
Dr4 - Drain port; PF3/8 34.3 Nm (25.3 lbf·ft)

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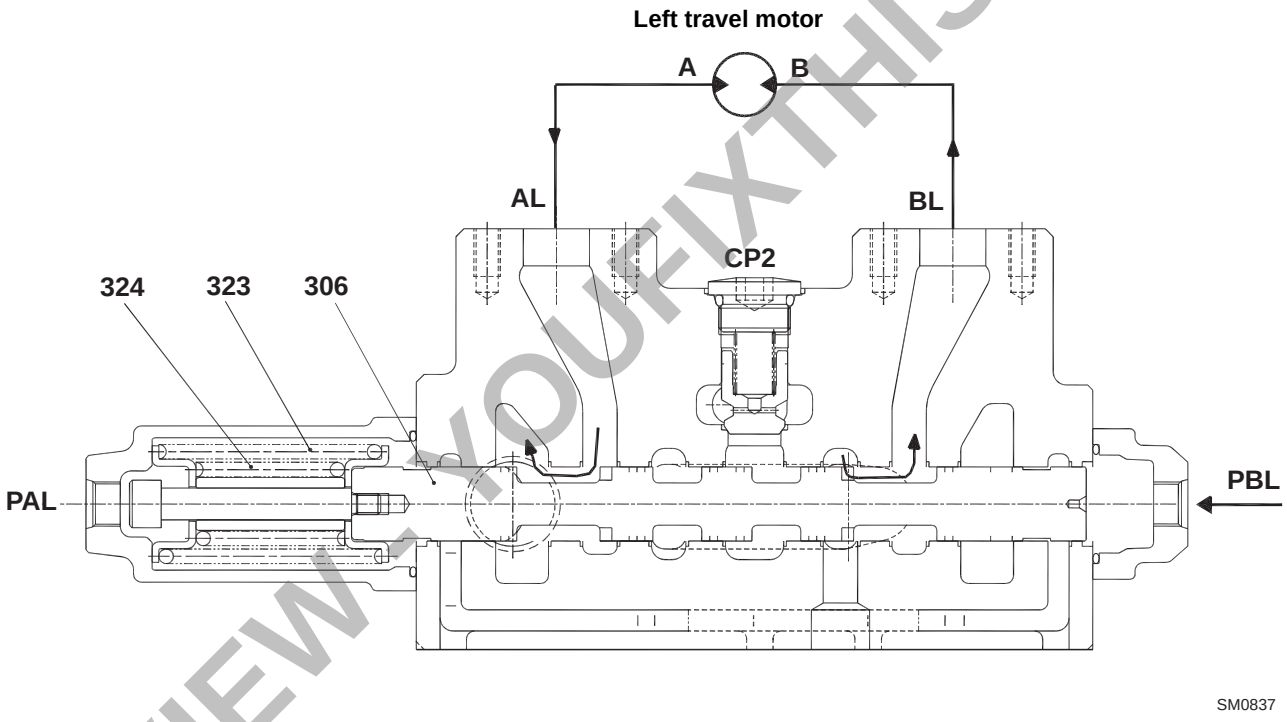
2. **Actuation in travel operation**

a) In travel independent operation

On starting travel operation (forward) started, the hydraulic oil delivered by hydraulic pump P1 is fed into travel right motor, and the hydraulic oil delivered by hydraulic pump P2 is fed into travel left motor. The pilot pressure enters ports PAr and PAL, and the right and left travel spools (**306**) move rightward the force of springs (**323**) (**324**) and the secondary pressure of solenoid proportional valves [X1] and [X2] acts on ports PCb and PCa and switches unloading spools (**309**) (**310**).

The hydraulic oil delivered by hydraulic pump P1 passes through travel straight spool (**307**) and flows into main circuit, and flows through between the perimeter of right travel spool (**306**) and casing and is fed into A side of right travel motor through port AR. The hydraulic oil delivered by hydraulic pump P2 flows through between the perimeter of left travel spool (**306**) and casing and is fed into A side of left travel motor through port AL similarly to the stream of hydraulic oil delivered by hydraulic pump P1.

But in the meantime, the return oil from the B sides of left and right travel operations passes through between the perimeter of right and left travel spools (**306**) and casing through ports Br and BL and flows into low pressure circuit (**D**), boost check valve (**517**), and then returns to the hydraulic tank through tank port T1. On traveling reverse (at the time when the pilot pressure actuates on ports PBr and PBL of control valve), the actuation is similar to that in forward travel operation.



In left reverse travel (at PBL is pressurized)

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FUNCTIONS OF TRAVEL MOTOR

1. Functions of motor

   The high pressure hydraulic oil delivered by the hydraulic pump enters from the inlets (**VA**, **VB**), passes through the brake valve, rear cover (**24**) and valve plate (**54**), and is admitted into cylinder block (**13**).

   The high pressure oil acts upon each of the pistons arranged in 180° bordering on the line Y-Y that connects the upper dead point with the lower dead point of the piston, as shown in figure on the right.

   And the high pressure oil creates;

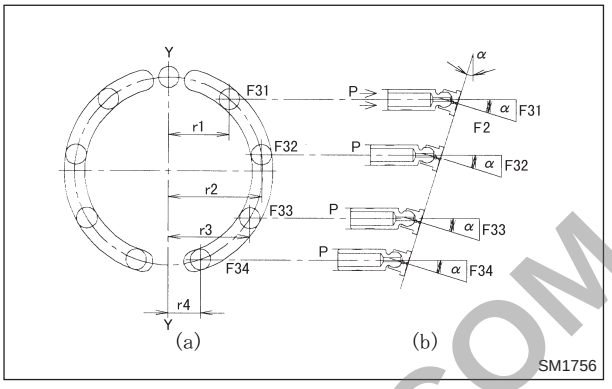
   Force F1=P×A (P; Pressure, A; Sectional area of piston).

   This force F1 becomes thrust component F2 and radial components F31-F34 (or F35) by shoe plate (**12**) having a tilting angle a. These radial components act upon the Y-Y axis as rotating force, and

   T=r1×F31+r2×F32+r3×F33+r4×F34

   (If high pressure acts upon five pistons, add r5×F35.) is produced.

   This torque is transmitted to the spline via cylinder block (**13**) and then to shaft (**9**).



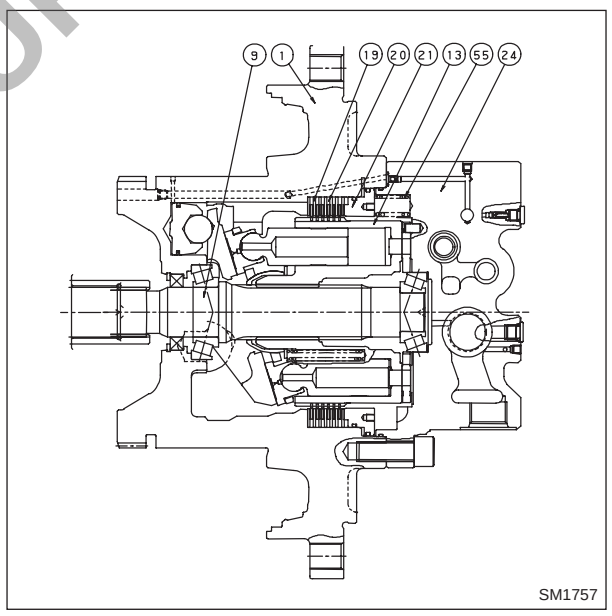
2. Functions of negative brake

   The negative brake is released when preferentially brake valve selected high pressure from the counterbalance built in rear cover (**24**) acts upon brake piston (**21**) and is generating braking torque when there is no pressure.

   The braking torque is produced by frictional force that is created by separator plate (**19**) linked to casing (**1**) with the spline and friction plate (**20**) linked to cylinder block (**13**) with the spline.

   When pressure is not acting upon the brake piston (**21**), it is pushed by the action of spring (**55**). Friction plate (**20**) and separator plate (**19**) are sandwiched between brake piston (**21**) and casing (**1**).

   This sandwiching force generates frictional force between friction plate (**20**) and separator plate (**19**) and acts as braking torque that binds cylinder block (**13**) or shaft (**9**).



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9. Open low pressure valve (**1**) of the gauge manifold and service valve can (**10**) and fill with refrigerant until all air bubbles in sight window (**12**) of the dryer disappear.
   Total quantity of gas to be charged: 900 ± 50 g.
10. Once the refrigerant change operation is terminated, close low pressure valve (**1**) of the gauge manifold and the service valve can (**10**).

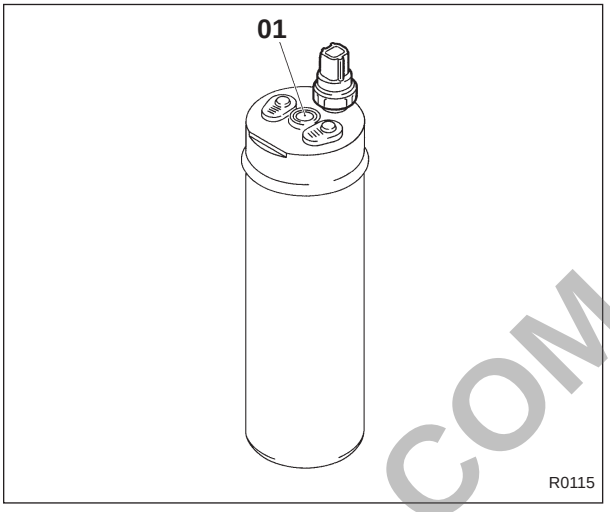
CAUTION

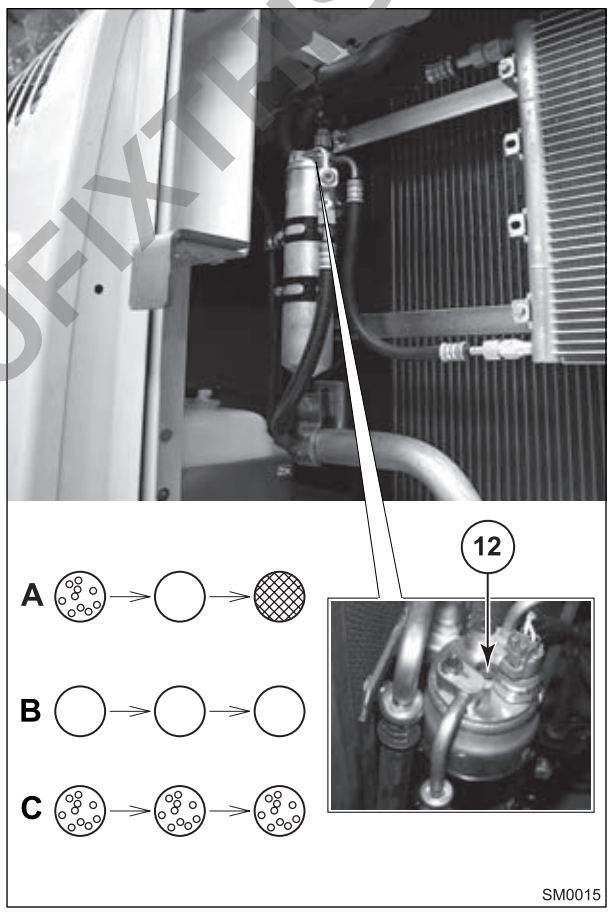
Do not open the high pressure valve of the manifold under any circumstance nor place the service can upside down.

11. The level of refrigerant is correct only once the air conditioner is activated and through the inspection sight window, just a few air bubbles are seen and, afterward, a white colour slightly milky is seen.

IMPORTANT: *when the air conditioner operates with an insufficient quantity of refrigerant, this has a negative effect on the compressor; on the contrary, when the refrigerant is charged with an excessive quantity, the cooling performance is lost. Also, the pressure of the system increases abnormally.*

12. Disassemble the manifold disconnecting the charging pipes from the compressor, as indicated here below.
    a. Press the quick release coupling of the charging pipe on the low pressure side against the service valve of the compressor so that the refrigerant doers not escape leaking when loosening the connection. As soon as the nut has been removed, disconnect the charging pipe from the service valve.
    b. Wait for the pressure in the high pressure site to decrease, indicated on the pressure gauge, to a value of 1.0 MPa.
    c. Disconnect the red charging pipe from the high pressure side, in the same manner as described for the low pressure.





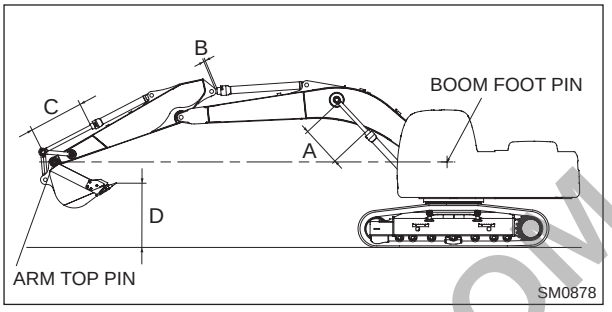
A: Appropriate quantity of refrigerant
B: The system is overloaded
C: Insufficient quantity of refrigerant

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Oil tightness of cylinders

PURPOSE

Confirm that the cylinder oil tight by checking the moving length of the cylinder rods.



CONDITIONS

Hydraulic oil temperature: 45~55°C (113~131°F)

Firm, level ground

After cylinders are replaced, bleed off air from the cylinders, before checking for oil tightness.

Retract the arm cylinder rod 50mm (2in) from stroke end so that the piston does not match a same range of the cushioning mechanism.

PREPARATION

Put the bucket empty. Extend the arm cylinder rod 50mm (2in) from the most retracted position. And extend the bucket cylinders fully. Then hold the boom so that the arm top pin is positioned at same height with boom foot pin.

MEASUREMENT

Measure the items ten minutes after the engine is turned off.

Oil tightness of cylinder Unit: mm(in)/10 min

Measuring position	Standard value	Reference value for remedy	Service limit
A	7 (0.28)	9 (0.35)	12 (0.47)
B	10 (0.4)	12.5 (0.49)	16.5 (0.65)
C	-	-	-
D	200 (7.9)	250 (9.8)	334 (13.1)

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Table 35

Error code	**B104**		
Trouble	Travel left pressure sensor's power source is shortcut.		
Judging condition	The input voltage from Travel left pressure sensor is 4.7 V or more.		
Symptom	The Travel left operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0 mA. (Hydraulic pump emergency mode) P1, Set output of P2 unload proportional valve to 0 mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-10 TRAVEL (L)
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Travel left pressure sensor SE-10	When B104 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel left pressure sensor and controller CN-302F CN-102F	When B104 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

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Table 97

Error code	**R144**		
Trouble	Swing flasher relay error.		
Judging condition	The mechatro controller output line to swing flasher relay is short-circuited with the power source.		
Symptom	Left swing flasher does not light.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF.		
Service diagnosis checking screen	Screen No.	22	D14
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Swing flasher relay R-19	When error is cancelled after removing connector (CN-74F) of swing flasher relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (HB) and (HC) is 0 Ω, it is in abnormal condition. 
2	• Wiring between swing flasher relay and controller CN-74F, CN-109F	When R144 is left displayed with the relay removed Check that no power 24 V is produced on relay (-) line (as shown right upper figure B) according to the wiring checking procedure and replace it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

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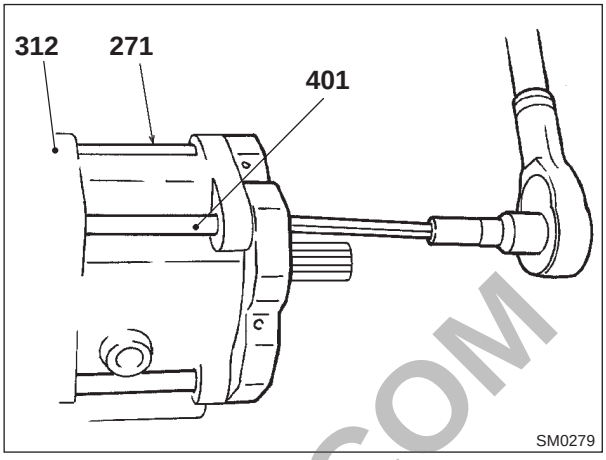
Trouble \ Factors		Fuel system				Intake and exhaust system				Lubrication system				Cooling system	
		Failure of injector	Failure of supply pump	Improper fuel injection time	Fuel leak into the head cover	Turbocharger oil drain tube clogged	Seal of turbocharger worn, damaged	Seizing and interference of turbocharger	Damage of EGR cooler	Failure oil pump	Failure of relief valve	Failure of regulation valve	Leak and crush of hydraulic piping	Damage of water pump	Failure of thermostat (Do not open)
Faulty starting	Poor starting ability (Takes a long time)	○	○												
	Faulty engine starting/engine does not rotate														
	Faulty engine starting/engine rotates but no exhaust gas (No fuel injection)														
	Faulty engine starting/exhaust gas is emitted but engine does not rotate	○	○												
Insufficient rotation	Engine poor run-up (Low follow-up ability)	○	○						○						
	Rotation in bad condition (hunting)														
Poor output	Engine stalled during operation		○												
	Output is lowered	○	○	○					○						
	Overheating			○										○	○
Other failures	Exhaust smoke is in black	○	○						○						
	Exhaust smoke is white	○		○		○	○			○					
	Lager oil consumption (or blue exhaust gas)					○	○						○		
	Early contamination of oil				○	○	○				○				
	Larger fuel consumption	○		○	○										
	Intruding of oil in coolant, back flow, reduction of coolant quantity						○		○						
	Hydraulic pressure down (Monitor lights up)									○	○	○	○		
	Oil quantity increased (Intruding of water and fuel)	○	○		○										
	Vibration	○													

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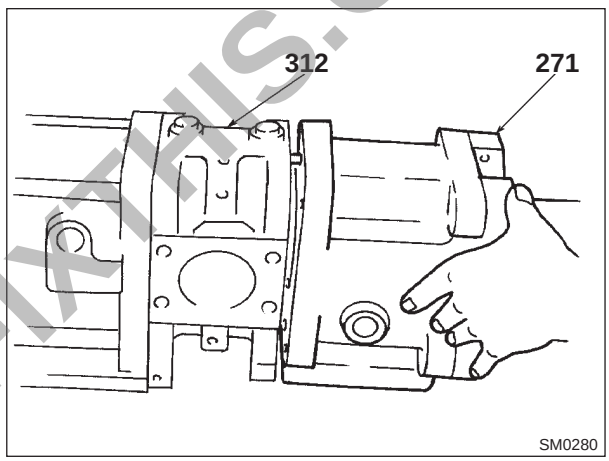
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4. Loosen socket bolts (**401**) that fasten swash plate support (**251**), pump casing (**271**) and valve block (**312**).

   : 17 mm

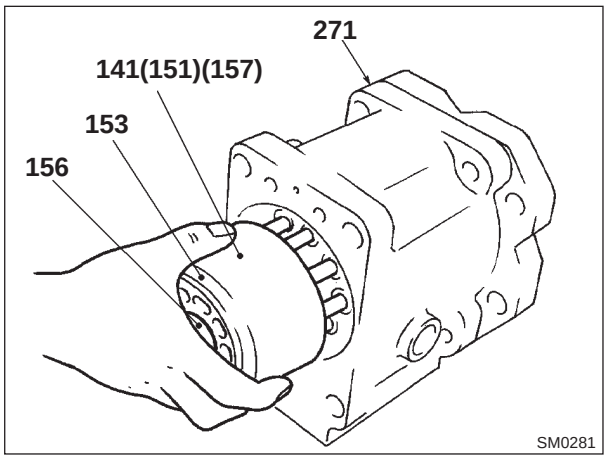


5. Place the pump level on a work bench with its mounting surface of the regulator facing down. Then separate pump casing (**271**) and valve block (**312**).



NOTE: *when facing the mounting surface of the regulator down, place a rubber board on a work bench so as not to score the mounting surface.*
*When the pump casing has been separated from the valve block, draw out the 1st gear (**116**) at the same time.*

6. Draw out cylinder (**141**) out of pump casing (**271**) in parallel to shaft (**111**). At the same time draw out piston (**151**), plate (**153**), spherical bushing (**156**) and cylinder spring (**157**).



NOTE: *use care so as not to score the sliding surface of the cylinder, spherical bushing, shoe and the swash plate.*

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16. Removing back pressure check valve

16.1 Loosen socket bolt (**278**) and remove back pressure check valve (**207**) and the O-rings (**264**), (**266**) from the casing.



16.2 Remove springs (**527**), (**528**), boost check valve poppet sub (**517**) and by-pass check valve poppet (**518**) from the casing. The further disassembly of boost check valve poppet sub (**517**) is not allowed.



Replace control valve so that the spool cover face directs downward.

IMPORTANT: *when replacing, take care so as not to score the spool cover.*

17. Removing plate

17.1 Loosen socket bolts (**274**), (**275**) and remove plates (**212**), (**213**).

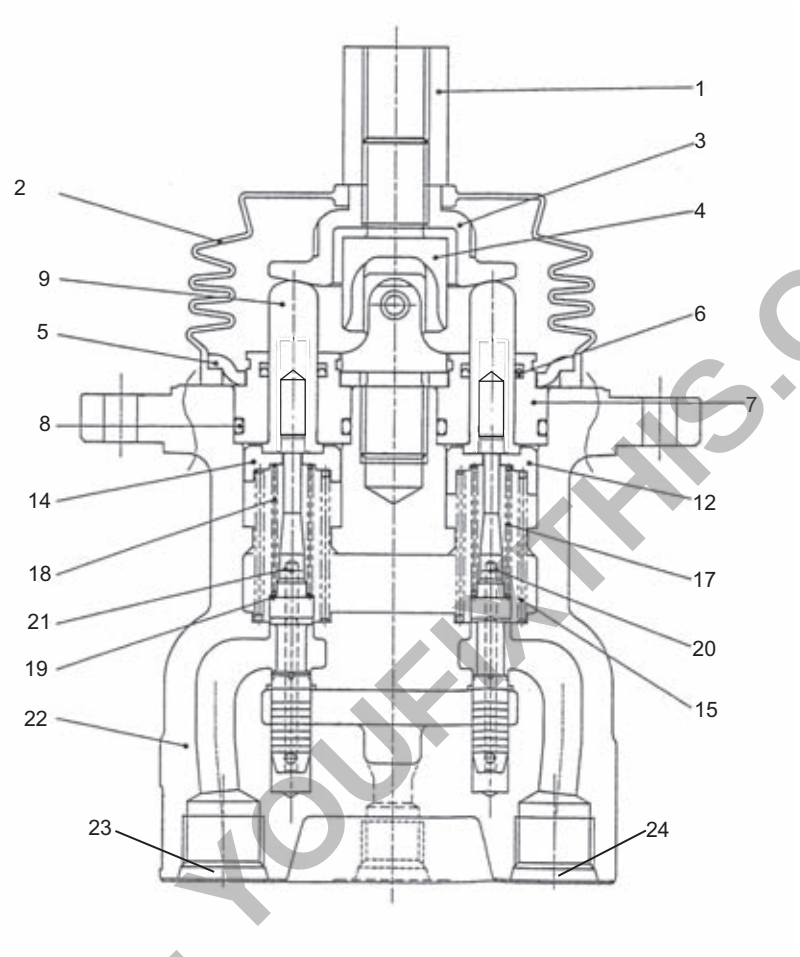
17.2 After removing plates, remove all O-rings (**162**), (**163**) remained on the casing side.



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ASSEMBLY RIGHT AND LEFT PILOT VALVE



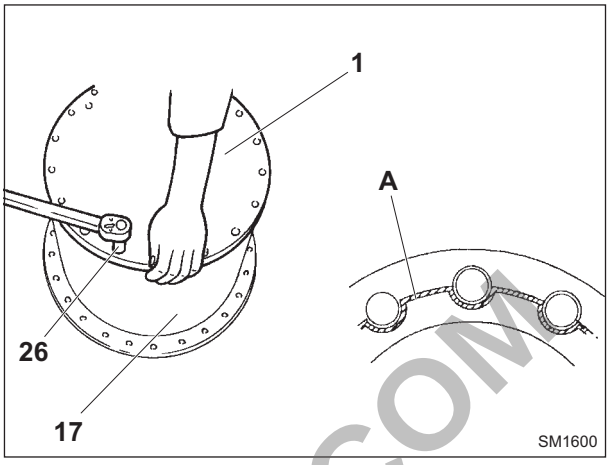
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1- **Adjusting nut** M14
2- **Boots**
3- **Circular plate**
4- **Joint** M14
5- **Plate**
6- **Seal** (Q.ty 4)
7- **Plug** (Q.ty 4)
8- **O-Ring** (Q.ty 4)
9- **Push rod** (Q.ty 4)
10- **Spring** (Q.ty 4)
11- **Spring seat 2** (Q.ty 2)
12- **Spring seat 1** (Q.ty 2)
13- **Spring seat 2** (Q.ty 2)
14- **Spring seat 1** (Q.ty 2)
15- **Spring** (Q.ty 2)
17- **Spring** (Q.ty 2)
18- **Spring** (Q.ty 2)
19- **Washer 2** (shim) (Q.ty 4)
20- **Spool** (Q.ty 2)
21- **Spool** (Q.ty 2)
22- **Casing**
23- **2E4 Port**
24- **1E3 Port**

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10. Installing cover
    a. Apply Loctite #515 to the matching surface (**A**) between cover (**1**) and ring gear (**17**). Install cover (**1**) to ring gear (**17**).
    b. Apply Loctite #242 to eighteen M10 socket bolts (24) and tighten them up.
       : 8 mm
       : 68.6 ± 6.9 Nm (50.6 ± 5 lbf•ft)



11. Filling gear oil
    a. Fill in gear oil (SAE90, API Grade GL-4, 10.5 l) through the socket plug PT3/4 (**26**), place seal tape on the plug and attach it to cover (**1**).
       : 14 mm
       : 98.1 Nm (72.3 lbf•ft)

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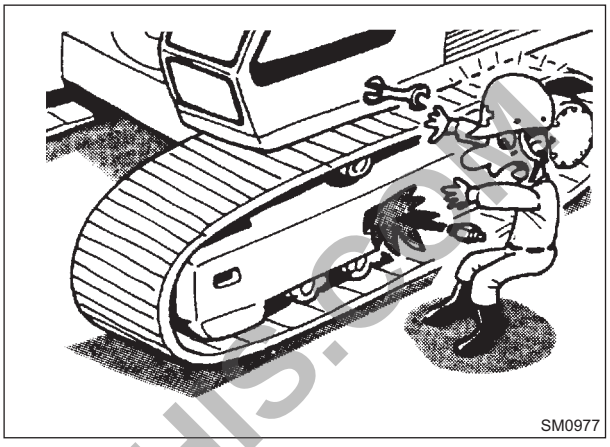
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REMOVAL AND INSTALLATION OF TRACKS

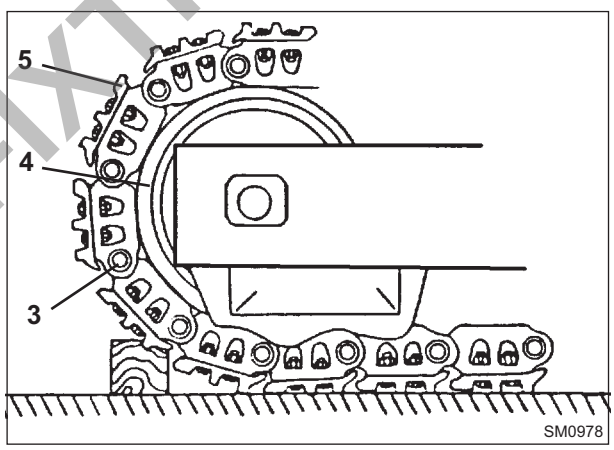
Removal

WARNING

*Do not loosen valve (**1**) quickly on loosen too much since high-pressure grease in the adjusting cylinder may spout out.*
*Loosen carefully, keeping body parts and face away from valve (**1**).*
*Never loosen grease fitting (**2**).*

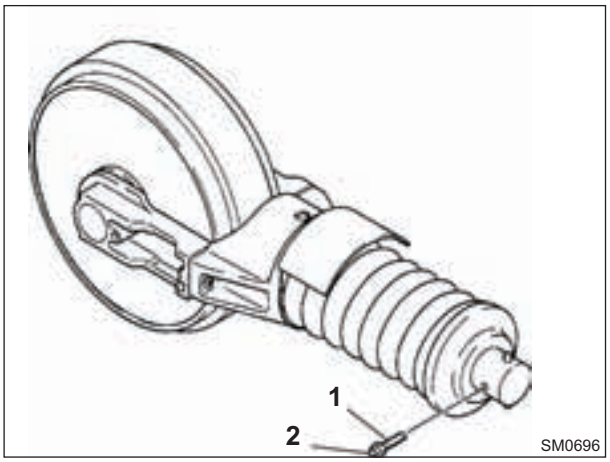

SM0977

1. Move the tracks so that master pin (**3**) is positioned over front idler (**4**).
   Put a wooden block under track shoes (**5**), as shown.



SM0978

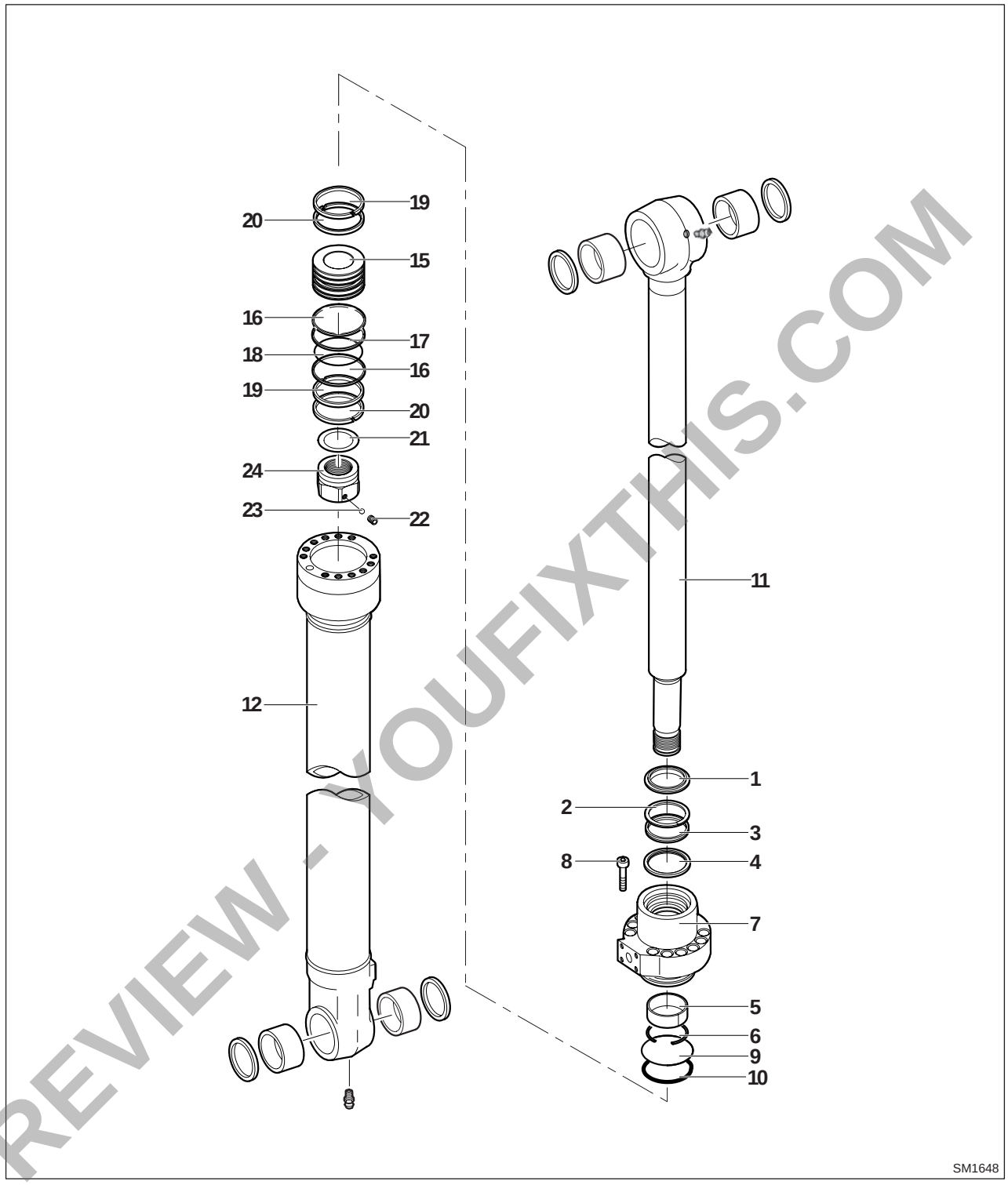
2. To loosen the track tension, slowly turn valve (**1**) counterclockwise one turn; grease will escape from grease outlet.
   : 19 mm



SM0696

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Positioner cylinder (triple articulation version)



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1 - Wiper Ring
2 - Backup Ring
3 - Seal
4 - Seal
5 - Bushing
6 - Snap Ring
7 - Cylinder Head
8 - Socket Bolt
(q.ty 12)
9 - Backup Ring
10 - O -Ring
11 - Cylinder Rod
12 - Cylinder Tube
15 - Piston
16 - Backup Ring
(q.ty 2)
17 - Seal Ring
18 - O -Ring
19 - Slide Ring
(q.ty 2)
20 - Slide Ring
(q.ty 2)
21 - Shim
22 - Set Screw
23 - Steel Ball
24 - Nut

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Inspection item			Standard value	Repair limit	Service limit	Action
Valve spring	Inner	Set length	44.8{1.764}	—	—	
		Set load	129N {13.1kgf}	—	—	
		Free length	64.6 {2.5433}	—	–3.0 {–0.3543}	Replace spring
		Squareness	—	—	2.0 {0.0787}	Replace spring
	Outer	Set length	46.8 {1.8252}	—	—	
		Set load	314N {32.0kgf}	—	—	
		Free length	75.7 {2.9803}	—	–3.0 {–0.3543}	Replace spring
		Squareness	—	—	2.0 {0.0787}	Replace spring

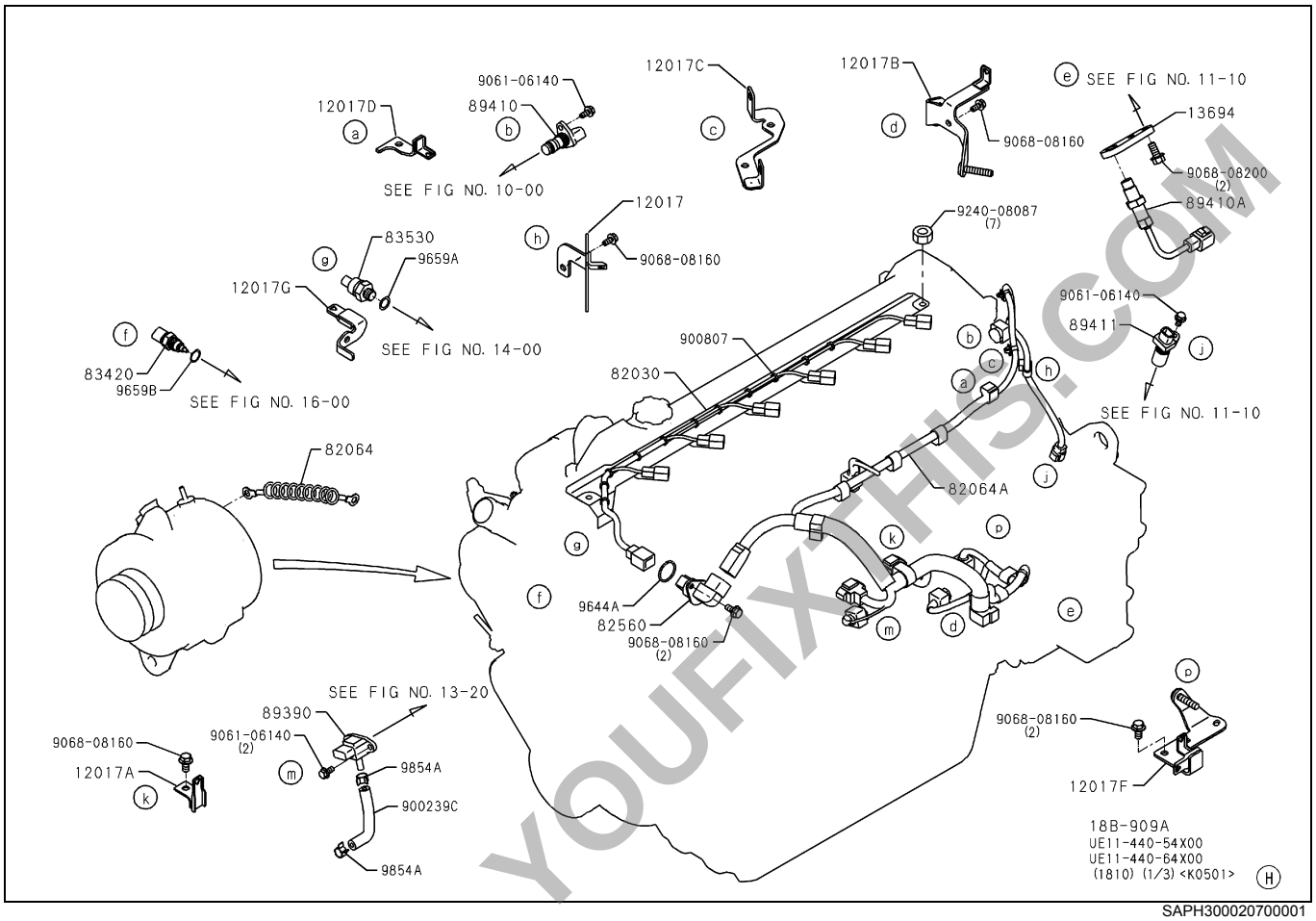
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Electrical System

Part layout

JP30002070402001



SAPH300020700001

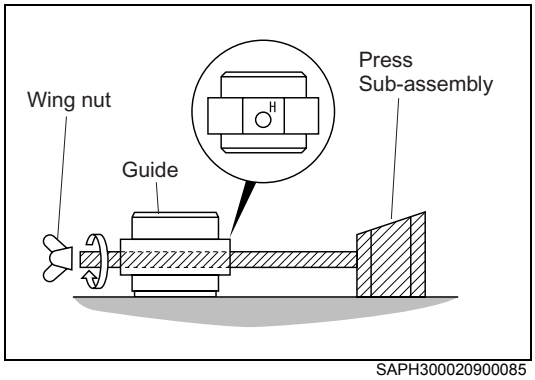
82030	Injector harness	89390	Boost pressure sensor
83420	Water temperature sender gauge	89410	Engine sub-revolution sensor
83530	Oil pressure warning switch	89411	Engine main revolution sensor

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Replacement of connecting rod bushing

JP30002090704007



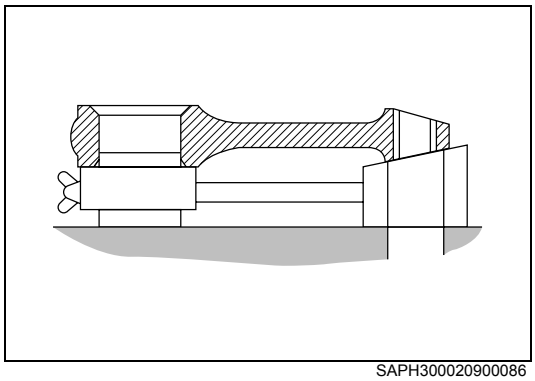
SAPH300020900085

1. Removal of connecting rod bushing

(1) Put the press sub-assembly together with the special tool guide nut and fix them using the wing nut.

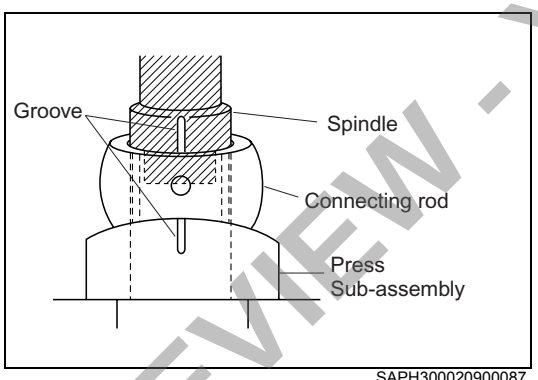
Guide
Press sub-assembly
Wing nut

⚠ **CAUTION**
- **Face "H" mark of the guide upward for assembly.**
- **Assemble it on a level table and make sure that the lower end of the guide and the press sub-assembly is flat.**



SAPH300020900086

(2) With the large end bearing removed, assemble the connecting rod and put it on the assembled tool.

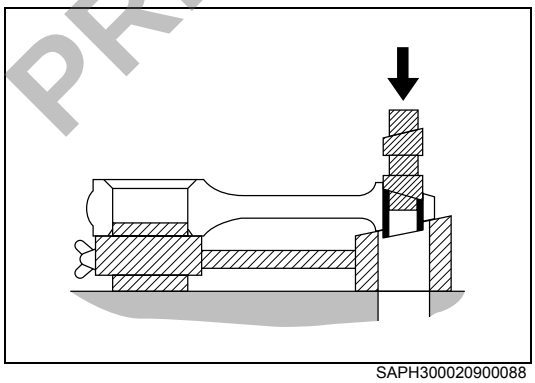


SAPH300020900087

(3) Install the spindle on the bushing of the connecting rod.

Spindle

⚠ **CAUTION**
- **Align the press sub-assembly groove with the special tool spindle groove for installation.**



SAPH300020900088

(4) Remove the bushing of the connecting rod using a press.

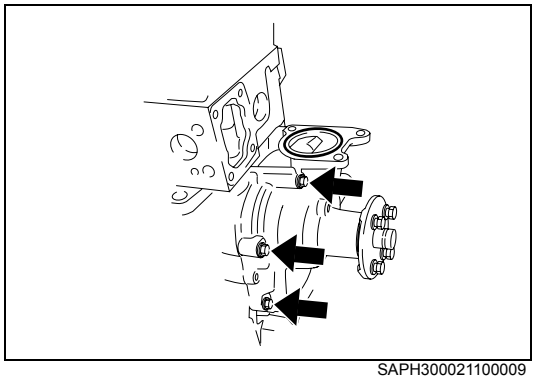
⚠ **CAUTION**
- **Move the press slowly.**

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Replacement of coolant pump

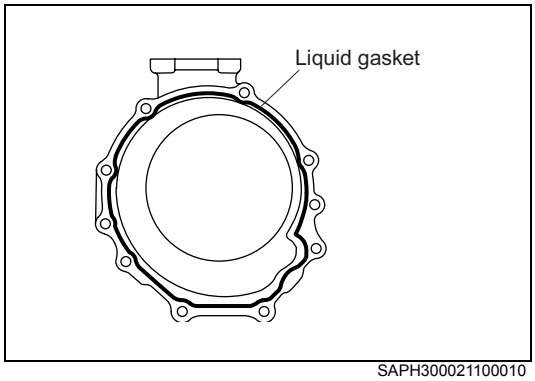
JP30002110704002



SAPH300021100009

1. Removal of coolant pump

(1) Remove bolts and remove the coolant pump.



SAPH300021100010

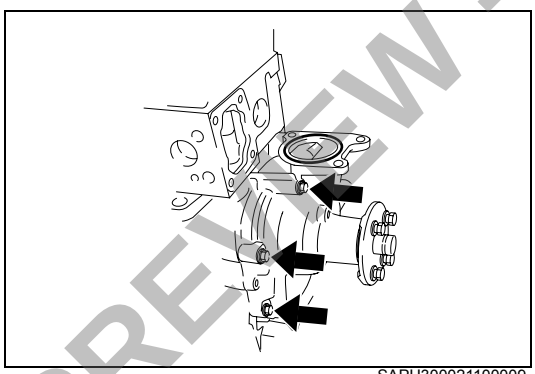
2. Installation of coolant pump

(1) Remove contamination on the joint surface between the coolant pump and the cylinder block using a scraper and degrease the surface.

(2) Apply the liquid gasket [Threebond TB1207B (black) or equivalent] to the coolant pump as shown in the figure.

⚠ CAUTION

- **Apply it continuously.**
- **Apply the liquid gasket at the width of 2 to 3mm{0.0787 to 0.1181in.}.**
- **Install the oil cooler within 20 minutes after application of the liquid gasket.**
- **Fill the groove on the water pump flange with the liquid gasket.**



SAPH300021100009

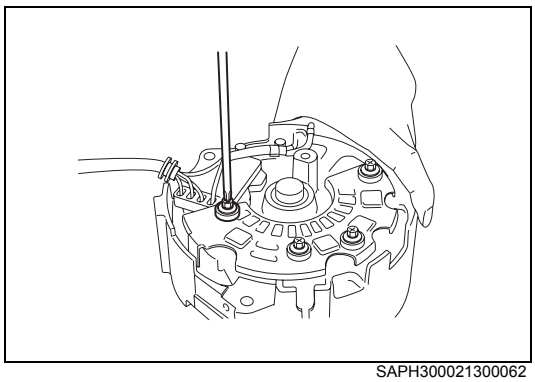
(3) Install the coolant pump to the dowel pin of the cylinder block.

NOTICE

- **When the coolant pump is installed using a guide bolt, displacement of the liquid gasket does not occur.**

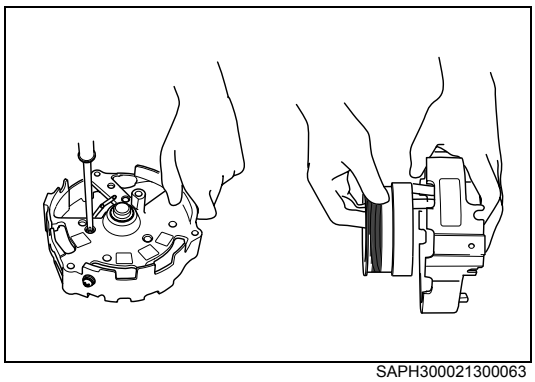
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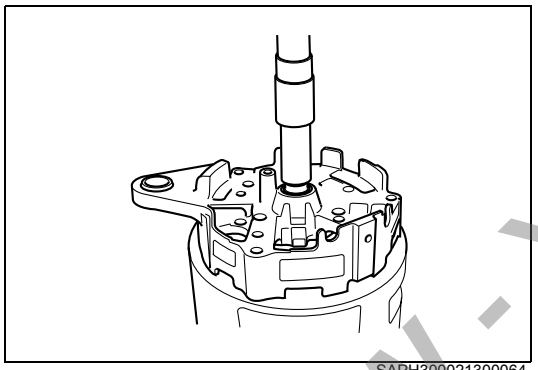

SAPH300021300062

(5) Remove five bolts using a screwdriver and remove the heat sink assembly (plus), heat sink assembly (minus) and regulator all together.

⚠ CAUTION
- **Screw lock is used. Since torque is high until bolt is removed, be careful not to damage the groove of the bolt head.**
- **When the rear bracket is reused, clean the screw hole.**


SAPH300021300063

(6) Remove the capacitor.
(7) Remove three bolts with a screwdriver and remove the field coil from the rear bracket.

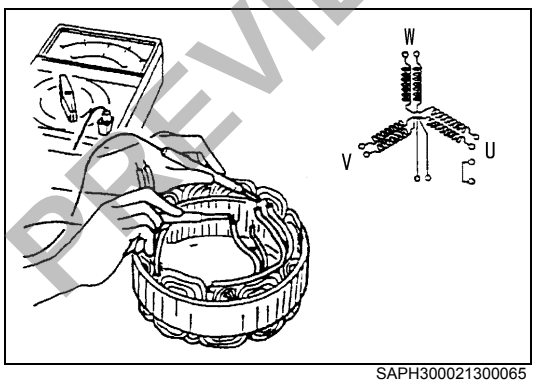

SAPH300021300064

(8) Remove the roller bearing from the rear bracket using a press, jig A and jig B.

⚠ CAUTION
- **Removed bearing must not be reused.**

Inspection of components (60A)

JP30002130703002



SAPH300021300065

⚠ CAUTION
- **Place a rubber mat and perform work on the mat.**

1. Inspection of stator coil and field coil

(1) Measure the resistance between U-V, V-W and W-U terminals of the stator coil using a circuit tester.

Standard value (Ω)	0.15 - 0.17

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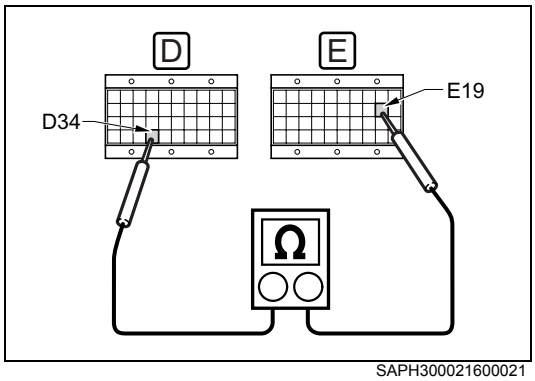
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Coolant temperature sensor malfunction (DTC code P0117, P0118/diagnosis monitor code 11)

JP30002160601007

DTC	P0117	Coolant temperature sensor circuit low input
DTC	P0118	Coolant temperature sensor circuit high input

1	Measurement of resistance between terminals



SAPH300021600021

1. Set the starter key to "LOCK" and connect the signal check harness.
2. Disconnect the ECU side connector of the signal check harness and meausre the resistance between terminal B19 and terminal D34.

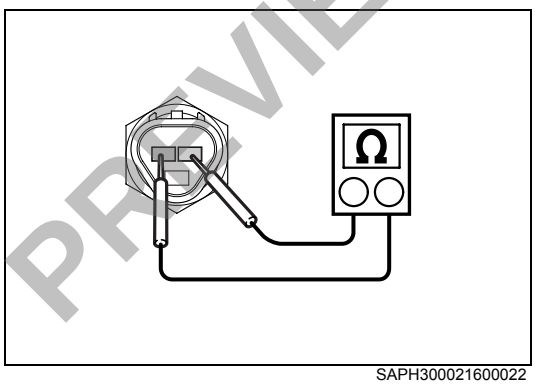
Standard value (Measure either one point of the following.)
: 2.45 kΩ (Coolant temperature at 20 °C{68 °F})
: 1.15 kΩ (Coolant temperature at 40 °C{104 °F})
: 584 Ω (Coolant temperature at 60 °C{140 °F})
: 318 Ω (Coolant temperature at 80 °C{176 °F})

NG → [2] Go to measurement of resistance between sensor terminals.

OK

Engine ECU failure, ECU connector failure, harness short-circuit

2	Measurement of resistance between terminals



SAPH300021600022

1. Disconnect the connector of the coolant temperature sensor and measure the resistance between No. 1 and No. 2 terminals at the sensor.

Standard value (Measure either one point of the following.)
: 2.45 kΩ (Coolant temperature at 20 °C{68 °F})
: 1.15 kΩ (Coolant temperature at 40 °C{104 °F})
: 584 Ω (Coolant temperature at 60 °C{140 °F})
: 318 Ω (Coolant temperature at 80 °C{176 °F})

NG → Failure of coolant temperature sensor

OK

Harness disconnection, connector failure

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