KOBELCO

SERVICE MANUAL

Hydraulic Excavator

260SRLC-3
Tier 4

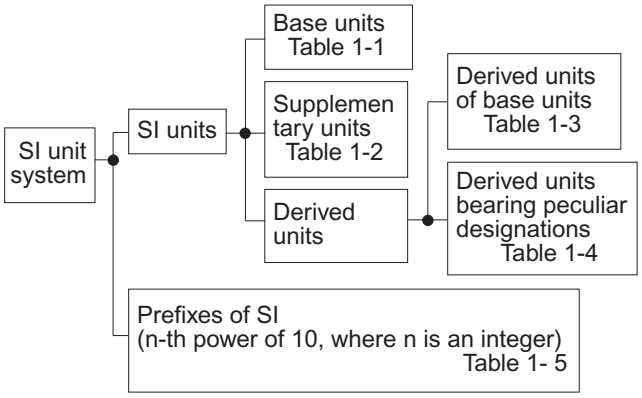
S5YF0014E01

Issued October 2012
1st Edition

APPLICABLE:
260SRLC-3 . . . . . YU07-04001~

1.2 INTERNATIONAL UNIT SYSTEM

Introduction
Although this manual uses the SI units system. Outline of SI units system is described here.
Given hereinunder are an excerpt of the units that are related to this manual :
1. Etymology of SI Units
English : International System of units
2. Construction of SI Unit System



(1) Basic Units

Table1-1

QUANTITIES	DESIGNATION	SIGN
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Current	Ampere	A
Thermodynamic temperature	Kelvin	K
Gram molecule	Mol	mol
Luminous intensity	Candela	cd

(2) Supplementary Units

Table1-2

QUANTITIES	DESIGNATION	SIGN
Plain angle	Radian	rad
Solid angle	Steradian	sr

(3) Derived Units of Basic Units

Table1-3

QUANTITIES	DESIGNATION	SIGN
Area	Square meter	m^2
Volume	Cubic meter	m^3
Velocity	Meter per second	m/s
Acceleration	Meter per second / second	m/s^2
Density	Kilogram per cubic meter	kg/m^3

(4) Derived Units bearing Peculiar Designations

Table1-4

QUANTITY	UNIT	SYMBOL	FORMULA
Frequency	hertz	Hz	1Hz=1/s
Force	newton	N	$kg \cdot m/s^2$
Pressure and Stress	pascal	Pa	N/m^2
Energy, Work and Quantity of heat	joule	J	N•m
Power	watt	W	J/s
Quantity of electricity	coulomb	C	A•s
Electric potential difference, Voltage, and Electromotive force	volt	V	W/A
Quantity of static electricity and Electric capacitance	farad	F	C/V
Electric resistance	ohm	Ω	V/A
Celcius temperature	celcius degree or degree	°C	(t+273.15)K
Illuminance	lux	lx	l m/m^2

2.8 COMBINATIONS OF ATTACHMENT

Bucket			Available Arm		
Type	Heaped capacity m^3 (cu•yd)	Struck m^3 (cu•yd)	2.94m (9ft-8in) Arm (STD)	3.33m (10ft-10in) Arm (Long)	2.4m (7ft-10in) Arm (Short)
Hoe bucket	0.51 (0.67)	0.39 (0.51)	○	○	○
	0.70 (0.92)	0.52 (0.68)	○	△	○
	STD 0.80 (1.05)	0.59 (0.77)	◎	×	○
	0.93 (1.2)	0.67 (0.88)	△	×	◎
Breaker	—	—	○	○	○
Nibbler	—	—	○	○	○

Note

◎ Standard combination

○ General operation : Excavation or loading of sand, gravel, and clay

△ Light operation : Mainly loading or loose gravel (e.g., cultivation or loading of sand or gravel)

× Prohibited combination : There are problems from the view points of strength and stability.

- Use the attachments recommended by NEW HOLLAND KOBELCO.
  The trouble due to the use in the condition "Use not allowed" described in the above table is not included in our responsibility

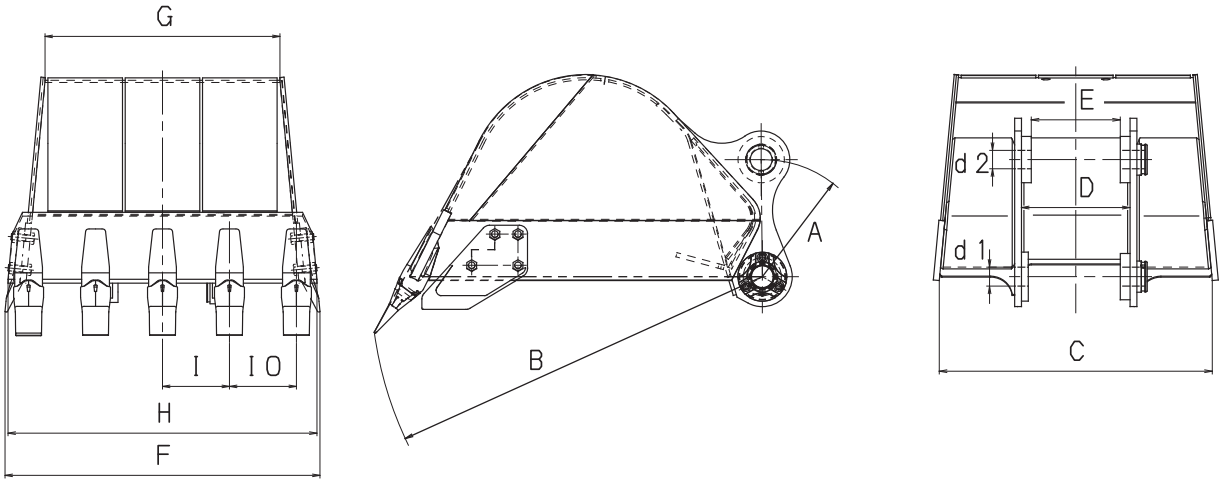
CAUTION

When the only 2.94m (9ft-8in) arm is using, do not turn the bucket back to front to use as a shovel.

3.3 BUCKET

3.3.1 BUCKET DIMENSIONAL DRAWING

(1) Hoe bucket

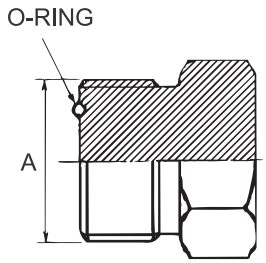


Bucket dimensional drawing

No.	NAME	No.	NAME
A	Distance between pin and bracket	G	Inner width of bucket bottom
B	Distance between bucket pin and tooth end	H	Bucket outer width of front side
C	Inner width of bucket top end	I	Pitch between teeth
D	Inner width of lug	Io	Pitch between teeth
E	Inner width of bracket	d1	Outer dia. of bushing
F	Outer width of side cutter	d2	Pin dia.

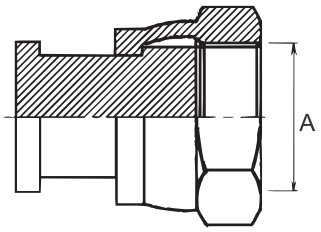
(4) Plug for ORS joints

Male



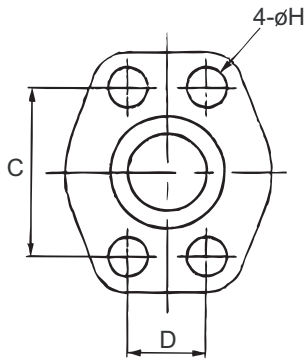
Screw size A	Applicable hose O.D	Plug parts No.	Opposing flats (HEX)	O-ring parts No.	Nominal O-ring
1-14UNS	ø21.7	YN01H01001P1	27	ZD12A01600	1B A16
1 3/16-12UN	ø27.2	YN01H01002P1	36	ZD12A01800	1B A18
1 7/16-12UN	ø34.0	YN01H01003P1	41	ZD12A02100	1B A21

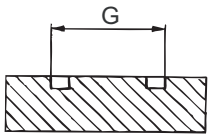
Female



Screw size A	Applicable tube O.D	Plug parts No.	Opposing flats (HEX)
1-14UNS	ø21.7	YN01H01004P1	32
1 3/16-12UN	ø27.2	YN01H01005P1	36
1 7/16-12UN	ø34.0	YN01H01006P1	41

(5) Plug for half clamp





For standard pressure : 20.6 MPa (2990 psi)

Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE12Q08000	38.10	17.48	25.53~ 25.40	9	45Z91D2
3/4	ZE12Q12000	47.63	22.23	31.88~ 31.75	11	ZD12P02600
1	ZE12Q16000	52.37	26.19	39.75~ 39.62	11	ZD12P03400
1 1/4	ZE12Q20000	58.72	30.18	44.58~ 44.45	11	ZD12P03800

For high pressure : 41.2 MPa (5970 psi)

Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE13Q08000	40.49	18.24	25.53~ 25.40	9	2445Z831D1
3/4	ZE13Q12000	50.80	23.80	31.88~ 31.75	11	ZD12P02600
1	ZE13Q16000	57.15	27.76	39.75~ 39.62	13	ZD12P03400
1 1/4	ZE13Q20000	66.68	31.75	44.58~ 44.45	15	ZD12P03800

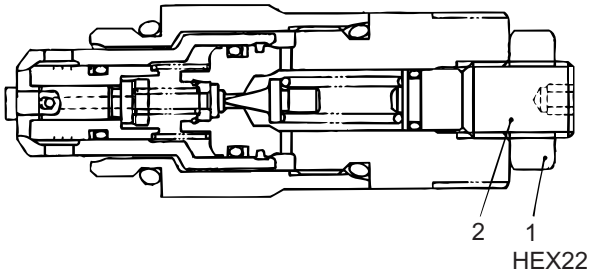
06 Electric equipments (3/4)

Group	Location	Work to be done	Unit	Remarks	Unit: Hour
	Sensor				OPT
SE-1	Pressure sensor : Bucket digging	Replace	1		0.3
SE-2	Pressure sensor : Bucket dump	Replace	1		0.3
SE-3	Pressure sensor : Boom up	Replace	1		0.3
SE-4	Pressure sensor : Boom down	Replace	1		0.3
SE-5	Pressure sensor : Swing	Replace	1		0.3
SE-7	Pressure sensor : Arm in	Replace	1		0.3
SE-8	Pressure sensor : Arm out	Replace	1		0.3
SE-9	Pressure sensor : Travel right	Replace	1	Include under cover removing and installing	0.5
SE-10	Pressure sensor : Travel left	Replace	1	Include under cover removing and installing	0.5
SE-11	Pressure sensor : P2 Opt.	Replace	1	Include under cover removing and installing	0.5
SE-13	Engine speed sensor	Replace	1	Include under cover removing and installing	0.5
SE-15	Fuel sensor	Replace	1	Include guard removing and installing	0.5
SE-16	Accel potentio meter	Replace	1		0.5
SE-17	Boom potentio meter	Replace	1		0.5
SE-20	Pressure sensor : P1 Opt.	Replace	1	Include under cover removing and installing	0.5
SE-22	Pressure sensor : Pump P1	Replace	1		0.3
SE-23	Pressure sensor : Pump P2	Replace	1		0.3
SE-26	Pressure sensor : Boom head EU (For overload alarm)	Replace	1		0.3
SE-28	Extra pressure	Replace	1		0.3
SE-29	Opt. selector detect sensor	Replace	1		0.3
SE-60	Hyd. fluid filter restriction sensor	Replace	1		0.3
SE-62	Suction temp. sensor / Air flow meter	Replace	1		0.3
	Solenoid				
SV-1	Swing parking brake SOL	Replace	1	Include proportional valve block removing and installing.	0.3
SV-2	Power boost SOL	Replace	1	Include proportional valve block removing and installing.	0.3
SV-3	2-speed select SOL	Replace	1	Include proportional valve block removing and installing.	0.3
SV-4	Safety lock lever SOL	Replace	1	Include proportional valve block removing and installing.	0.3
SV-9	Nibbler open SOL	Replace	1		0.3
SV-10	Nibbler close SOL	Replace	1		0.3
SV-11	Extra dis-press. SOL	Replace	1		0.3
SV-13	Opt. selector SOL	Replace	1		0.3

	Work No.	Work	Work unit	Works	260SRLC-3	
					Q'ty	
					1	Adding hour by 1 each
440	01830	Removal and installing common rail assembly (with pressure sensor, pressure limiter)	One set	Include; Function check	3.8	
441	01804	Replacing common rail assembly (with pressure sensor, pressure limiter)	One set	Include; Function check	3.8	
442	01805	Removal and installing injector assembly	Completed machine	Include; Function check	3.5	
443	01806	Replacing injector assembly	Completed machine	Include; Function check and reprogramming	4.0	
444	01807	Removal and installing injector assembly	One set	Include; Function check	1.9	0.2
445	01808	Replacing injector assembly	One set	Include; Function check and reprogramming	2.4	0.2
446	01809	Removal and installing injector sub harness assembly	One set	Include; Function check	1.9	
447	01810	Replace injector sub harness assembly	One set	Include; Function check	1.9	
448	01811	Removal and installing flow dumper	One set	Include; Function check	1.2	0.3
449	01812	Replacing flow dumper	One set	Include; Function check	1.2	0.3
450	01813	Removal and installing pressure limiter	One set	Include; Function check	1.2	
451	01814	Replacing pressure limiter	One set	Include; Function check	1.2	
452	01815	Replacing common rail pressure sensor	One set	Include; Function check	1.2	
453	01816	Replacing main engine speed sensor	One set	Include; Function check	1.2	
454	01817	Replacing sub engine speed sensor	One set	Include; Function check	1.2	
455	01818	Replacing coolant temperature sensor	One set	Include; Function check	1.2	
456	01819	Replacing fuel temperature sensor	One set	Include; Function check	1.2	

(3) Over load relief valve
(Boom, bucket, arm sections)
Loosen lock nut (1) and adjust it with adjust screw (2).
Tools: Spanner: 22 mm,
Tightening torque : 27.4 to 31.4 N-m (20 to 23 lbf-ft)
Tools: Allen wrench: 6 mm

No. of turns of adjust screw	Pressure change MPa (psi)
1 turn	Approx. 17.7 (2560)

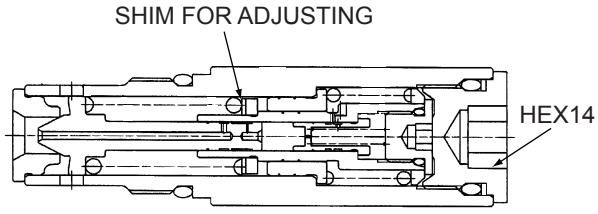


Over load relief valve (Boom, bucket, arm sections)

(4) Over load relief valve (Swing)
This valve was adjusted by valve maker. If adjustment is required, adjust with shim thickness. When you cannot perform a check of setting pressure, do not adjust pressure by any means.

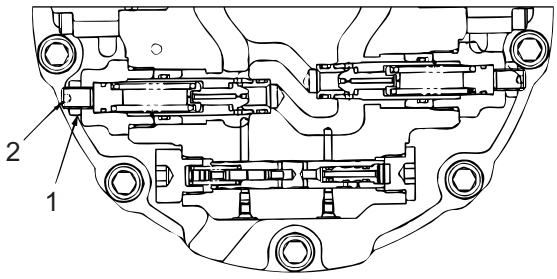
Pressure change [by SIMM 0.1 mm] :
about 0.5 MPa (73 psi)

Tools: Allen wrench: 14 mm
Tightening torque : 157 N-m (116 lbf-ft)



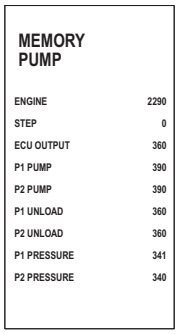
Swing over load relief valve

(5) Travel over load relief valve
The adjustment is done by manufacturer before shipment. When adjustment is required, loosen nut (1) and adjust the pressure with adjusting screw (2).
Tools: Spanner: 19 mm
Tools: Allen wrench: 6 mm

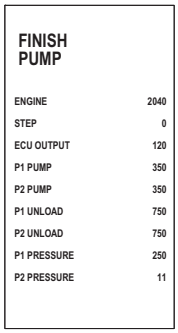


Travel over load relief valve

4. After engine starting, press the menu switch on gauge cluster, and "MEMORY PUMP" displayed. And the adjustment shifts to pump adjustment automatically. Then the speed shifts from LOW idling to HIGH idling. And "MEMORY PUMP" is displayed. And the unloading proportional valve and pump proportional valve actuate, accordingly the loading of pump is increased.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 pump "PROPO-VALVE" current (command value) are indicated.



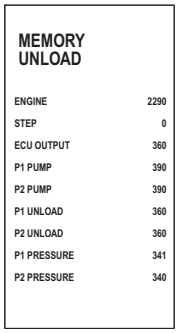
5. After detection of the engine rated speed, the adjustment of pump is automatically completed. And "FINISH PUMP" is displayed.
   (Press the buzzer stop switch on gauge cluster while this display is appeared and the adjustment is completed. The unloading adjustment required later is not performed, and default value is written.)



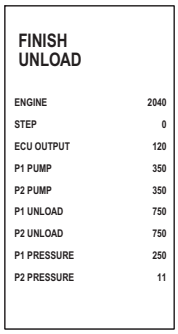
(6) Adjustment of unloading valve ("C" adjustment)

Procedure

1. The adjustment shifts from pump to unloading, and the unloading valve actuates, accordingly the pump pressure is detected. And "MEMORY UNLOAD" is displayed.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 "PROPO-VALVE" voltage (command value) are indicated.

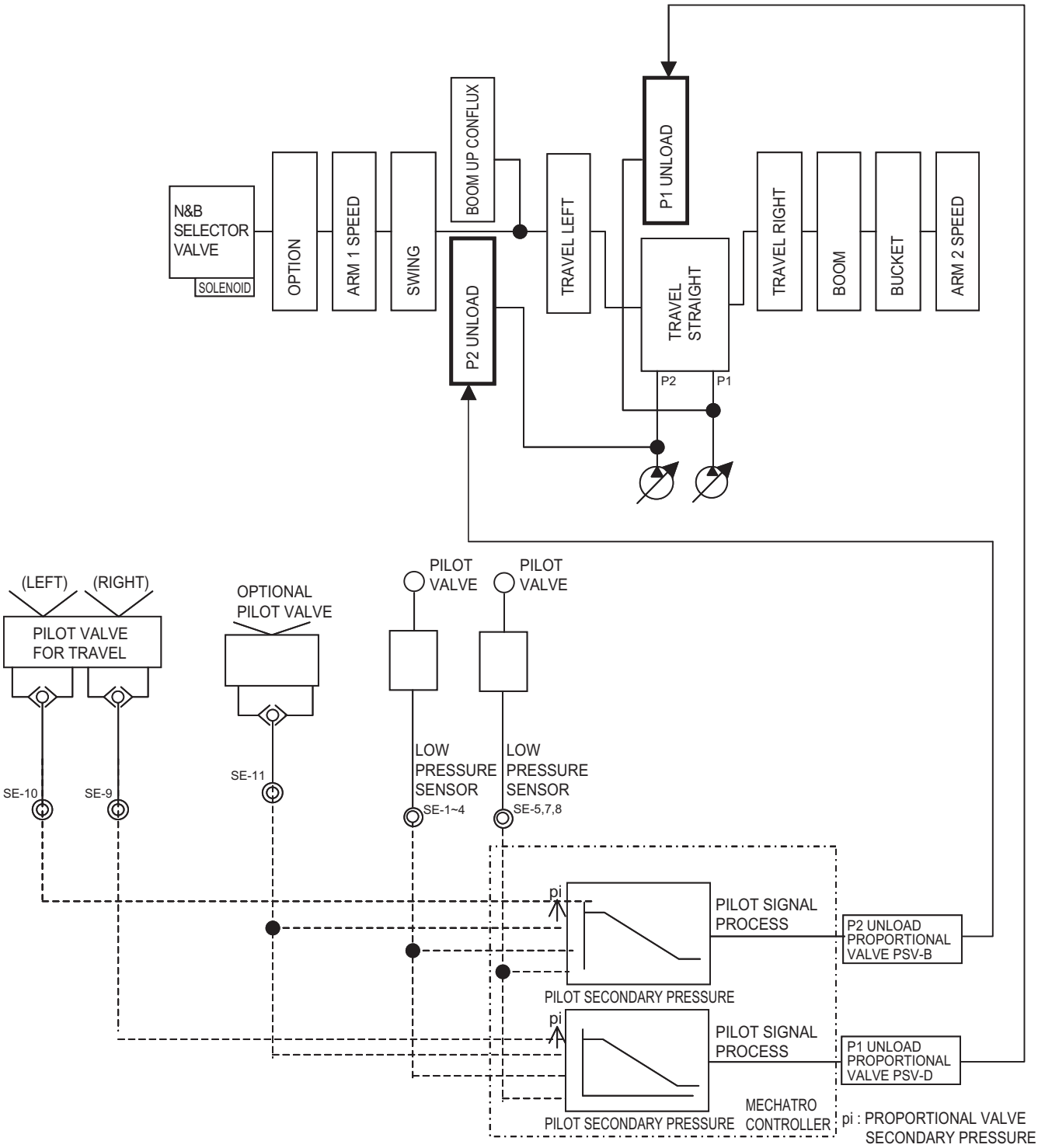


2. When the unloading valve operates to the specified value, the adjustment of unloading proportional valve is automatically terminated. And "FINISH UNLOAD" is displayed.
   The speed is shifted to the speed corresponding to acceleration potentiometer.
   The adjusting current value is indicated on the display of current of P1, P2 unloading proportional valves. The adjusting range is usually 520 to 635 mA.



   Stop the engine. (The adjusted data is automatically stored.)

21.1.2 UNLOAD VALVE CONTROL



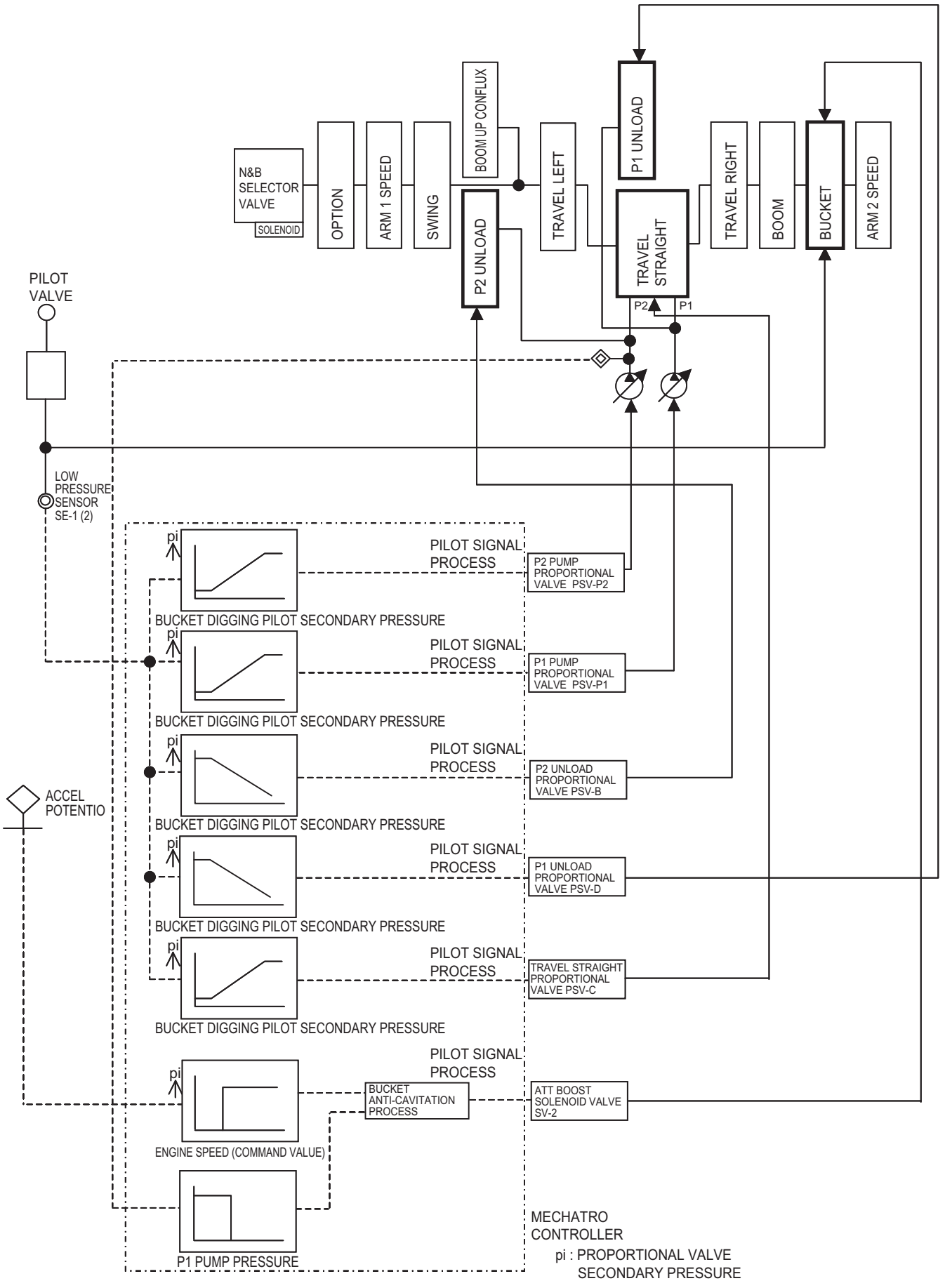
(1) On starting any one of operations, the control pilot secondary pressure switches spools and enters in respective low pressure sensors.

(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 each unload pressure proportional valve.

(3) Each unload pressure proportional valves output pilot secondary pressure according to the command output by mechatro controller and switches each unload spools.

(4) With this operation, the bleed opening according to lever manipulated movement is obtained, consequently the pump pressure which is used to actuate each actuators are delivered and makes each actuator start operating.

21.1.9 BUCKET DIGGING ANTI-CAVITATION CONTROL

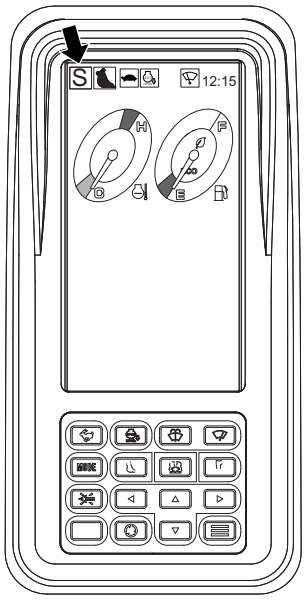


(3) Screen selection by work mode select switch

The mode after the engine starting is always the start from "S" mode. The work mode is switched in order of "S" to "E" to "H" to "S" each time the work mode select switch is pressed.

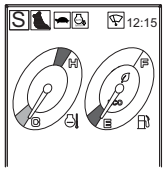
Select proper work mode shown below according to the work condition and the purpose. For the selected work mode, refer to the upper left corner of display.

- S mode: For standard excavating work
- ECO mode: For low fuel consumption excavating work
- H mode: For heavy duty excavating work



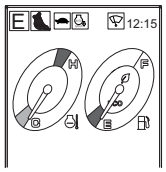
S mode

"S mode" is suitable for standard digging and loading works and is in saving fuel consumption and is in good balance to the workload.



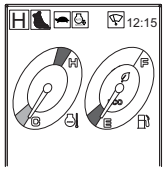
ECO mode

"Eco mode" is the mode focusing on better fuel economy, allowing for normal digging operation with lower fuel consumption than S mode.



H mode

"H mode" is suitable for heavy duty digging work which gives priority to the workload at the high speed.



ERROR CODE OF ENGINE

SYSTEM	ERROR CODE	POSSIBLE CAUSE	PAGE FOR REFERENCE
BASIC SENSOR SYSTEM	P0217	Engine over heat	17-73
	P2228	Atmospheric pressure sensor malfunction (Low)	17-171
	P2229	Atmospheric pressure sensor malfunction (High)	17-171
	P119F	Common rail pressure sensor property error	17-123
	P0192	Common rail pressure sensor malfunction (Low)	17-59
	P0193	Common rail pressure sensor malfunction (High)	17-64
	P1197	Common rail sub pressure sensor malfunction (Low)	17-113
	P1198	Common rail sub pressure sensor malfunction (High)	17-118
	P0237	Boost pressure sensor malfunction (Low)	17-77
	P0108	Boost pressure sensor malfunction (High)	17-38
	P0117	Coolant temperature sensor malfunction (Low)	17-45
	P0118	Coolant temperature sensor malfunction (High)	17-45
	P0182	Fuel temperature sensor malfunction (Low)	17-56
	P0183	Fuel temperature sensor malfunction (High)	17-56
	P2120	Accelerator sensor 1 and 2 error	17-164
	P2121	Accelerator sensor 1 voltage error	17-165
	P2122	Accelerator sensor 1 malfunction (Low)	17-167
	P2123	Accelerator sensor 1 malfunction (High)	17-167
	P2126	Accelerator sensor 2 voltage error	17-165
	P2127	Accelerator sensor 2 malfunction (Low)	17-169
	P2128	Accelerator sensor 2 malfunction (High)	17-169
	P1133	Accelerator sensor for work (High)	17-110
	P0335	Main engine speed sensor malfunction, both engine speed sensors malfunction	17-83
	P0336	Main engine speed sensor pulse error	17-85
	P0016	Main and sub engine speed sensor phase shift malfunction	17-24
	P0340	Sub engine speed sensor malfunction	17-87
	P0341	Sub engine speed sensor pulse error	17-89
SUPPLY PUMP SYSTEM	P0088	Common rail abnormal high pressure (First stage)	17-36
	P0088	Common rail abnormal high pressure (Second stage)	17-36
	P0088	Common rail abnormal high pressure	17-27
	P0087	Common rail abnormal low pressure	17-27
	P0629	Supply pump SCV 1 malfunction (No discharge)	17-100
	P0628	Supply pump SCV 1 malfunction (Full discharge)	17-100
	P2635	Supply pump replacement	17-27
INJECTOR SYSTEM	P1211	Injector common 1 malfunction (ground short)	17-125
	P1214	Injector common 2 malfunction (ground short)	17-129
	P1212	Injector common 1 malfunction (VB short, open)	17-127
	P1215	Injector common 2 malfunction (VB short, open)	17-131
	P0201	Injector 1 circuit disconnection	17-70
	P0202	Injector 2 circuit disconnection	17-70
	P0203	Injector 3 circuit disconnection	17-70
	P0204	Injector 4 circuit disconnection	17-70
	P0263	Cylinder 1 calibration error	17-81
	P0266	Cylinder 2 calibration error	17-81
	P0269	Cylinder 3 calibration error	17-81
	P0272	Cylinder 4 calibration error	17-81
TURBO CHARGER SYSTEM	P0234	Turbo charger over boost	17-75
VNT SYSTEM	P0045	VNT actuator malfunction 1 (Severe)	17-25
	P0045	VNT actuator malfunction 2 (Light)	17-25
	P00AF	VNT controller malfunction 1 (Severe)	17-25
	P00AF	VNT controller malfunction 2 (Light)	17-25
ECU SYSTEM	P0611	ECU charge circuit malfunction (Low)	17-69
	P0200	ECU charge circuit malfunction (High)	17-69
	P0605	Flash ROM error	17-69
	P0606	CPU malfunction (Hard detection)	17-69
	P0607	IC for monitoring CPU malfunction	17-69
	P1601	QR code error	17-145
INTAKE THROTTLE VALVE	P2100	DC motor circuit disconnection, driving duty circuit disconnection	17-161
	P2103	DC motor ground short	17-161
	P2101	Intake throttle sensor adhesion	17-163
	P0122	Intake throttle opening degree sensor malfunction (Low)	17-48
	P0123	Intake throttle opening degree sensor malfunction (High)	17-52
EGR SYSTEM	P1458	EGR system malfunction (Severe)	17-142
	P1459	EGR system malfunction (Light)	17-144
AIR FLOW SENSOR	P06D3	Air flow sensor power source (+B)	17-107
	P06D4	Air flow sensor power source (GND)	17-109
	P0104	Air flow sensor error (High frequency)	17-37
	P0104	Air flow sensor error (Low frequency)	17-37
INTAKE TEMPERATURE SENSOR	P0112	Intake air temperature sensor error (Low)	17-42
	P0113	Intake air temperature sensor error (High)	17-42

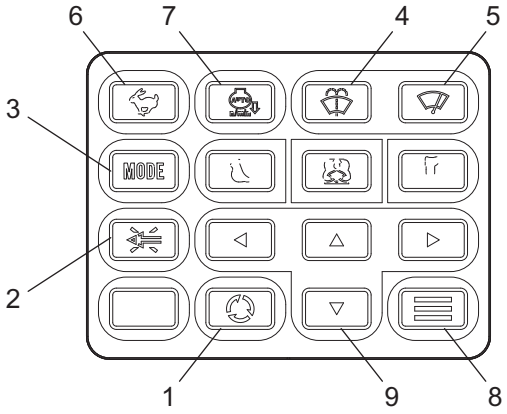
NOTE)
The numbers the column of “page for reference” show the related page in Chapter 51 Engine.

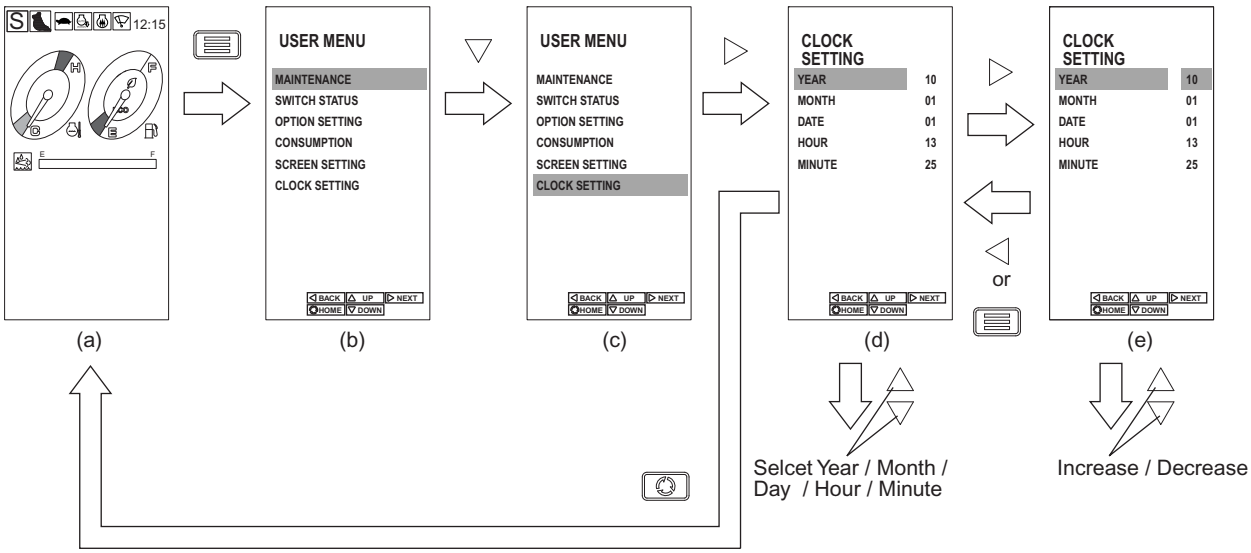
21.2.6 ADJUSTING PROCEDURE OF DISPLAY

(1) For operator

1) Clock Adjustment Switches

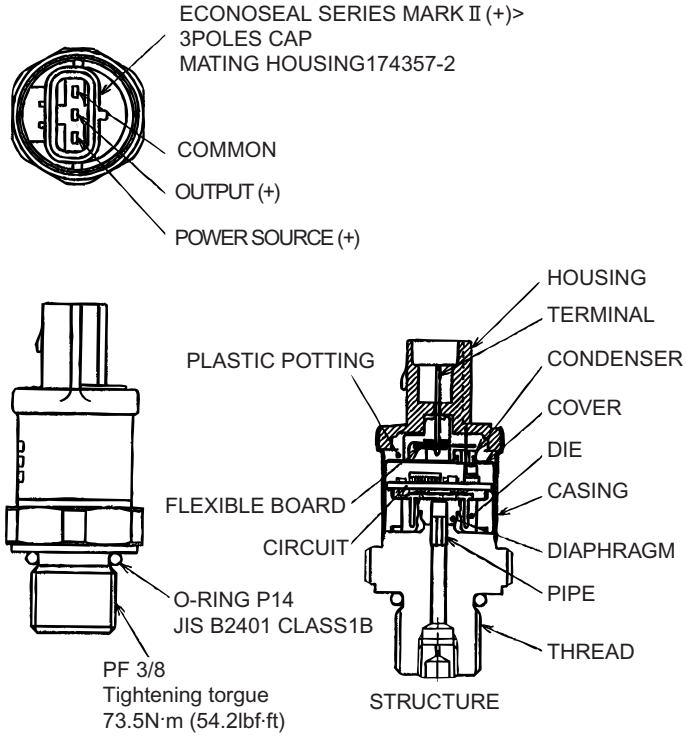
1: Screen Change Switch
2: Buzzer Stop Switch
3: Work Mode Select Switch
4: Washer Switch
5: Wiper Switch
6: Travel Speed Select Switch
7: Auto Accel Switch
8: Menu Switch
9: Arrow Switch





1. After turning starter key switch ON, the main screen (a) is appeared. And press "MENU SWITCH" to enter into "USER MENU" display (b).
2. Using switch "DOWN" or "UP", move cursor to "CLOCK SETTING" display. Press "NEXT" to select "CLOCK SETTING" display (d).
3. Using switch "DOWN" or "UP", select "YEAR/MONTH/DAY/HOUR/MINUTE" display. Press "NEXT" to select desired item.
4. Using switch "DOWN" or "UP", and get the desired value.
5. After adjustment, press "Menu Switch". And the adjusted values are stored as memory and clock setting is completed. Press " Screen Change Switch", and the display returns to main display (a).

(4) High pressure sensor: LS52S00015P1



SPECIFICATION :

PRESSURE RANGE : 0～50 MPa (0～7110 psi)

POWER SOURCE VOLTAGE : 5.0+0.5V DC

OUTPUT : 1/10Vs-9/10Vs

(Vs=5V DC 0.5～4.5V DC)

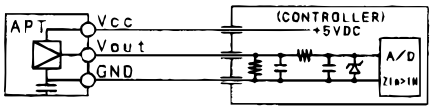
INSURANCE RESISTANCE : 100M ΩOR MORE

(BETWEEN CASING AND ALL IN/OUT

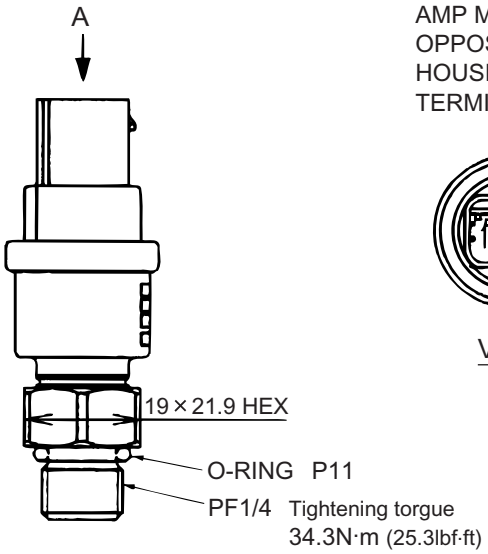
TERMINALS AT 50V DC MEGGER)

ELECTRIC CONNECTING DIAGRAM

(Ex. Construction of internal controller)

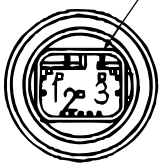


(5) Low pressure sensor: LC52S00019P1



DETAIL OF SENSOR CONNECTOR

AMP MQS CONNECTOR 3 POLE (B TYPE)
OPPOSITE CONNECTOR (FEMALE)
HOUSING : 2-967642-1
TERMINAL (GOLD PLATED) : 965906-5



CONNECTOR TERMINAL POSITION
TERMINAL No.
1－COM
2－OUT PUT (+)
3－POWER (+)

VIEW A

SPECIFICATION :

PRESSURE RANGE : 0～3.0 MPa (0～448 psi)

RATED VOLTAGE : 5.0+0.5V DC

INSURANCE RESISTANCE : 100MΩ OR MORE

(BETWEEN BODY AND EACH TERMINAL AT

50V DC MEGGER)

22.7 BOOM CIRCUIT

This section describes the boom raise conflux operation.
(1) Boom up pilot circuit
(2) Boom up 2 pumps conflux main circuit in C/V

22.7.1 BOOM RAISE PILOT CIRCUIT

(1) Operation:
1. If boom up operation is performed, the secondary pilot proportional pressure from the right pilot valve (10) gets out of port 3 and acts upon the low pressure sensor (SE3). At the same time, the pressure acts upon the PAb and PB1 ports.
2. The secondary pressure which enters the PAb port of C/V (2) shifts the boom spool. The secondary pressure which enters the PB1 port shifts the boom conflux spool.

22.7.2 BOOM UP 2 PUMPS CONFLUX MAIN CIRCUIT IN C/V

(1) Purpose:
Boom up speed up
(2) Principle:
Confluxing oil from 2 pumps
(3) Operation:
1. The oil delivered through A1 port of P1 pump flows into C/V (2) P1 port, and branches into bypass circuit and parallel circuit. Since P1 unloading valve is closed, the boom spool is moved and bypass circuit is closed, the oil opens load check valve LCb through parallel circuit and flows into boom spool.
2. Then the oil passes through boom spool, opens lock valve of boom lock valve CRb, and is led into H side of boom cylinder through C/V (2) Ab port.
3. Meanwhile, the oil delivered from the A2 port of the P2 pump enters the P2 port of C/V (2) and due to shut off the P2 unloading valve, the oil then passes through the parallel circuit and via the restrictor on the circumference of the boom conflux spool, pushes the load check valve CCb open from the boom conflux circuit, and combines the oil delivered by the P1 pump internally.

4. The return oil from boom cylinder R side flows into tank circuit through boom spool from C/V (2) Bb port.

In this section, the independent operation is omitted and describes difference in combined operation.

(3) Swing / Arm in light load, pilot circuit
(4) Swing / Arm in, swing priority main circuit

22.10.5 SWING / ARM IN LIGHT LOAD, PILOT CIRCUIT

(1) Operation:

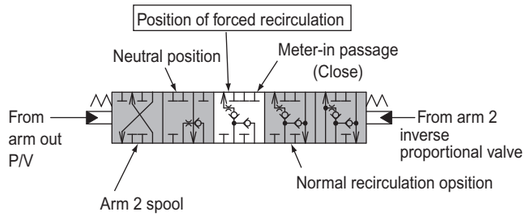
1. On operating swing (left) and arm in motions simultaneously, mechatro controller outputs command current to travel straight solenoid proportional valve (PSV-C) and arm 2 solenoid inverse proportional valve according to signal processing, and this proportional valve outputs secondary pressure, which acts on PTb port and PAa2 port of C/V(2).
2. PTb port pressure switches the travel straight spool 2 steps, and the PAa2 port pressure switches the arm 2 spool to the forced recirculation position.

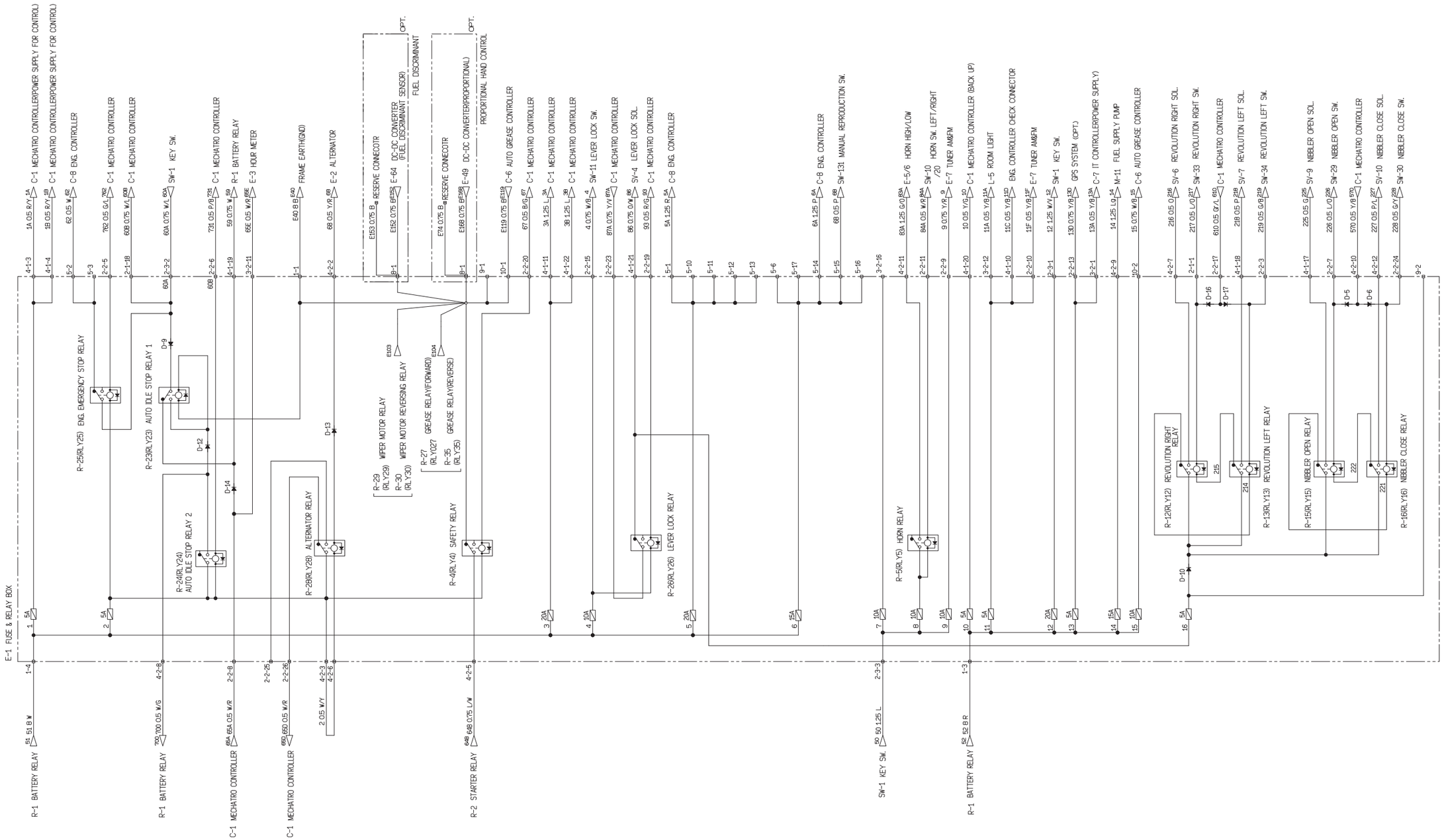
22.10.6 SWING / ARM IN, SWING PRIORITY MAIN CIRCUIT

(1) Purpose:
Stable swing speed.
(2) Principle:
Raise the oil pressure flowing to arm cylinder, and give a priority of the delivery of P2 pump to swing operation.
(3) Operation:

1. The swing main circuit operates with P2 pump flow. But on P2 pump circuit side, the flow goes to the swing circuit and arm circuit simultaneously because the swing circuit and arm circuit are parallel. Then since the return oil from arm cylinder rod (R) side is restricted in the arm 2 spool because the arm 2 spool is switched to forced recirculation position, the pressure of return oil is raised, causing the rise of circuit pressure on the arm cylinder head (H) side.
2. At the same time meter-in of arm 2 spool closes and arm in conflux is therefore cancelled, and delivery oil from P2 pump and P1 pump are combined in the parallel circuit on P2 pump side because the travel straight spool was switched.
The conflux oil of P1 and P2 delivery oil in high pressure flows in swing side taking priority over all others.
This operation is called "Swing Priority Circuit".

Position of arm 2 spool

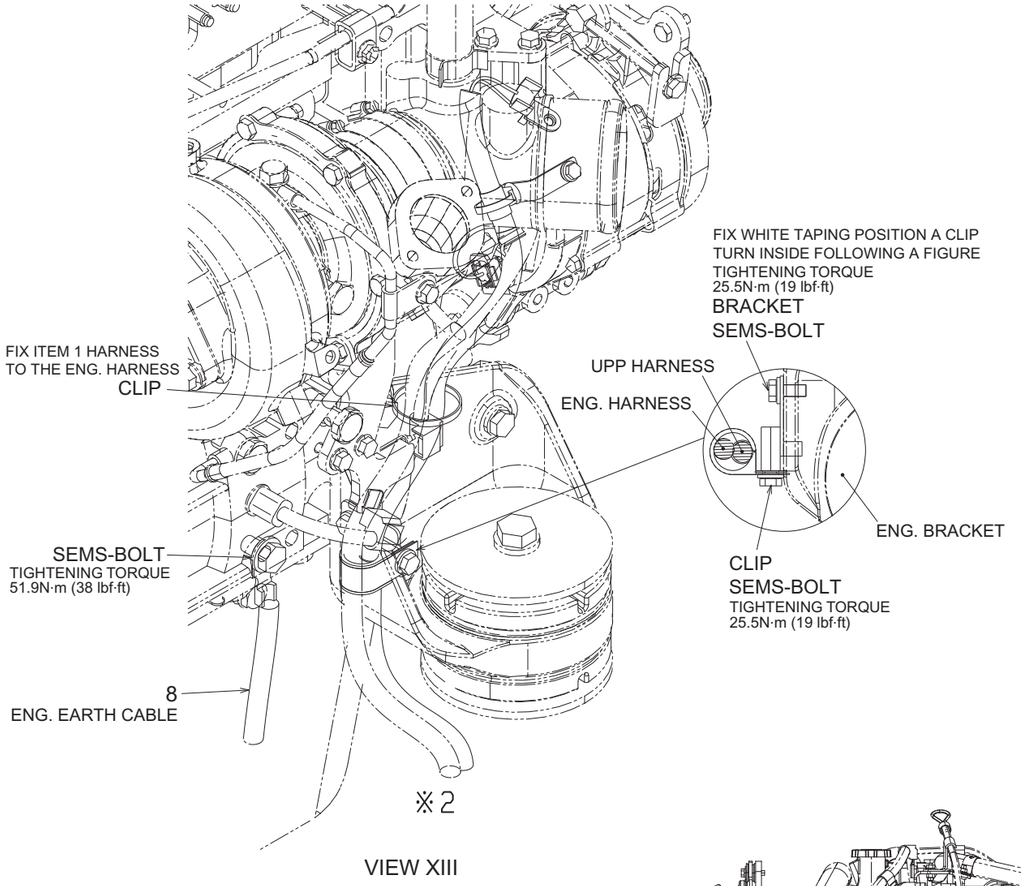




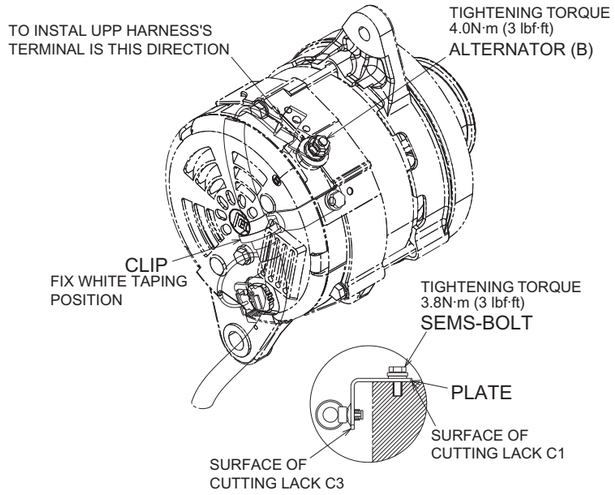
(8/10)

YF03Z00014P1 (01)

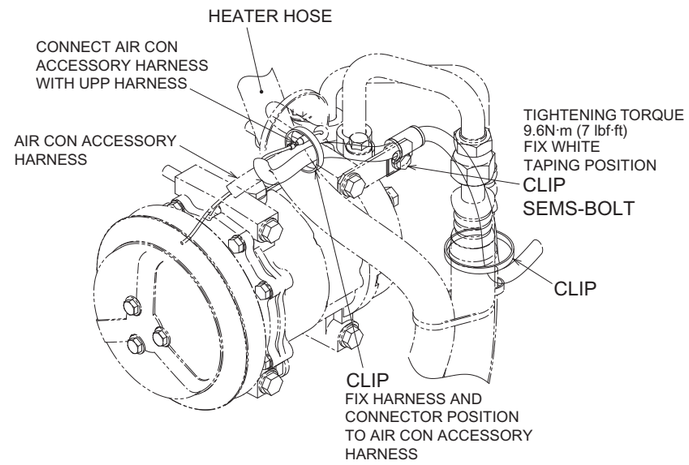
23.3.6 UPPER HARNESS ASSY (5/6)



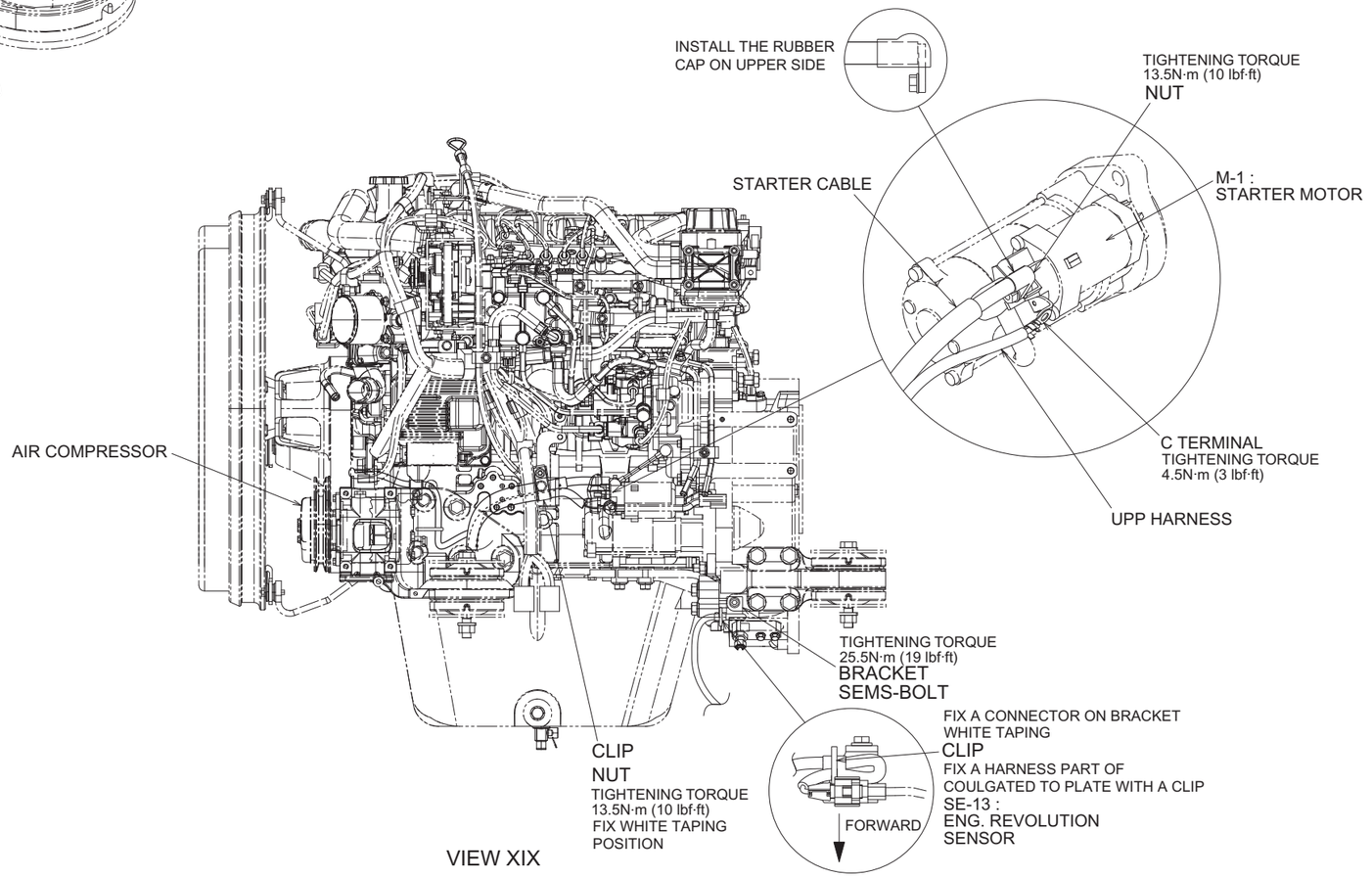
VIEW XIII



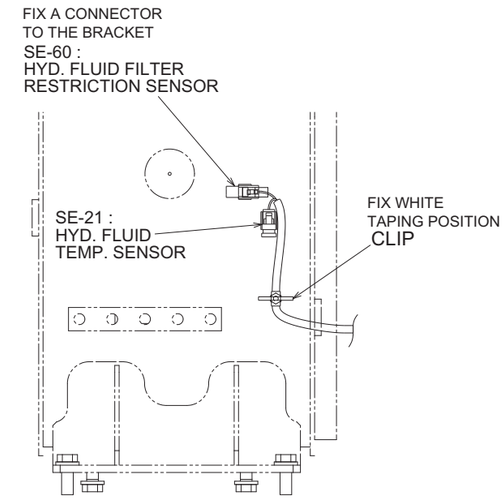
DETAIL OF ALTERNATOR



DETAIL OF AIR COMPRESSOR

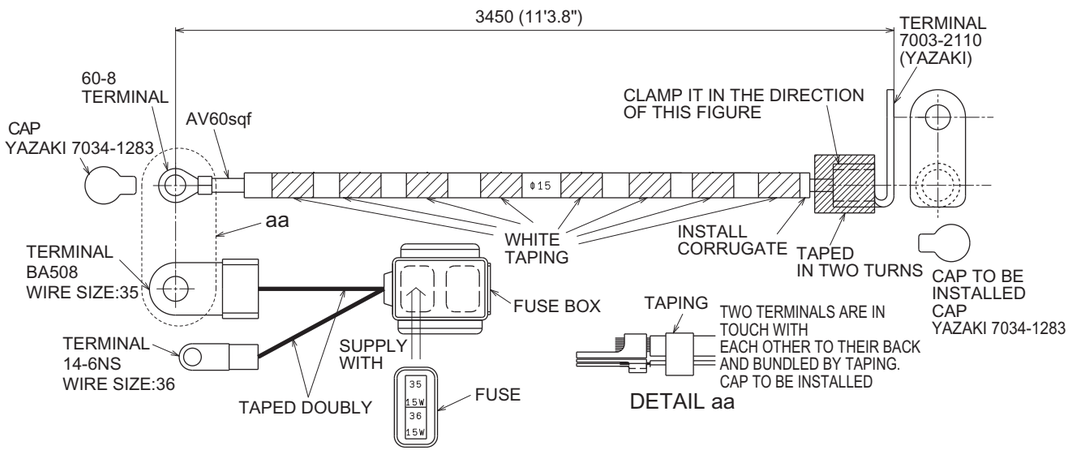


VIEW XIX

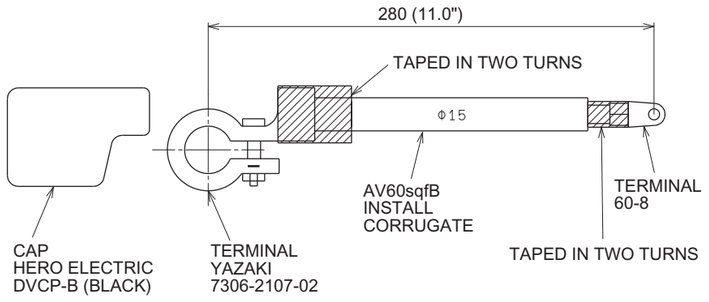


VIEW XX

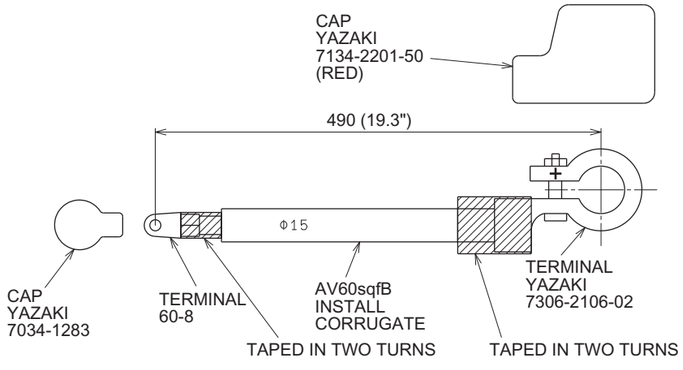
23.3.6.3 STARTER CABLE : YF13E01087P1



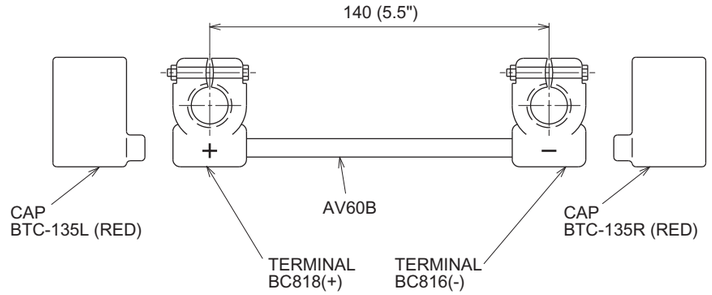
23.3.6.4 BATTERY GROUNDING CABLE : YF13E01085P1



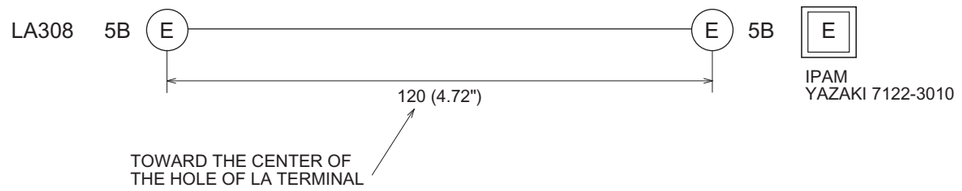
23.3.6.5 BATTERY RELAY CABLE : YF13E01084P1



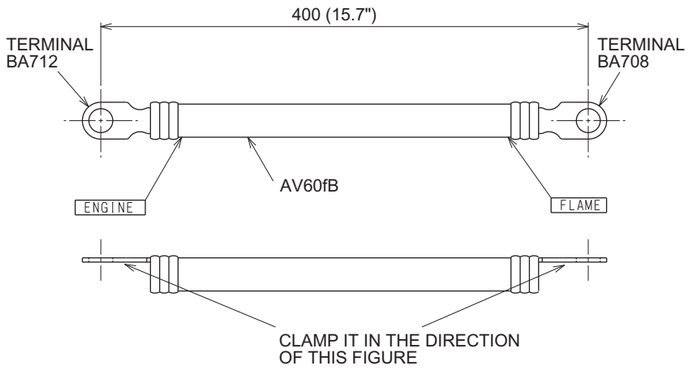
23.3.6.6 BATTERY CABLE : YB13E01040P2



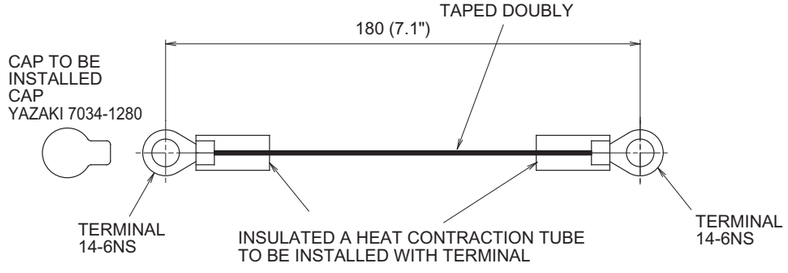
23.3.6.7 FLOOR GROUNDING CABLE : LE13E01006P1



23.3.6.8 ENGINE GROUNDING CABLE : LQ13E01173P1

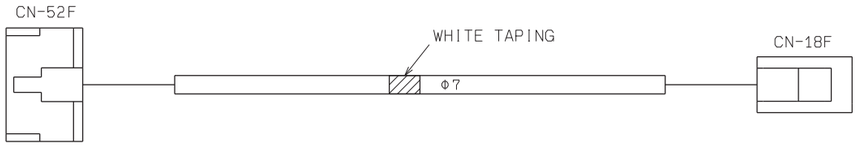


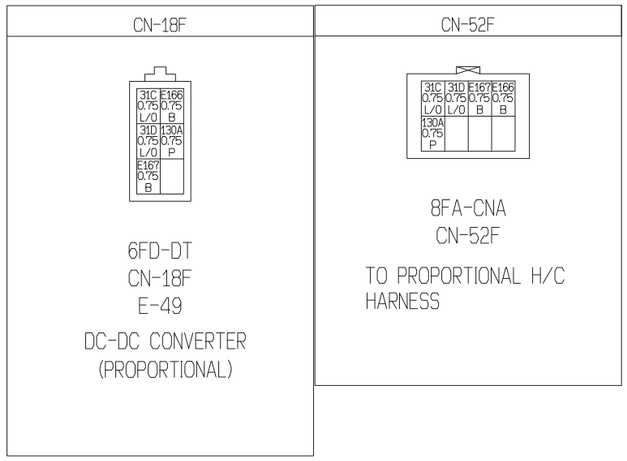
23.3.6.9 GLOW-STARTER RELAY CABLE : LC13E01180P2



23.3.9.1 PROPO CAB HARNESS : YY14E01087P1

PROPO CAB HARNESS ASSY : YY14E01087P1





WIRE NO	WIRE COLOR	WIRE SIZE (mm2)	FROM	CONNECTION	TO
31C	L/O	AVSS0.75	CN-18F	———	CN-52F
31D	L/O	AVSS0.75	CN-18F	———	CN-52F
130A	P	AVSS0.75	CN-18F	———	CN-52F
E166	B	AVSS0.75	CN-18F	———	CN-52F
E167	B	AVSS0.75	CN-18F	———	CN-52F

CONNECTORS SELECTION TABLE

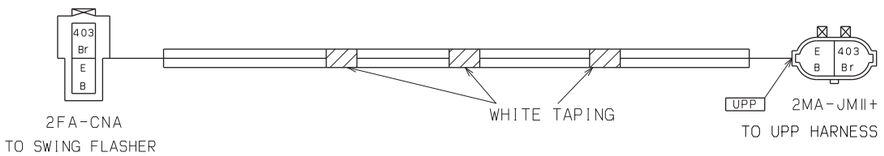
CONNECTER NAME (PIN NUM.)	MANUFUC.	PART.NUMBER	
		HOUSING	TERMINAL
8FA-CNA	AMP	172136-1	170032-2
6FD-DT	DEUTSCH	DT06-6S-EP06	1062-16-0122

23.3.15.1 FLASHER HARNESS : YB80E01004P1
23.3.15.2 FLASHER HARNESS : YB80E01005P1

FLASHER HARNESS : YB80E01004P1

CONNECTORS SELECTION TABLE

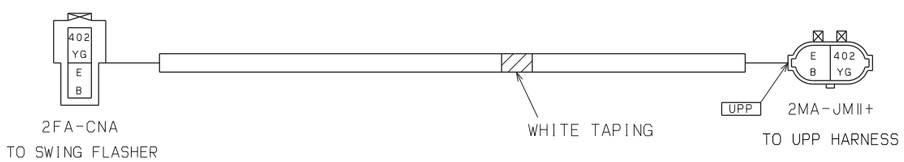
CONNECTER NAME (PIN NUM.)	MANUFUC.	PART NUMBER	
		HOUSING	TERMINAL
2FA-CNA	AMP	172130-1	170032-2
2MA-JMII+	AMP	174354-2	171661-1



FLASHER HARNESS : YB80E01005P1

CONNECTORS SELECTION TABLE

CONNECTER NAME (PIN NUM.)	MANUFUC.	PART NUMBER	
		HOUSING	TERMINAL
2FA-CNA	AMP	172130-1	170032-2
2MA-JMII+	AMP	174354-2	171661-1



24.1.1.3.2 OPERATION

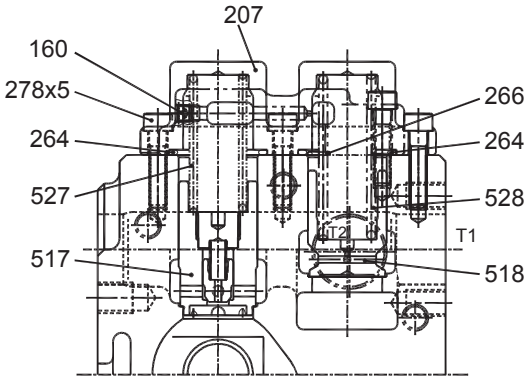
(1) Control function

Control function ..... Electric flow control.
-Positive flow control.
-Total horsepower control.

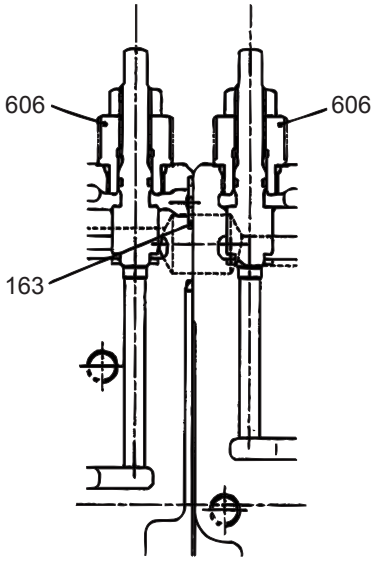
(2) Summary

The regulator KR3G-0E01-V for the in-line type axial piston pump K3V series is composed of the control mechanism as mentioned below:

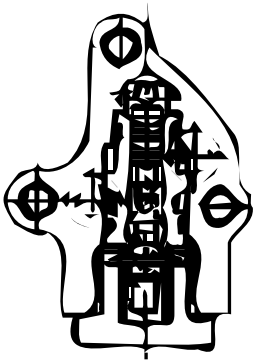
1. Electric flow control and positive flow control
   The tilting angle of the pump (delivery rate) is controlled by controlling the current command value of the solenoid proportional reducing valve attached to the regulator. The regulator makes positive flow control (positive control) that increases the delivery rate as the secondary pressure of the solenoid proportional reducing valve rises. Since this function permits the output power of the pump to be varied, it is possible to attain optimum power according to the operating condition. Also, since the pump delivers only the necessary oil flow, the machine does not consume excessive power.



SECTION J-J



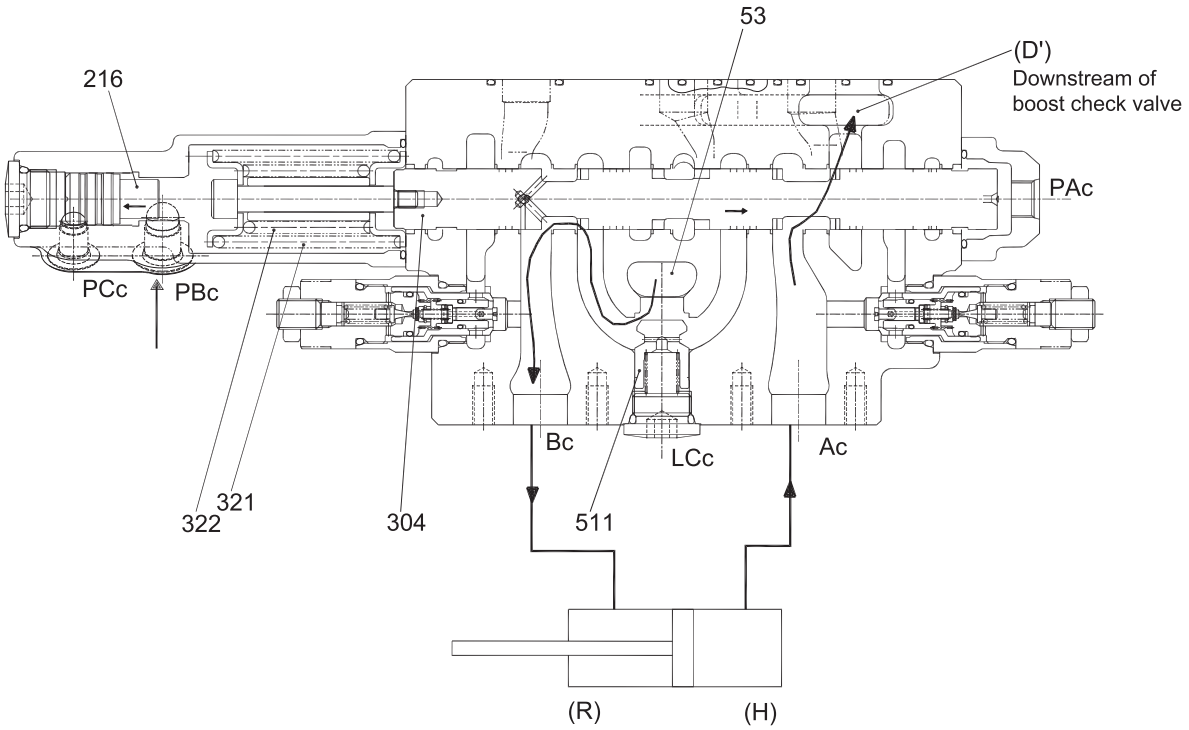
SECTION K-K



SECTION L-L

Section (6/6)

2. In bucket dumping operation
On starting bucket dumping operation, the pilot pressure enters port PBc and bucket spool (304) moves rightward the force of springs (321)(322), and simultaneously the secondary pressure of solenoid proportional valve [XI] acts on port PCb and switches unloading spool (309). The hydraulic oil delivered by hydraulic pump P1 flows into parallel passage (53), pushes and opens load check valve LCc (511), and flows through between the perimeter of bucket spool (304) and casing through U-shaped passage, and supplied to bucket cylinder rod side (R) through port (Bc).
In the meantime, the return oil from bucket cylinder head side (H) passes through between the perimeter of bucket spool (304) and casing and flows through low pressure circuit (D), and returns to the hydraulic tank through tank port T1. The return oil does not pass through boost check valve (517).
Downstream of boost check valve

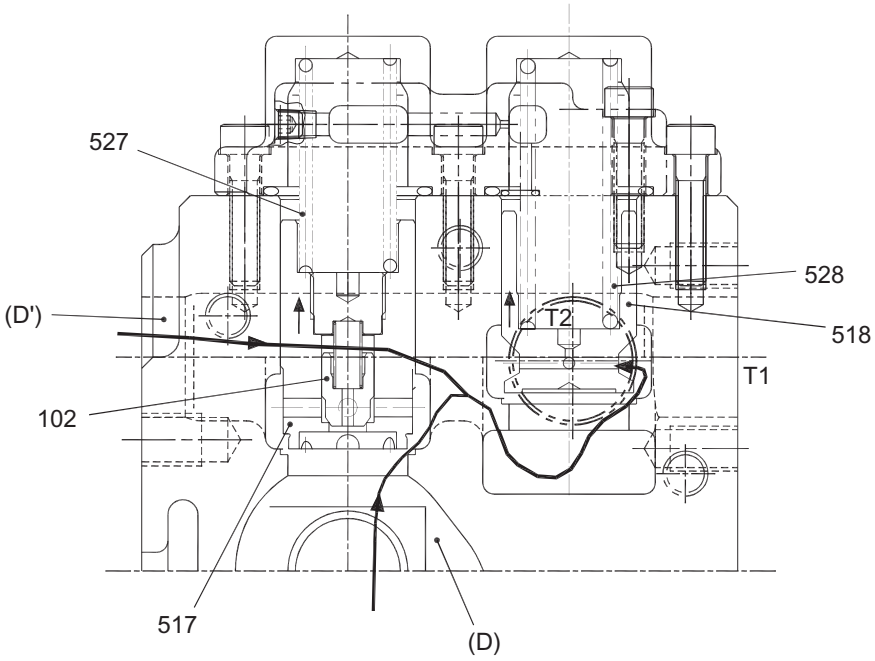


In bucket dumping operation

2. By-pass check valve

Even if the pressure at tank port T1 goes up due to the sudden change of return flow rate, the by-pass check valve actuates and prevents the pressure at tank port T1 from going up higher than the specified pressure, and consequently the oil cooler and filter located between tank port T1 and the hydraulic tank are protected from possible damage.

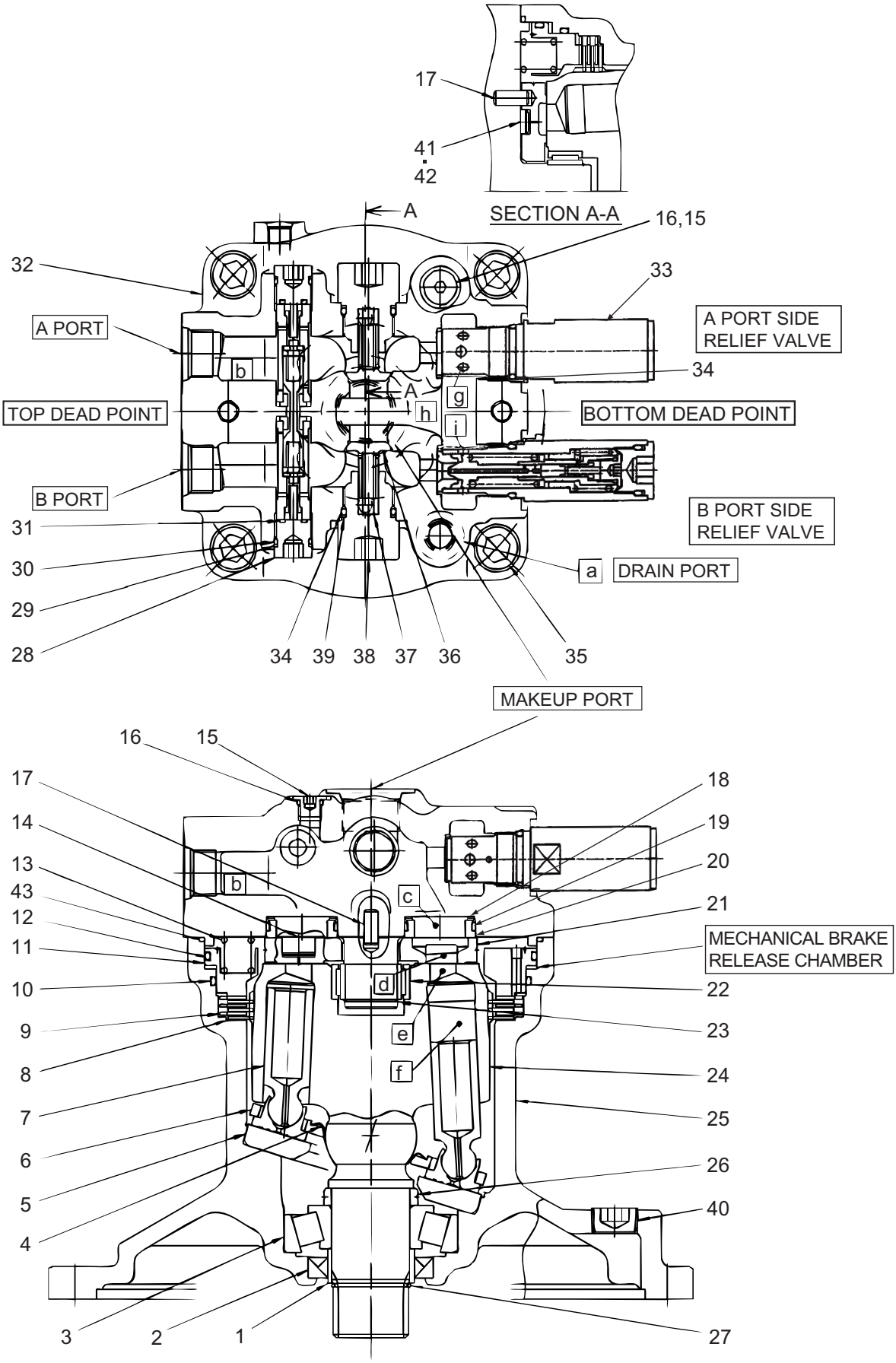
When the pressure at tank port T1 goes up to the pressure added by spring (528), by-pass check valve (518) is pushed and opens against the force of spring (528), and the hydraulic oil in tank port T1 directly returns to the hydraulic tank through tank port T2.



By-pass check valve operation

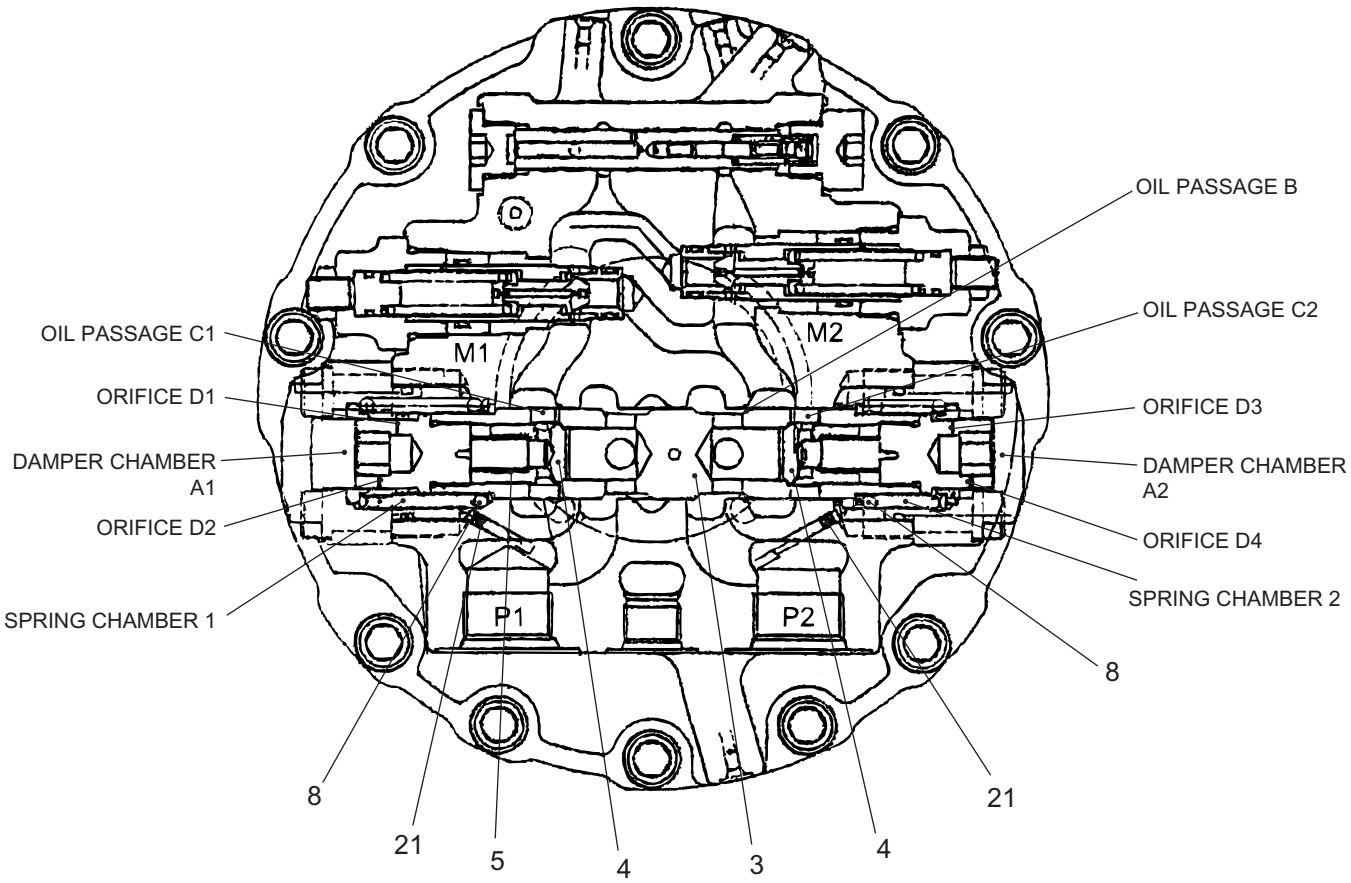
24.1.5.2 CONSTRUCTION

(1) Swing motor



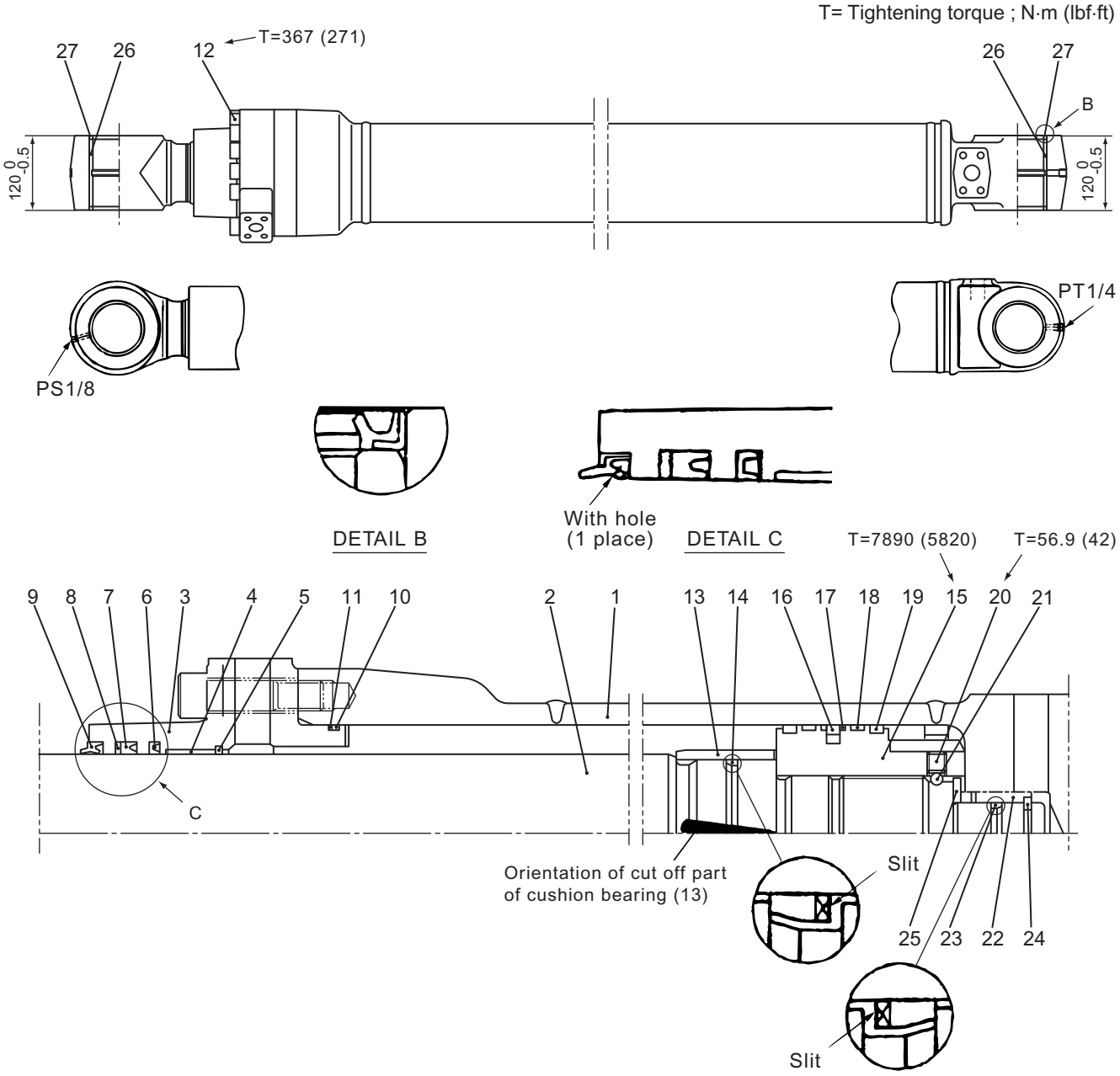
2. When motor starts rotating (See below Fig..)
When the oil delivered from the hydraulic pump is led into P1 port of the double counter balance valve, check valve (4) moves leftward resisting to the spring (5) force and oil passage C1 opens, and the oil delivered flows into the piston motor through M1 port and tries to rotate the piston motor.
On the other hand, the return oil from the piston motor flows into the double counter balance valve through M2 port, but the flow of the oil delivered is interrupted by check valve (4) consequently the delivery pressure of the hydraulic pump is raised.
Therefore, the pressure in P1 port side is raised, the pressure oil flows through orifice (21), acts on the spring chamber 1 and damper chamber A1 and moves plunger (3) rightward resisting the spring (8) force on the opposite side with the force in proportion to the pressure.
Then, the return oil through M2 port flows through oil passage B on the notched section around plunger (3) into P2 port, generates back pressure in M2 port, and flows into P2 port, and returns into the tank through the control valve, and consequently the piston motor starts rotating.

3. Counter balance function (See below Fig..)
When the piston motor is rotating, if the outer load is applied on it to forcibly rotate further, the piston motor give rise to the pumping action and causes a overrun. In this case, P1 port side is in suction side, and the pressure falls. Concurrently the pressure of spring chamber 1 and damper chamber A1 also lowers. Therefore, plunger (3) is moved leftward by the spring (8) force, oil passage B closes, and the flow of return oil also stops. Immediately after stopping the flow of oil in oil passage B, the pressure in P1 port side is raised by the oil delivered of the hydraulic pump and moves plunger (3) rightward.
This way, when the pumping action is caused by the outer load, plunger moves bit by bit, and maintains the opening area of oil passage B in the appropriate condition. And the piston motor maintains the speed corresponding to the supply flow rate from the hydraulic pump, and prevents vacuum phenomenon in the hydraulic circuit to protect the piston motor from overrunning.



Double counter balance valve when motor is rotated

(2) Arm cylinder

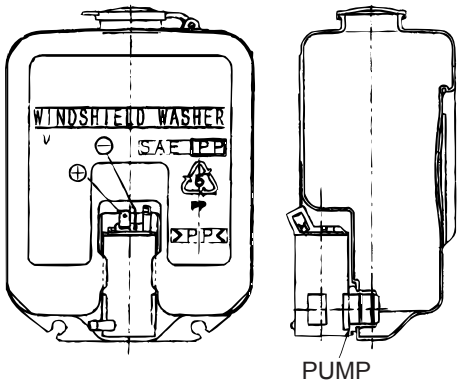


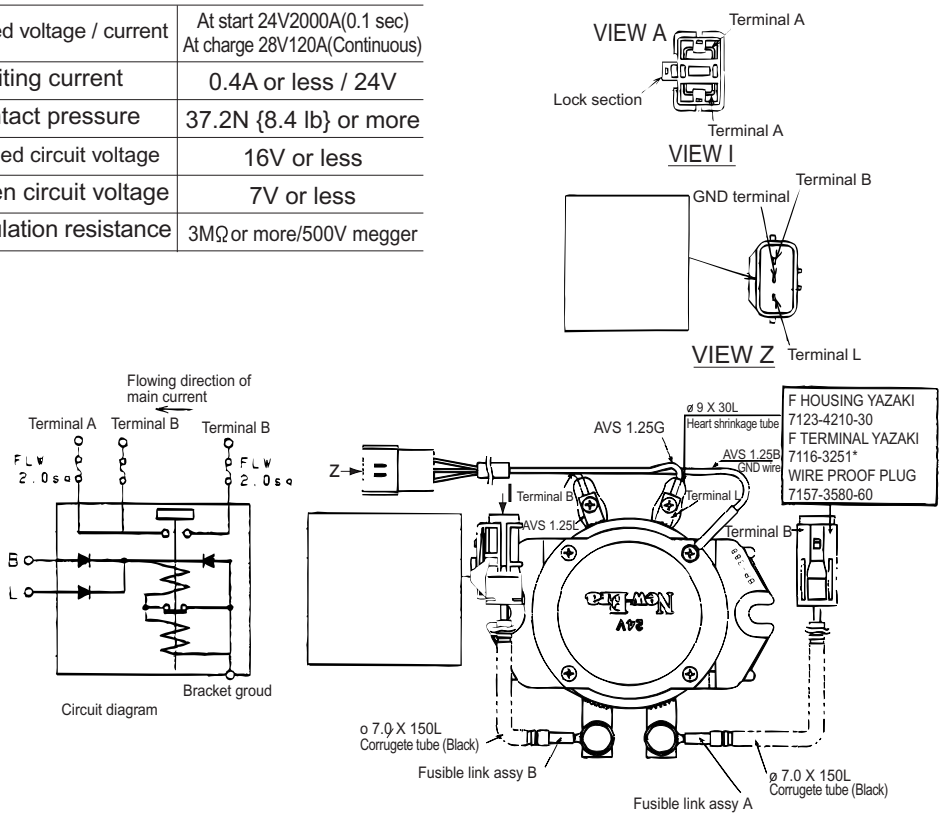
Construction of arm cylinder

P/No: YN01V00175F1

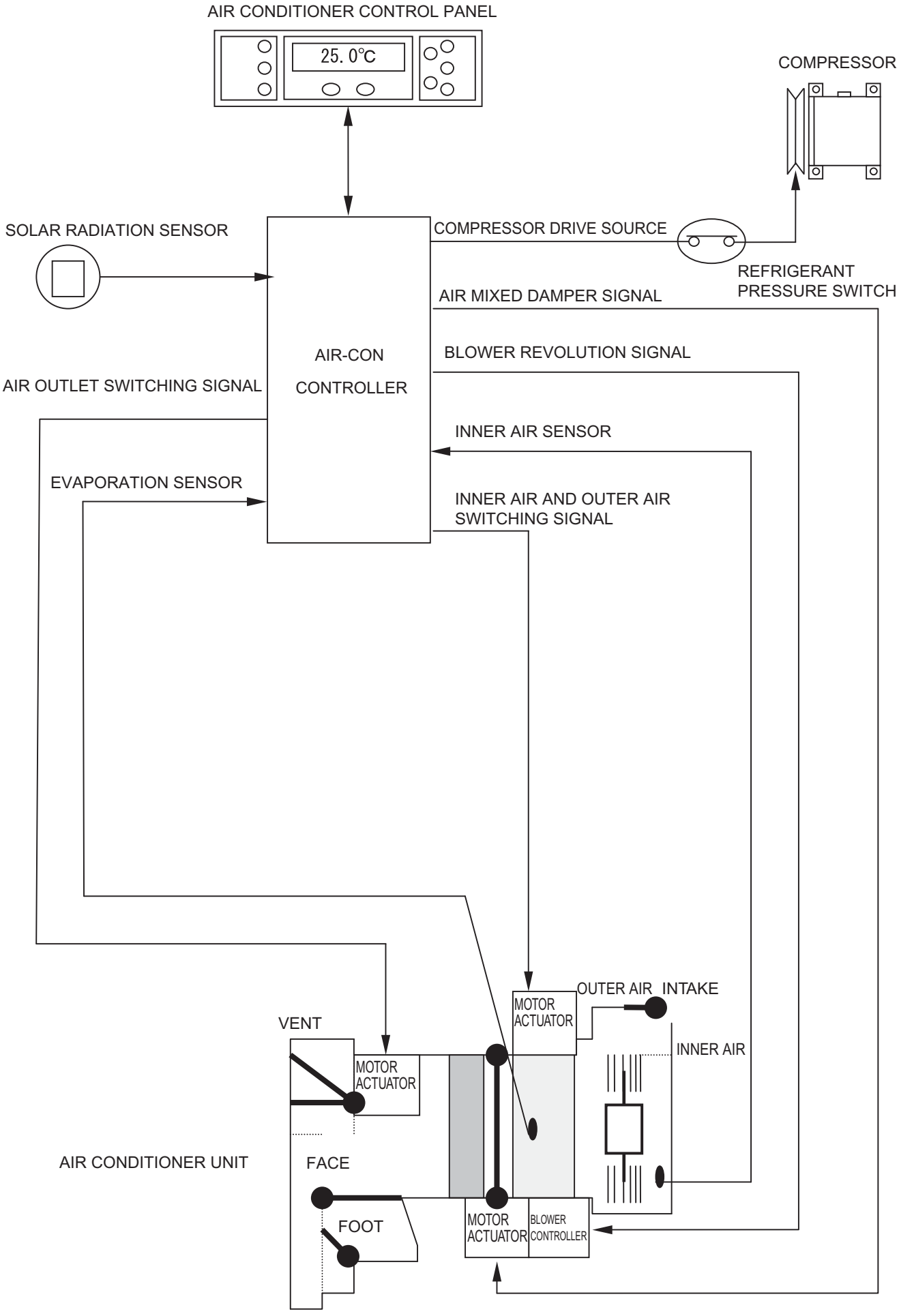
No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
1	Cylinder tube	1	10	O-ring	1	19	Slide ring	2
2	Piston rod	1	11	Buckup ring	1	20	Set screw; M12	1
3	Rod cover	1	12	Socket bolt; M18X80	12	21	Steel ball	1
4	Bushing	1	13	Cushion bearing	1	22	Cushion bearing	1
5	Snap ring	1	14	Cushion seal	1	23	Cushion seal	1
6	Buffer ring	1	15	Piston	1	24	Stopper	2
7	U-ring	1	16	Seal ring	1	25	Snap ring	1
8	Buckup ring	1	17	Buckup ring	2	26	Pin bushing	4
9	Wiper ring	1	18	Slide ring	2	27	Wiper ring	4

Code No. Parts Name Parts No. Use Applicable Machine	Specifications	Description

M - 4 Motor (Tank) YT54C00003F1 Window washer YF06 - 02501 ~ YU06 - 03001 ~ YB06 - 03501 ~ LA06 - 02501 ~ YB07 - LA07 - 03001 ~ YU07 - 04001 ~	Rated voltage: DC 24V Injection flow: 1.2L (0.32 gal) / min or more Capacity: 1.5L (0.4 gal) Time rated: Max. continuous 60 sec. Injection nozzle: ϕ 1 X 2 pcs.	

R - 1 Relay YN24S00008F1 Battery relay YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~ YN12 - 56001 ~ YQ12 - 08001 ~ LQ13 - 07001 ~ LL13 - 06001 ~ YF06 - 02501 ~ YU06 - 03001 ~ YB06 - 03501 ~ LA06 - 02501 ~ YB07 - LA07 - 03001 ~ YU07 - 04001 ~	Rated voltage / current: At start 24V2000A(0.1 sec) At charge 28V120A(Continuous) Exciting current: 0.4A or less / 24V Contact pressure: 37.2N {8.4 lb} or more Closed circuit voltage: 16V or less Open circuit voltage: 7V or less Insulation resistance: 3MΩ or more/500V megger	

25.1.2 AUTO AIR CONDITIONER SYSTEM OUTLINE



25.4.3 COMPONENT PARTS

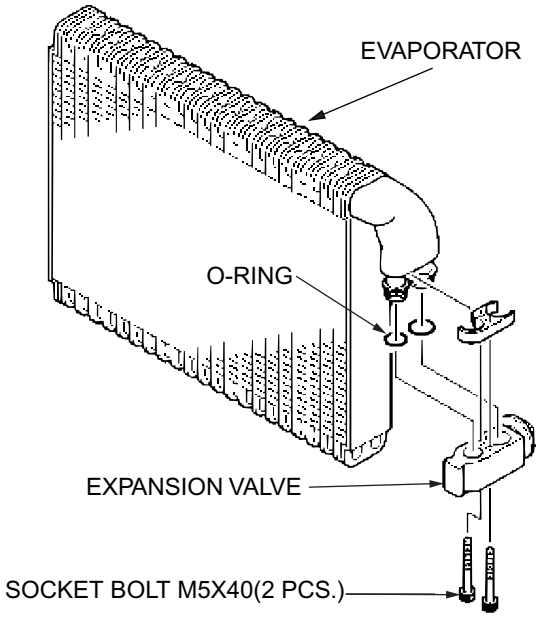
(1) Evaporator (See right Fig.)

The evaporator is an important heat exchanger that absorbs the heat of the compartment air (object) by the utilization of the latent vaporization heat of the low-temperature, low-pressure liquid-state refrigerant. Therefore, it is necessary that satisfactory heat transfer between the object and the refrigerant take place in the evaporator.

To that end, the evaporator is equipped with fins on the air side in order to increase the heat transfer area of the air side and thereby perform excellent thermal transfer between the refrigerant and the air.

The humidity in the air condenses as the air cools down and adheres to the outside of the evaporator as water drops. The cooling effect deteriorates if the water drops freeze. Therefore, how to discharge water is an important point.

The amount of refrigerant supplied to the evaporator is controlled by the expansion valve which is described in the following. In order to attain proper control, it is necessary to reduce the pressure drop of the refrigerant of the evaporator. Accordingly, reducing the pressure drop is one element that makes the evaporator attain its full performances.



(2) Expansion Valve

In order for the evaporator to fulfill its performances, a proper amount of low-pressure low-temperature liquid refrigerant must be fed to the evaporator.

If the feed rate is too low, the refrigerant completes vaporization early in the evaporator which results in deterioration of the cooling effect. If the feed rate is too high, unvaporized liquid refrigerant returns to the compressor (liquid back). This not only deteriorates the cooling effect, but also damages the compressor valves.

The expansion valve feeds the flowing high-pressure high-temperature liquid refrigerant to the evaporator as low-pressure low-temperature liquid refrigerant (damp vapor of low dryness). The expansion valve controls the feed rate of the refrigerant at the same time.

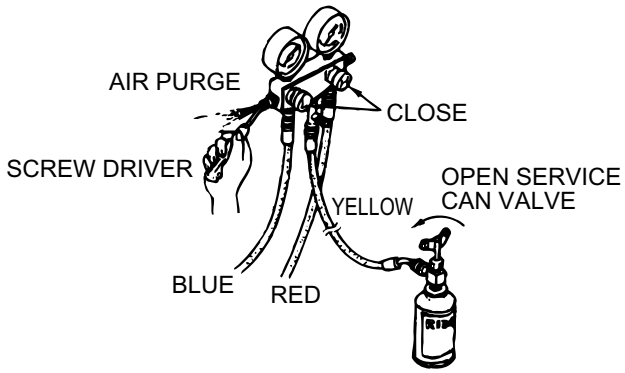
25.6.3.2 GAS CHARGING OPERATION

(1) Charging from high pressure side (See right Fig.)

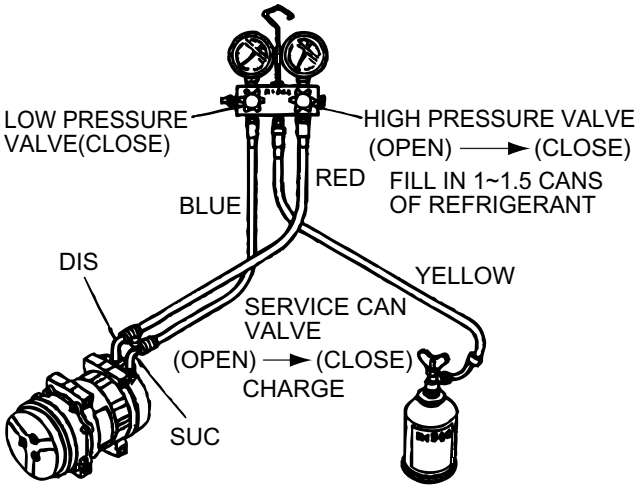
1.
After making vacuum repeatedly, change the charging hose (yellow) of the gauge manifold from the vacuum pump to the service can.

2.
Air purge
Open the service can valve. (However, close the high and low pressure valves of the gauge manifold.) Then push the gas valve of the side service port on the low pressure side of the gauge manifold, using a screw driver, in order to let out the air in the charging hose by the pressure of the refrigerant. (See right Fig.) (The operation ends when a hissing sound is heard.)

3.
Open the high pressure valve of the gauge manifold and charge in refrigerant. [Charge in gaseous refrigerant to a gauge pressure of 0.1MPa (14psi).]
After charging, close the high pressure valve of the gauge manifold and the service and valve. (See right Fig.)



Gas charging operation



Gas charging operation (High pressure side)

⚠ WARNING

Do not run the compressor during this work, (Otherwise the refrigerant flow in reverse direction which causes the service can and the hoses to rupture. This is very dangerous.)

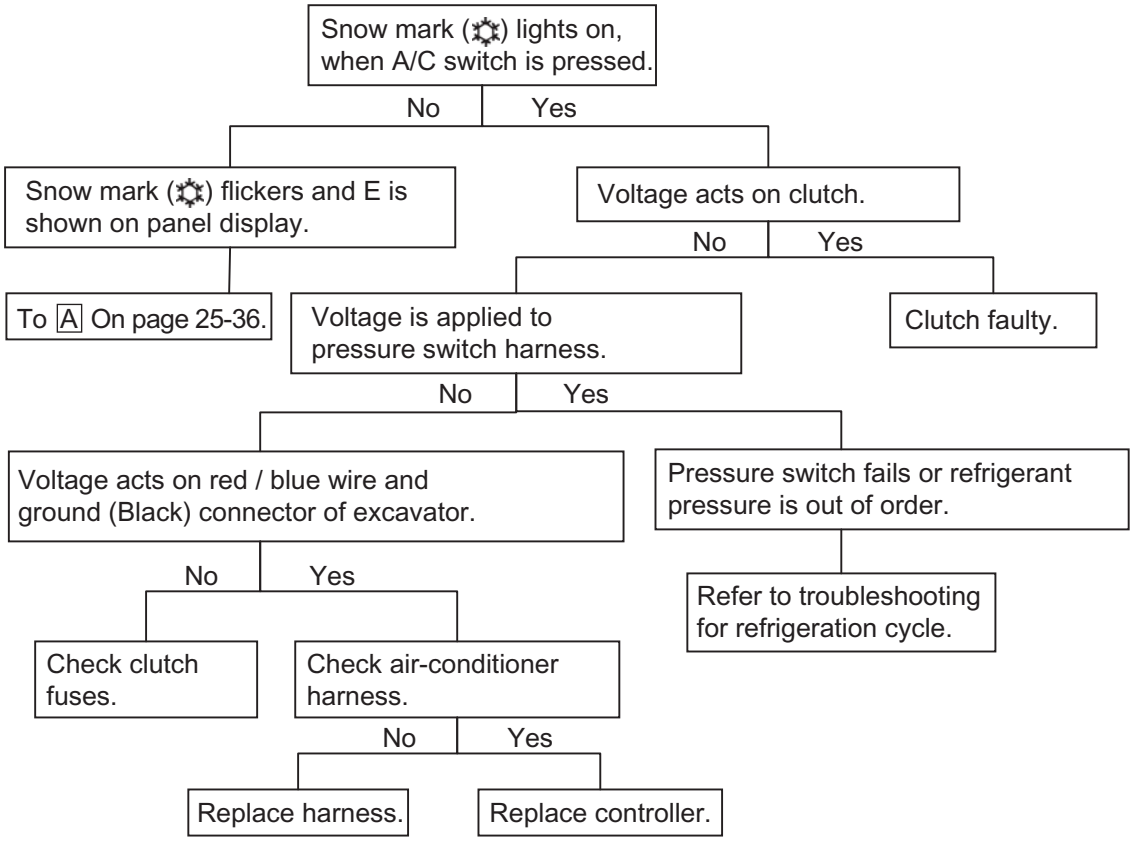
(2) Checking for gas leak

Check for gas leak in the cycle, using a gas leak detector (electric type). Retighten and correct leaking points.

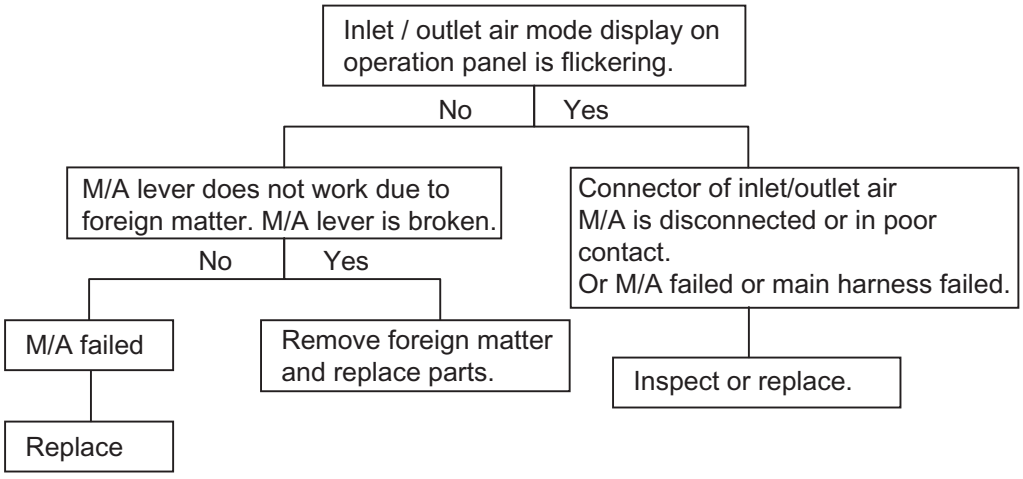
⚠ CAUTION

Always use the leak tester for R134a. (Do not use one for flon gas service as it provides poor sensitivity.)

Magnet clutch does not engage.



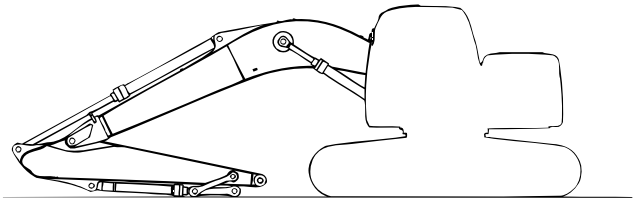
Inlet air and outlet air do not change over.



32.1.3 ARM

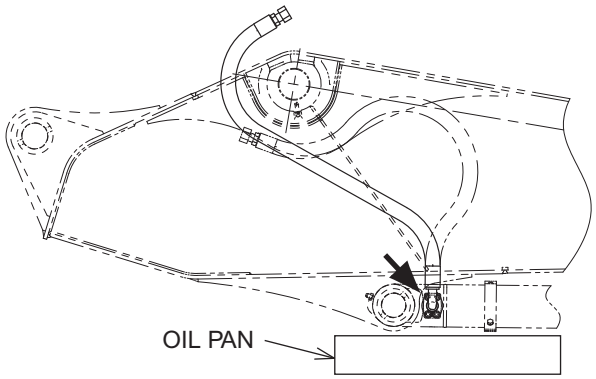
32.1.3.1 REMOVING ARM

(1) Put the machine in position to remove arm.
Extend the arm cylinder, retract the bucket cylinder and bring the arm down on the ground.



Position to remove arm

(2) Disconnecting piping of bucket cylinder
Release pressure of hydraulic tank, place oil pan to prepare for oil leaking, and disconnect pipes.
When the removal of bucket cylinder is not required, skip to procedure (6).



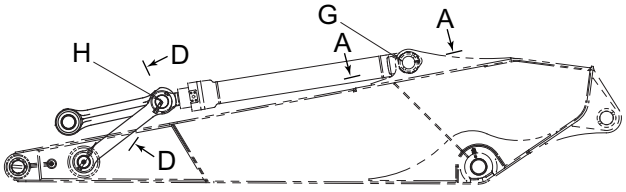
Disconnecting piping of bucket cylinder

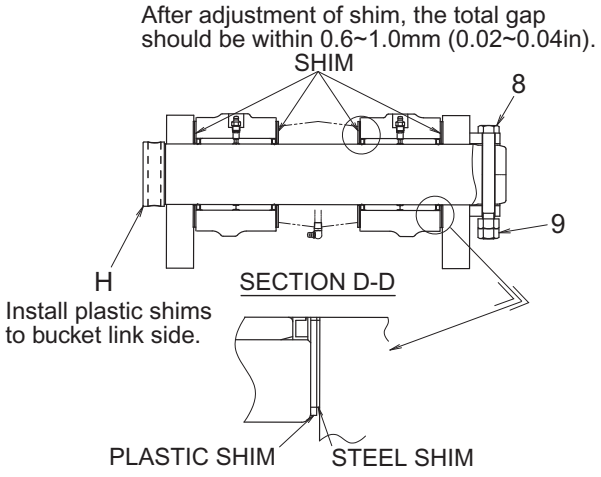
Note

Plug both end of disconnected pipes.
Plug:
Tools section 11.5.2-(4)
Tools section 11.5.2-(5)

(3) Removing bucket cylinder rod pin (H)
Loosen nut (9), remove capscrew M16X140 (8), and push out pin (H).

Tools: Spanner: 24mm



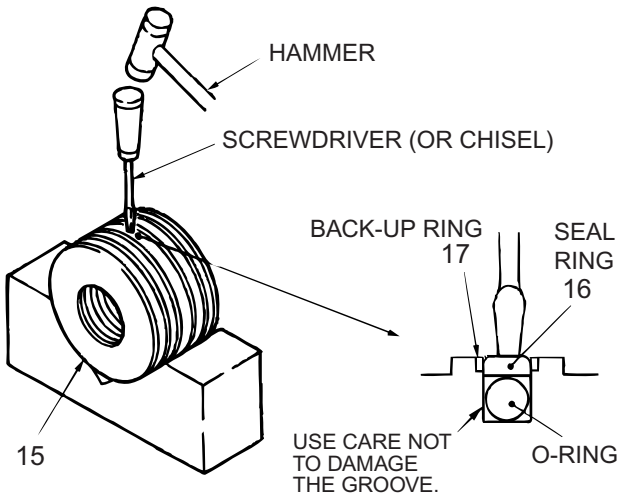


Detail of bucket cylinder rod pin (H)

32.2.1.3.3 DISASSEMBLING PISTON ASSY

(1)

Remove seal ring (16) and back-up ring (17).



Removing seal ring (16) and back-up ring (17)

CAUTION

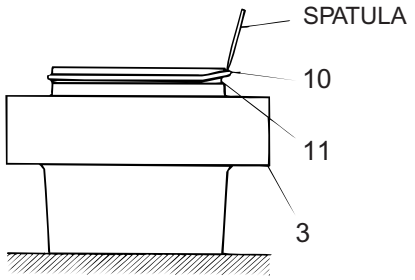
Cut the seal ring (16) by tapping it with a screwdriver or a chisel. Take care not to strike it too hard, otherwise the groove may be damaged.

32.2.1.3.4 DISASSEMBLING ROD COVER ASSY

(1)

Remove O-ring (10) and back-up ring (11).

Remove back-up ring (11) and O-ring (10) in that order. Remove back-up ring (11) and O-ring (10) by pulling and stretching them with an spatula like earpick.

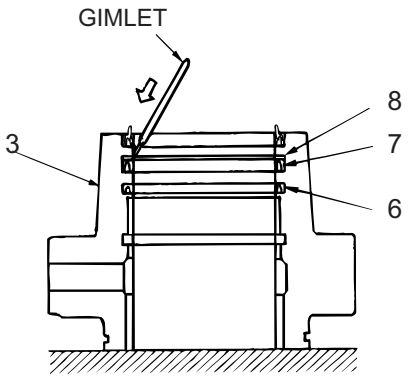


Removing the outer circumferential seal of rod cover (3)

(2)

Remove buffer ring (6), U-ring (7) and back-up ring (8). Each seal is fixed in the groove on the bore and removing in flawless is impossible.

Stab each seal with a gimlet and pull it out of the groove.



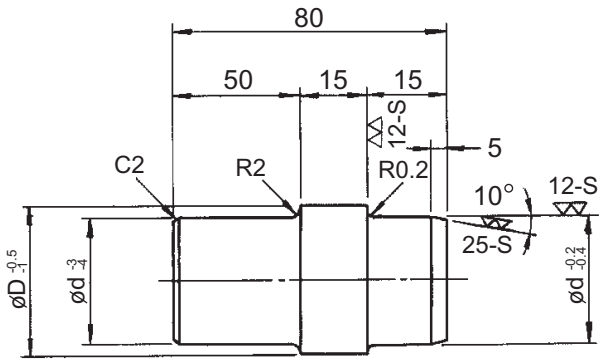
Removing the inner circumferential seal of rod cover (3)

CAUTION

Take care in this operation not to damage the grooves.

32.2.1.9.2 OTHER SPECIAL JIGS (PREPARED BY SERVICE SHOP)

(1) Bushing removing jig (Symbol J)



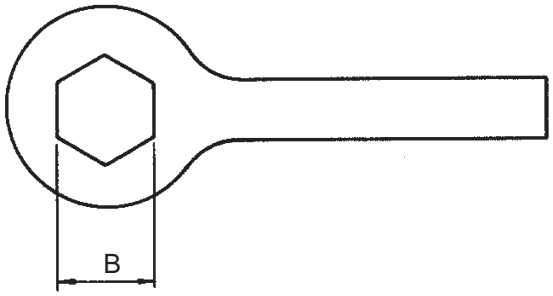
MATERIAL : Mild steel

Unit : mm (inch)

d	D	Cylinder Used
80	94	Bucket
85	94	Arm
85	99	Boom (Rod side)
90	104	Boom (Head side)

Bushing removing jig

(2) Wrench for piston nut or [piston]



Unit : mm (inch)

B	Cylinder Used
110	Arm
95	Boom
95	Bucket

Wrench for piston nut or [piston]

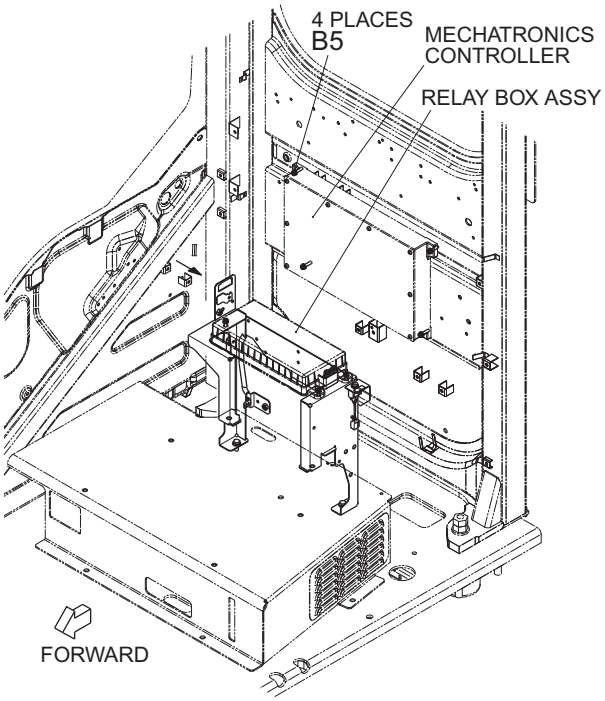
(7) Removal of mechatro-controller

1.

Loosen 4 sems bolts (B5) M6X25.

2.

With harnesses are connected condition, remove mechatro-controller, and place it in front of it temporally.



Removal of mechatro-controller

(8) Removal of cab attaching bolts

1.

Loosen 4 capscrews (C1) M12X35.

2.

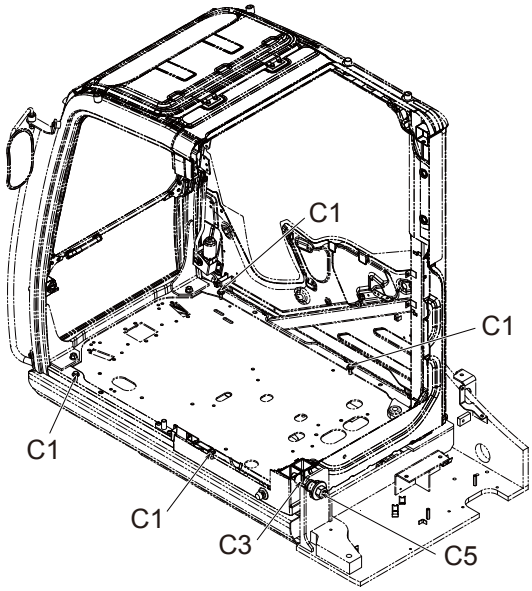
Loosen a nut (C5) M20.

3.

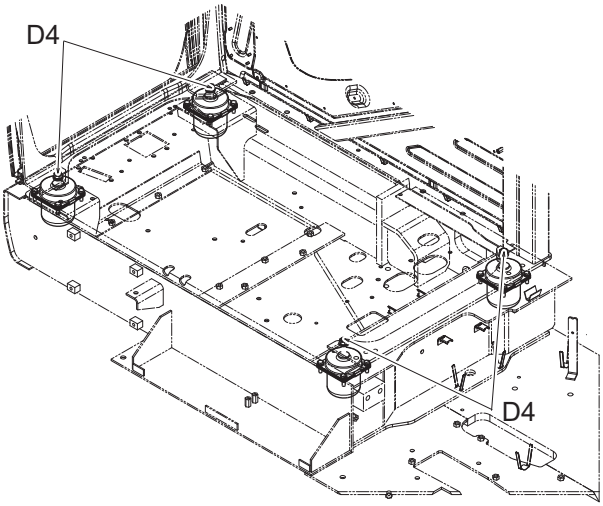
Loosen a pin (C3) M30.

4.

Loosen 4 nut (D4) M16.



Removing and installing cab mounting bolts



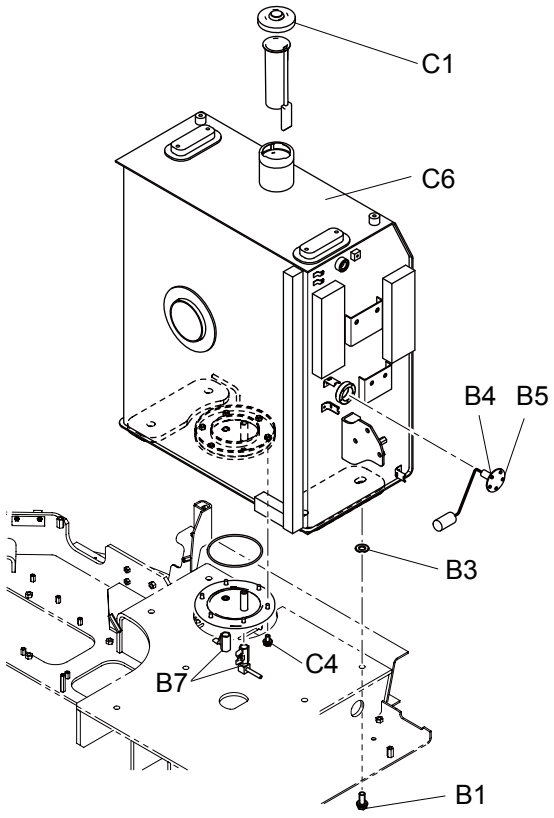
Removing and installing cab mounting bolts

33.1.6.2 REMOVAL

(1) Remove 4 capscrews (B1) M16X40.
Tools: Socket: 24mm

(2) Hook the wire to the lifting eye on the fuel tank assy (C6) and remove the fuel tank.
Weight: 143 kg (315 lbs)

(3) Remove shim (B3).



Removing fuel tank

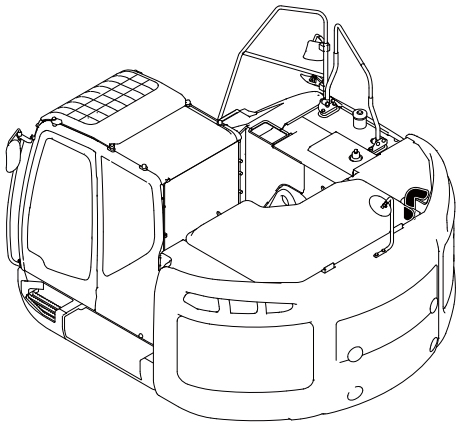
Note

Record the shim locations.

33.1.10 MUFFLER

33.1.10.1 PREPARATION FOR REMOVAL

(1) Remove bonnet assy (F1) with exhaust tube (6).
(See Fig."Remove bonnet assy (F1)".)



Preparation for removal

(1) Remove hose of engine oil filter.
1. Place oil pan under the connection of filter (1) and disconnect hoses (9),(10),(11) at * positions.
Tools: Spanner: 17mm, 19mm, 41mm
(2) Plug connector of filter side and hose.
(3) Loosen engine mounting bolt of frame.
1. Loosen 2 nuts (36) M16.
Tools: Socket: 24mm
2. Loosen 4 capcsrews (34) M16X150.
Tools: Socket: 24mm
3. Remove each 4 plates (17).
4. Remove upper rubber mounts (15) and (16) 2 each.

CAUTION

Prepare a stand, which withstands the weight of the engine assy and can place the removed engine firmly. (Refer to "Tool".)

(4) Slinging engine body.
1. Sling engine hooking wire to lifting lugs on the front and rear sides.
Weight: Approx. 565 kg (1246 lbs)
Wire: 6 dia. (0.236")X1m (3ft 3in) - 2pcs.
(5) Position engine on the stand stably.

33.1.13.3 INSTALLATION

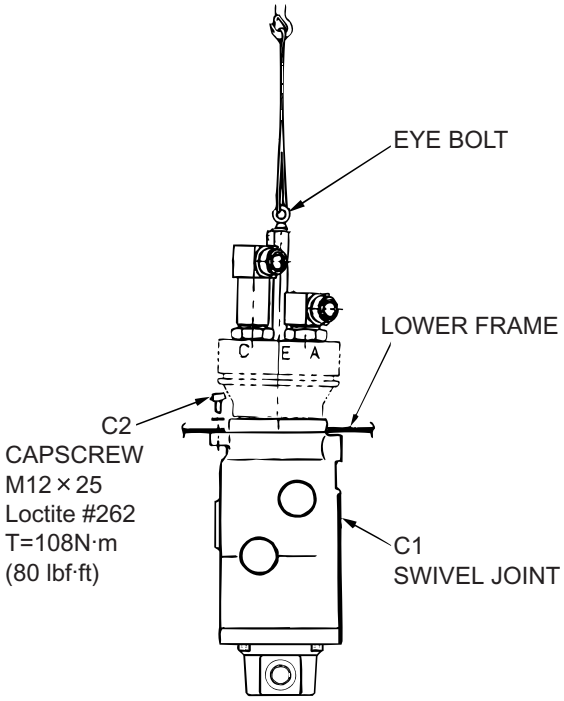
Installing is done in the reverse order of removing.
(1) Tightening torque

No.	Name	Tightening torque N-m (lbf-ft)	Remarks
28	Sems bolt M10X40	64.7 (47.7)	Apply Loctite #262
30	Sems bolt M12X40	115 (84.8)	Apply Loctite #262
31	Capscrew M10X35	46.1 (34)	Apply Loctite #262
32	Capscrew M14X45	172 (127)	Apply Loctite #262
33	Capscrew M10X130	46.1 (34)	Apply Loctite #262
34	Capscrew M16X150	279 (206)	Apply Loctite #271

Size PF	Tool. HEX	Tightening torque N-m (lbf-ft)	
		O-ring type connector	Hydraulic hose
PF1	41	205 (151)	137 (101)
PF1	41	137 (101)	137 (101)
PF1/4	19	26.5 (20)	29 (21)

(6) Remove capscrew for installation

Attach eye bolt, lift it up temporarily, and remove 3 capscrews (C2) M12X25.
Tools: Socket: 19mm
(See 11.7 SPECIAL TOOLS No.9 Plug)



Removing sems bolts for installation

(7) Slinging the swivel joint

Weight: Approx. 28kg (62 lbs)

33.1.19.3 INSTALLATION

(1) Installing is done in the reverse order of removing.
Piping tightening torque

(2) Check for oil leak and the hydraulic oil level.

(3) Check for operating.

Size PF	Tool. HEX	Tightening torque N·m (lbf·ft)	
		O-ring type Connector	Hydraulic hose
1/4	19	36 (27)	29 (22)
3/8	22	74 (54)	49 (36)
1/2	27	108 (80)	78 (58)
3/4	36	162 (120)	118 (87)
1	41	255 (180)	137 (100)
1-3/16-12UN	36	–	177 (130)

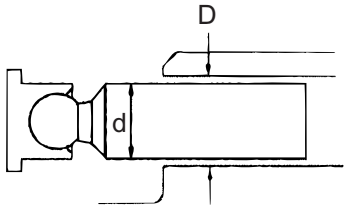
33.2.1.1.3 Maintenance standards

(1) Replacement standards for abrasive parts

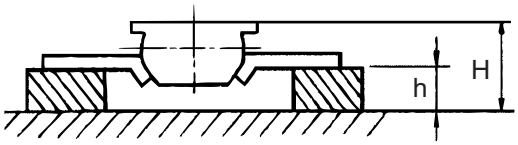
Replace or readjust parts that exceed the following standards of wear.

However, always replace such parts that show excessive damage on appearance.

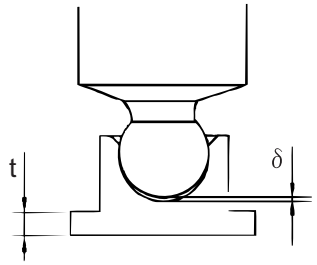
Part name and inspection item		Standard dimension	Recommende dvalue forreplacement	Remedy
Clearance between piston and cylinder bore	(D-d)	0.039 (0.0015)	0.067 (0.0026)	Replace piston or cylinder.
Gap between piston and caulked part of shoe	(δ)	0 - 0.1 (0.004)	0.3 (0.012)	Replace piston shoe assy.
Thickness of shoe	(t)	4.9 (0.193)	4.7 (0.185)	Replace piston shoe assy.
Free height of cylinder spring	(L)	41.1 (1.618)	40.3 (1.587)	Replace cylinder spring.
Combined height of retainer plate and spherical bushing	(H-h)	23.0 (0.906)	22.0 (0.866)	Replace spherical bushing or retainer plate.



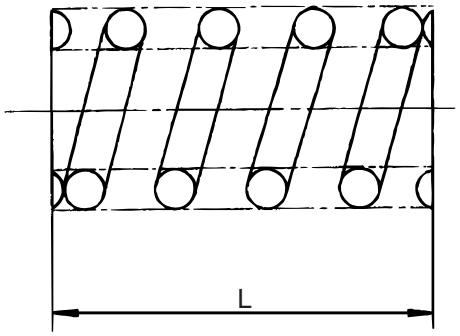
Clearance between piston and cylinder bore : D-d



Combination of retainer plate and spherical bushing Height=H-h



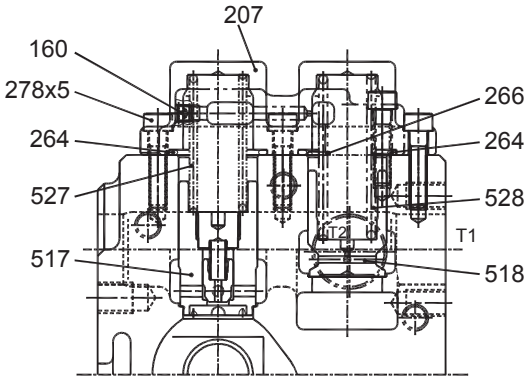
Gap between piston and shoe : δ
thickness of shoe : t



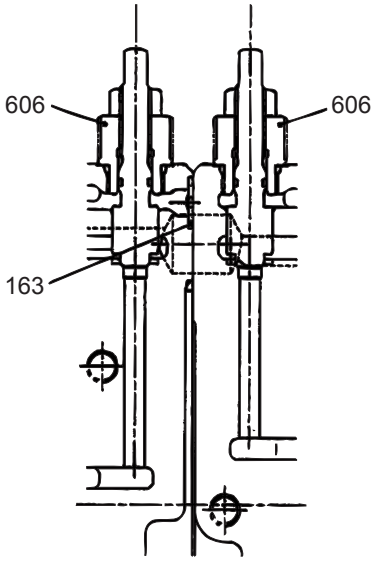
Free height cylinder spring : L

(2) Repair standards for cylinder, valve plate and swash plate (shoe plate face)

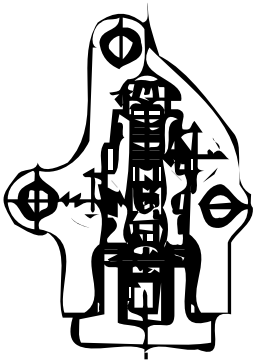
Valve plate (sliding section) Swash plate (shoe plate face) Cylinder (sliding section) Roughness of each surface	Surface roughness requiring correction	3 - Z
	Standard surface roughness (correction value)	Less than 0.4Z (lapping)



SECTION J-J



SECTION K-K



SECTION L-L

Section (6/6)

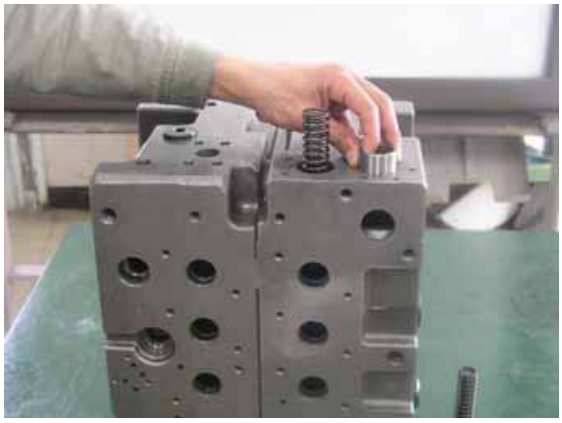
33.2.2.3.16 Removing back pressure check valve

(1) Loosen socket bolt (278) and remove back pressure check valve (207) from the casing.

Removing back pressure check valve cover (207)

(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.



Removing boost check valve sub (517) and by-pass check valve poppet (518)

CAUTION

When replacing, take care so as not to score the spool cover.

33.2.2.3.17 Removing plate

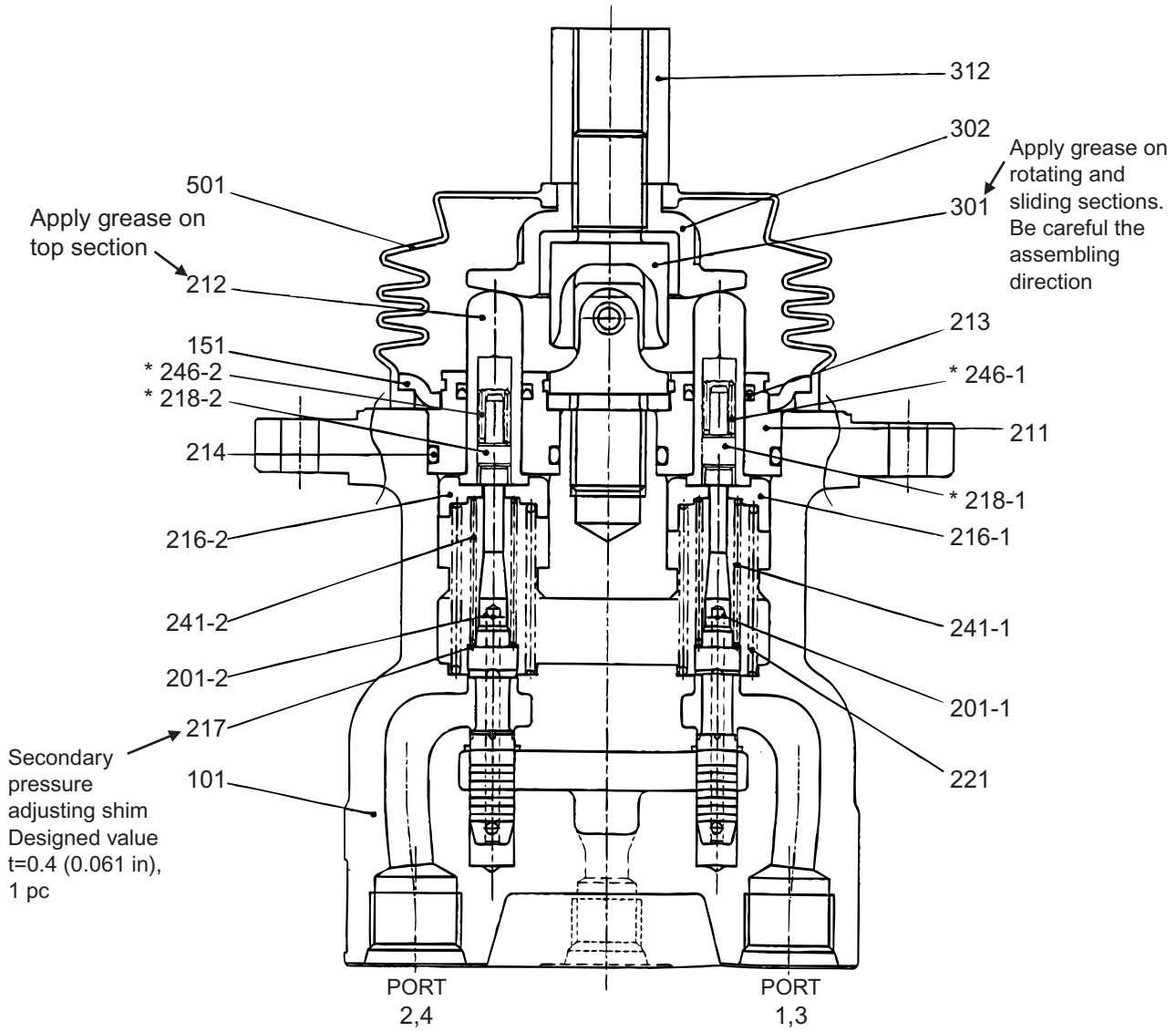
(1) Loosen socket bolts (274), (275) and remove plates (212), (213).

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

Removing plate (212),(213)

33.2.3 PILOT VALVE (FOR ATT)

33.2.3.1 CROSS-SECTIONAL VIEW



Pilot valve (For ATT)

Apply loctite #277 to areas marked **

Tightening torque N-m (lbf-ft)	No.	Parts	Q'ty	Tightening torque N-m (lbf-ft)	No.	Parts	Q'ty
	101	Casing	1		*218-1	Seat	2
	151	Plate	1		*218-2	Seat	2
	201-1	Spool	2		221	Spring	4
	201-2	Spool	2		241-1	Spring	2
	211	Plug	4		241-2	Spring	2
	212	Push rod	4		*246-1	Spring	2
	213	Seal	4		*246-2	Spring	2
	214	O-ring; 1B P20	4	47.1 (35)	301	Joint: M14	1
	216-1	Spring seat	2		302	Circular plate	1
	216-2	Spring seat	2	68.6 (51)**	312	Adjust nut: M14	1
	217	Washer 2 (Shim)	4		501	Boots	1

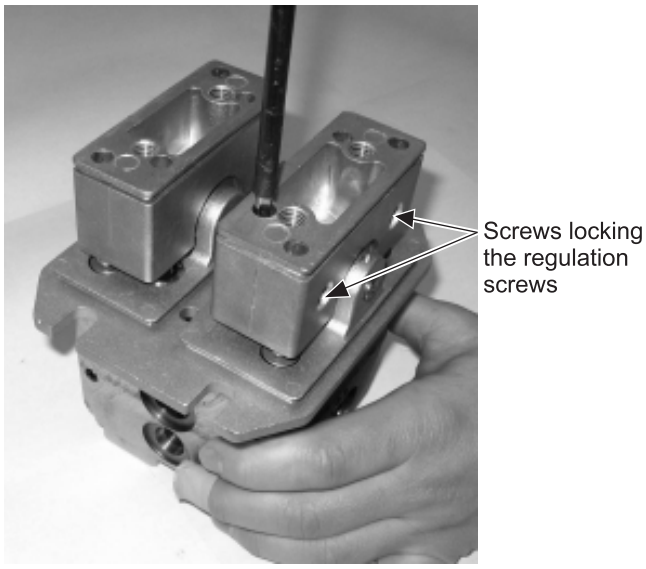
Note) The parts marked * might not be equipped depending on valve type.

(3) Switch plate adjustment

CAUTION

If the switch plate is replaced, it is necessary to adjust the regulation screws.

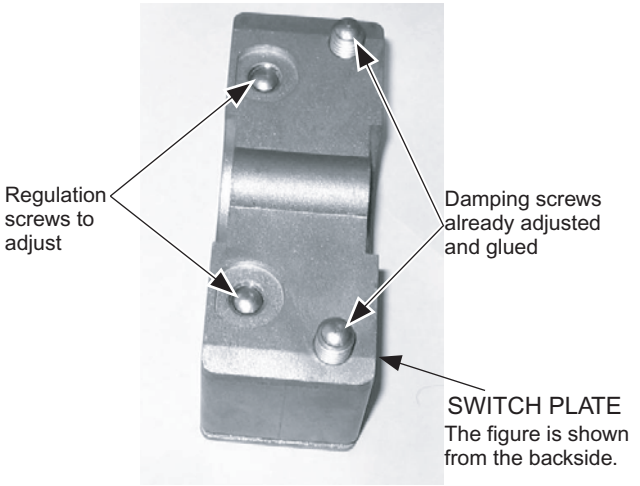
1. Unscrew the 2 locking screws using a 2,5 mm socket wrench (See right Fig.)
   * Reassembly:
   -Apply a droplet of Loctite #262 on the locking screw thread.
   -Torque :3N-m 2.2 (lbf-ft)
2. Set the switch plate horizontally.
3. Screw on simultaneously both regulation screws using a flat screw driver (5,5X150) until feeling some resistance.



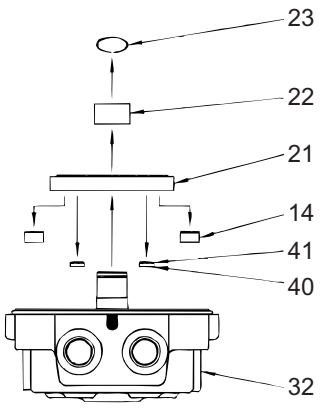
CAUTION

Do not misadjust the two damping screws. (See below Fig.)

4. Tighten the locking screws to hold the regulation screws in position.
5. Repeat the operation for the second switch plate making sure both switch plates are parallel. (See above Fig.)



4. Remove balance plate
   Remove snap ring (23) with steel pointer and remove inner race of needle-bearing (22) and balance plate (21) by bearing puller.
   In this time, remove balance plate (21) with attaching gear puller to crescent shaped hole of balance plate (21) and shaft of cover (32), because inner race of needle bearing (22) is press fitted into the shaft.
   Remove piston (14) and piston (41) and teflon ring (42) from balance plate (21).



Removing balance plate

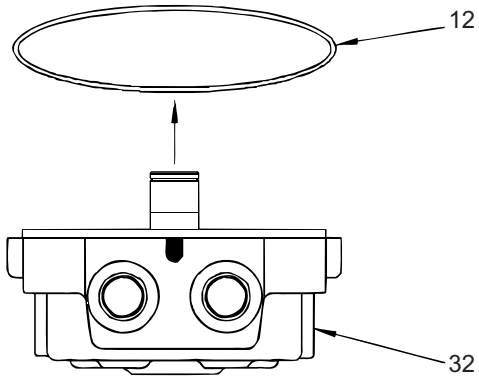
CAUTION

Work carefully to avoid damaging the sliding face of the balance plate (21).

CAUTION

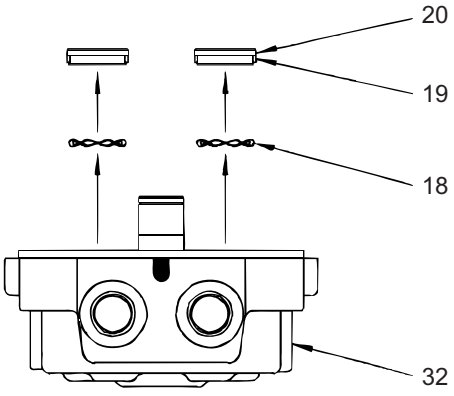
Before removing, check and record location of balance plate (21) to prevent misassembling

5. Remove O-ring (12) from cover (32).



Removing O-ring

6. Remove bushing (20) with teflon ring (19) and scrowave (18).

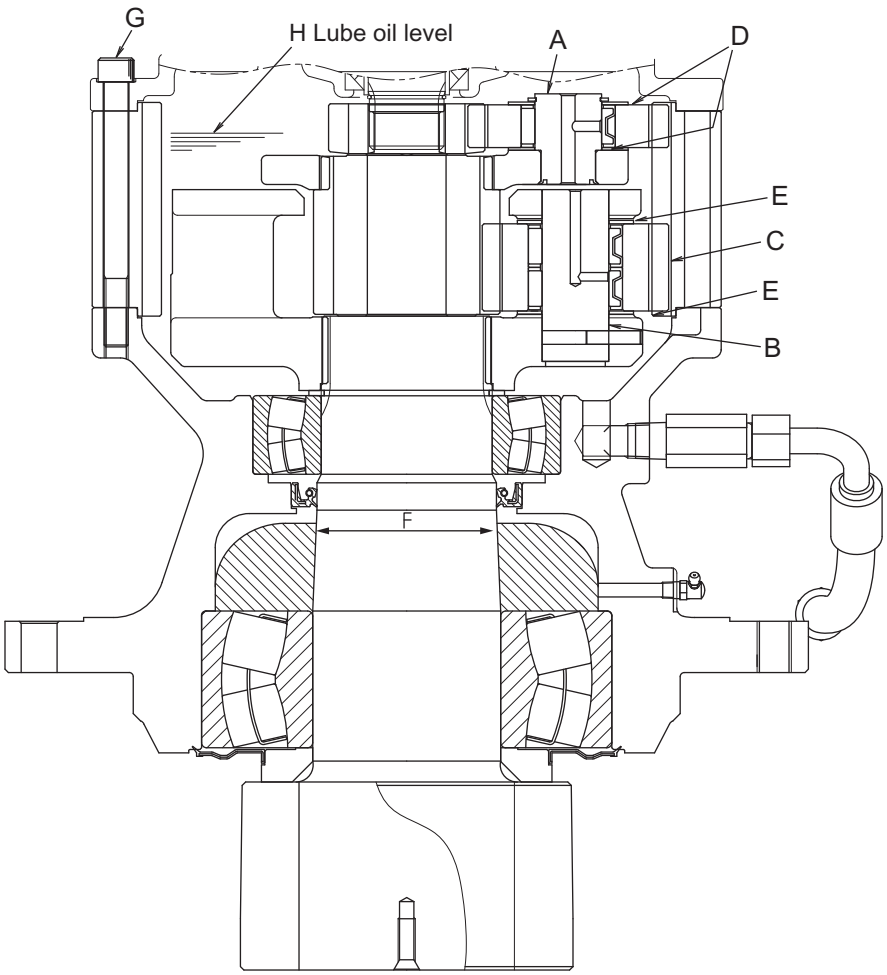


Removing bushing

33.2.5.3 DISASSEMBLY AND ASSEMBLY OF SWING REDUCTION UNIT

33.2.5.3.1Tools

(3) Maintenance standards



Unit : mm (in)

Code	Item		Repairable level	Service Limit	Remedy
A	Wear in #1 planetary shaft		ø39 $^{0}_{-0.011}$ (1.54 $^{0}_{-0.0004}$)	No flaking	Replace entire spider assy.
B	Wear in #2 planetary shaft		ø39 $^{0}_{-0.011}$ (1.54 $^{0}_{-0.0004}$)		Replace four shafts as a set.
C	Gears	Condition of tooth face	There should be no pitting exceeding 1.6mm (0.0630in) dia, abnormal wear or seizure.		Replace (Planetary pinion should be replaced in a set of four.)
		Condition of tooth flank	There should be no cracks.		
D	Thickness of thrust washer		1.6 ±0.1 (0.06±0.0039)	1.3 (0.0512)	Replace
E	Thickness of thrust washer		2.0 ±0.1 (0.08±0.0039)	1.6 (0.063)	Replace
F	Wear in shaft (Diameter of part coming in contact with oil seal)		ø105 $^{0}_{-0.087}$ (4.13 $^{0}_{-0.003}$)	ø104.9 (4.13)	Replace
G	Socket bolt tightening torque		M14 — 181 N·m (130 lbf·ft)		Apply Three-Bond 1360K and tighten to specified torque.
H	Lube oil	Gear oil SAE90 (API Service Grade GL-4)	4.7 L (1.24 gal)		Replenish or replace.

33.2.6.3.4 TROUBLESHOOTING

Trouble	Cause	Remedy
1. External leakage of hydraulic oil	Defective O-ring & seal	Replace all seals.
2. Internal leakage of hydraulic oil	1) Defective slipper seal 2) Sliding face worn excessively	1) Replace all seals. 2) Replace assy.
3. Swivel stem seized	1) Stem and body seized 2) Inappropriate swivel stopper bracket	1) Grind and hone. Replace assy, if stem and body are too loose and causing oil leakage. 2) Reinstall Secure 2 to 3 mm (0.08 to 0.12 in) allowance for bolt stopper.
4. Loose swivel stem and cover	Socket bolt tightened insufficiently.	Retighten.

34.1.3.7 TOOLS AND JIGS

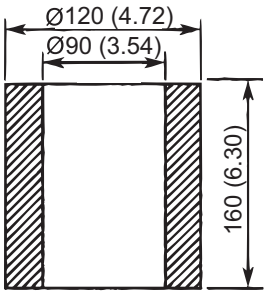
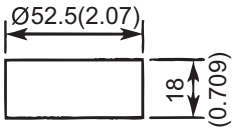
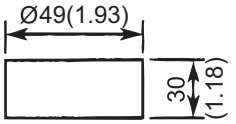
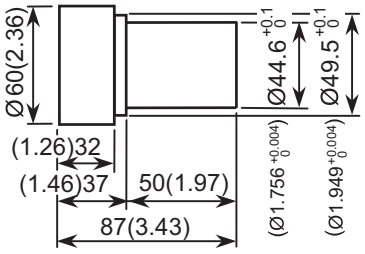
(1) Tightening tools

Unit : mm

NAME	OPPOSING FLATS
 Socket	30
 Allen wrench	6 , 10

(2) Jigs

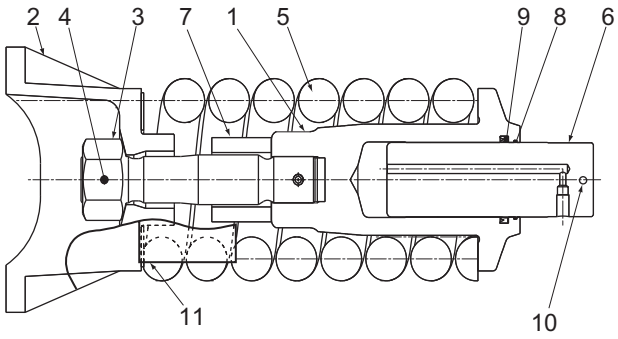
Unit : mm (in)

No.	NAME	SHAPE
f	Stand jig	
g	For extruding bushing	
h	For extruding shaft	
i	Bushing fixing jig	

34.1.5.4 IDLER ADJUSTER ASSY

34.1.5.4.1 CONSTRUCTION

IDLER ADJUSTER ASSY			LQ54D00010F1
No.	NAME	Q'TY	REMARKS
1	GREASE CYLINDER	1	
2	BRACKET	1	
3	NUT	1	
4	SPRING PIN	1	ϕ8X80
5	SPRING	1	
6	PISTON	1	
7	COLLAR	1	
8	O-RING	1	1B G90
9	U-PACKING	1	
10	PIN	2	
11	COVER	1	

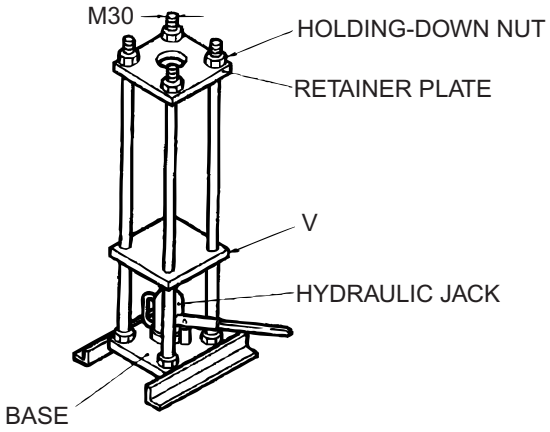


Idler adjuster assy

34.1.5.4.2 DISASSEMBLY AND ASSEMBLY

(1) Disassembly

1. Spring set special jig
   Before disassembling and assembling the idler adjuster assy, prepare spring setting jig (V).
   Capacity of hydraulic jack : more than 20 tons (44000 lbs)
   Tools: Spanner: 46 mm
2. Preparation for working
   Place a hydraulic jack between the jig base and the stand.
   Loosen the holding-down nuts of the jig and draw out the retainer plate upward.
   Tools: Spanner: 46 mm

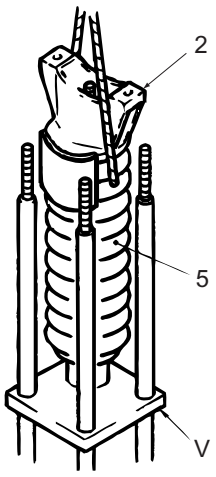


Spring set special jig (V)

CAUTION

Large power is needed to set the spring. Prepare a special jig before disassembly and assembly.

3. Draw out grease cylinder (See Fig. "Idler adjuster assy".)
   Draw out piston (6) from grease cylinder (1) of the idler adjuster assy.
4. Removing U-packing (9), O-ring (8)
   (See Fig. "Idler adjuster assy".)
   Remove U-packing (9) and O-ring (8) from grease cylinder (1).
5. Slinging work idler adjuster
   Set the idler adjuster assy on the stand of the jig, with its bracket side facing up.



Slinging work idler adjuster

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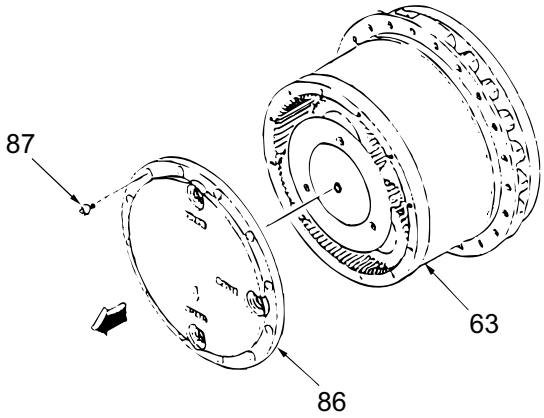
CAUTION

Prepare an oil container before doing the work.
-Do not lift the reduction unit too high, but do the work at as low level as possible.
(height of your knees)

(17)Removing cover (86)

Loosen bolts (87) and remove them.
Then remove cover (86).

Tools: Allen wrench: 8 mm



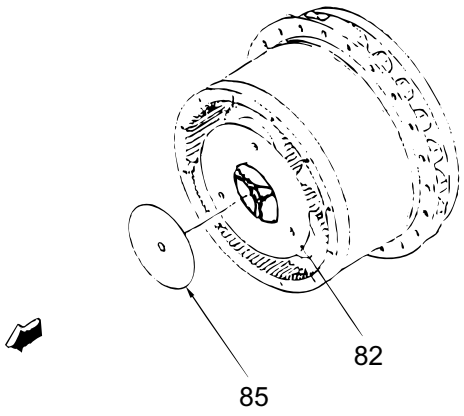
Removing cover (86)

CAUTION

Remove the cover as below
-Liquid packing is applied between cover (86) and housing (63). For this reason, the cover is hard to come off. Loosen bolts (87) and tap the top and side faces of the removed cover (86) with a plastic mallet.
-Put a flat-blade screwdriver between cover (86) and housing (63) and take off cover (86).

(18)Removing thrust plate (85)

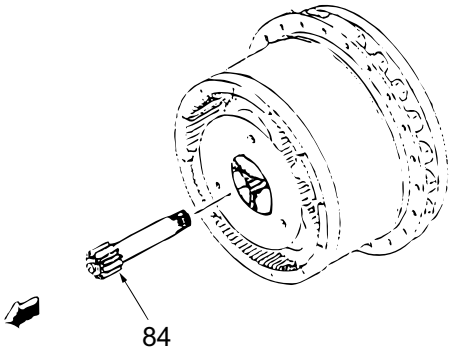
Separate thrust plate (85) from the top face of thrust plate (82)



Removing thrust plate (85)

(19)Removing drive gear (84)

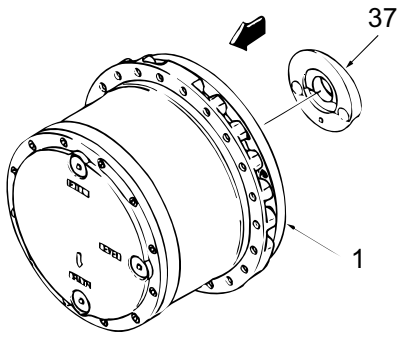
Remove drive gear (84)



Removing drive gear (84)

(5) Installing swash plate (37)

Attach flange (1) so the inclined surface of swash plate (37) faces up.



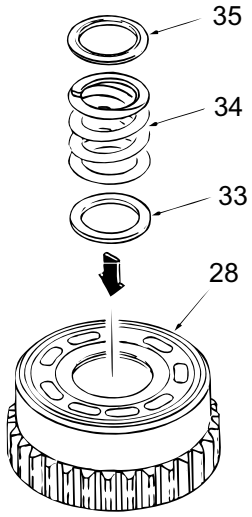
Installing swash plate (37)

CAUTION

Assemble swash plate (37) by matching the holes in the rear spherical surface of the swash plate (37) to steel balls (38).
-After coating steel balls (38) with hydraulic oil and assemble swash plate (37).
-After assembling swash plate (37), make sure that the swash plate moves smoothly.

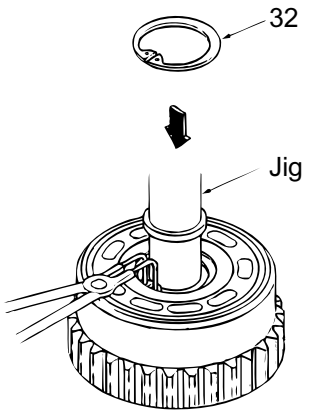
(6) Assembling cylinder block (28)

1. Place cylinder block (28) on a hand press bench so the sliding surface of valve plate (53) faces up. Assemble cylinder block (28) so the slope of spring seat (33) faces downward. Then mount spring (34) and collar (35) on spring seat (33), in that order.



Assembling cylinder block (28)

2. Press in the top face of collar (35), using a jig, and fix snap ring (32).



Fixing snap ring (32)

CAUTION

Trouble	Probable cause	Remedy
Oil leak	Bolts in matching surface get slack. This developed oil leakage.	Retighten fastening bolts to a specified torque.
	Oil is leaking as oil seal, O ring and packing are broken.	Disassemble and replace seals. Confirm the temperature of hydraulic oil. In case the operating oil temperature has risen above 80C degrees (176F degrees), examine the cooler and hold down the hydraulic oil temperature below 80C degrees(176F degrees).
	Since the sliding surface of piston motor is worn, the drain rate increased. This caused the oil seal to break and developed an oil leak.	Disassemble and check the worn condition of sliding surface. Repair or replace according to the shop manual. Review oil seals. Clean parts and reassemble.
	Drain pressure rose as drain pipe was stuck with foreign matter or drain pipe is too small or long. This caused oil seal to break and developed an oil leak.	Disassemble and replace oil seals. Clean drain pipe and eliminate foreign matter. Review piping system so as to decrease the line resistance.
Abnormal sound and revolution and pressure fluctuations occur due to cavitation.	Hydraulic oil level in hydraulic tank fell, entrapped air and developed aeration.	Confirm the hydraulic oil level in hydraulic oil tank and resupply hydraulic oil according to the instructions of the machine proper.
	Motor is installed improperly or the location of hydraulic oil tank is improper. Therefore, hydraulic oil is discharged from motor piping and motor circuits while the hydraulic device is not running. The motor developed aeration immediately after motor was driven.	Confirm the motor orientation and if it is wrong, correct it to the correct orientation. Check that the oil level in the hydraulic oil tank is above the motor level and if not, change it higher than the motor level. Before running, place a self supply circuit so hydraulic oil is filled up in motor circuit and piping.
	When motor makes pumping action, motor inlet pressure becomes negative due to malfunctioning double counterbalance valve. This causes the motor to develop cavitation.	Disassemble and repair or replace double counterbalance valve according to the shop manual.
Motor stopped while running	Engine stalled because of too much load.	Review load condition and change it to a suitable level.
	Motor stalled as the sliding surface of piston motor was seized.	Check the spec (flow and motor revolution in particular). if the motor revolution exceeds a limit value, decrease the flow. Replace motor as insides of motor are broken beyond reuse.

Table 46-24

Error code		B063		
Trouble		Bucket dump pressure sensor's wiring is disconnected.		
Judging condition		The input voltage from bucket dump pressure sensor is 0.1V or less.		
Symptom		The bucket dump speed slows down a little.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	5	B-6 BUCKET DUMP
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Bucket dump pressure sensor SE-2			When B063 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 bucket dump pressure sensor and controller CN-125F CN-101F			When B063 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.

Table 46-25

Error code		B064		
Trouble		Bucket dump pressure sensor's power source is shortcut.		
Judging condition		The input voltage from bucket dump pressure sensor is 4.7V or more.		
Symptom		The bucket dump speed slows down a little.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	5	B-6 BUCKET DUMP
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Bucket dump pressure sensor SE-2			When B064 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 bucket dump pressure sensor and controller CN-125F CN-101F			When B064 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.

Table 46-46

Error code		C022		
Trouble		P2 pump pressure sensor outputs error.		
Judging condition		After starter switch ON and engine does not start yet. And the input voltage from the P2 pump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom		The P2 pump operability becomes poor.		
Control in the event of failure		Normal control		
Returned in normal condition		Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen		Screen No.	6	C-2 PUMP P2
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-P2 pump pressure sensor SE-23			When C022 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 P2 pump pressure sensor and controller CN-140F CN-103F			When C022 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.

Table 46-47

Error code		C023		
Trouble		P2 pump pressure sensor's wiring is disconnected.		
Judging condition		The input voltage from P2 pump pressure sensor is 0.1V or less.		
Symptom		The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	C-2 PUMP P2
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-P2 pump pressure sensor SE-23			When C023 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 P2 pump pressure sensor and controller CN-140F CN-103F			When C023 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.

Table 46-71

Error code		F021		
Trouble		Swing parking solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition		The feed-back signal is grounding level while exciting command is output.		
Symptom		Swing parking is not available.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is 24V level while exciting command is output.		
Service diagnosis checking screen		Screen No.	3	F-2 SWING-BRAKE
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Swing parking solenoid valve SV-1			When F021 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it. Check solenoid valve unit for possible failure. If failure found, replace it.
2	-Wiring between swing parking solenoid valve and controller CN-123F CN-105F			When F021 is displayed after the connector is exchanged with other solenoid valve. 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.

Table 46-72

Error code		F023		
Trouble		Swing parking solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition		The feed-back signal is 24V level while exciting command is not output.		
Symptom		Swing parking is not available or is leaving available.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is grounding level while exciting command is output.		
Service diagnosis checking screen		Screen No.	3	F-1 POWER BOOST
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Swing parking solenoid valve SV-1			When F023 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	-Wiring between swing parking solenoid valve and controller CN-123F CN-105F			When F023 is displayed after the connector is exchanged with other solenoid valve. 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.

Table 46-96

Error code	K014		
Trouble	Battery relay contact welded		
Judging condition	The power 24V is continuously supplied to controller for 40 seconds or more while the key switch ON signal turned OFF		
Symptom	The power on the battery relay secondary side does not turn OFF even if the key switch is turned OFF.		
Control in the event of failure	Normal control with key switch OFF		
Returned in normal condition	Turn key switch ON. Or when the power supply 24V to mechatro controller is stopped		
Service diagnosis checking screen	Screen No.	4	K-1 AIS RELAY 2
	Screen No.	4	K-3 KEY SWITCH OFF
	Screen No.		

	Checking object	Checking contents and remedy
1	-Battery relay R-1 CN-256F	Turn key switch off and disconnect the connector (CN-256F) on the battery relay coil. If 24V power lives on battery relay secondary side, check on battery relay for failure and replace it if failed.
2	-Auto idle stop relay 2 R-24 -Alternator relay R-28	Turn off the key switch, and remove the connector (CN-256F) on the battery relay coil side. If power of battery relay on secondary side falls, remove either auto idling stop relay 2 or alternator relay. The failure may be occurred in case where the power falls after the relay was removed, and therefore check on the relay unit and replace it with new one if failed.
3	-Wiring between auto idle stop relay/alternator relay and controller CN-109F, CN2-1 -Fuse & relay box E-1	When K014 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and K014 is left displayed Replace fuse/relay box.
4	-Mechatro controller	Check that the error is corrected after replacement of controller.

(2) Engine down/stalled

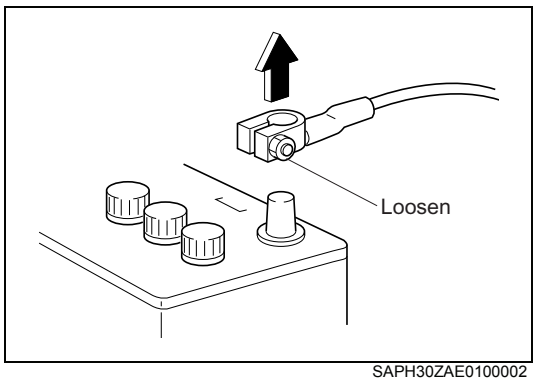
No.	Sections	Contents/normal value		Corrective action, others
1	Actual measuring current value of P1/ P2 pump proportional valve	Carry out service diagnosis	-No.9 E-1 P1 pump E-2 P2 pump -See Service Diagnosis Data List Operation No. 1 Operation is nil	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
2	Secondary pressure of P1, P2 pump proportional valve	Measure the pump proportional valve secondary pressure directly (Ports a3, a4)	Check that P1/P2 pump proportional valve pressures are within the range of 0.5 to 1.0MPa in control lever neutral and high idling operation.	Replace proportional valve
3	Pressure sensor of P1, P2 pump	Check pressure	-See Service Diagnosis Data List Operation No.1 Operation is nil Operation No.3 Boom up full lever & relief	Check pressure sensor and replace it if necessary
4	Pump regulator	Visual check	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring free from breakage, damage, etc.	Replace
5	Pump	Visual check	When removing, inside parts (cylinder block, piston, valve plate, shaft, etc.) are free from abnormal resistance against sliding, abnormal damage, etc.	Replace

(10) Bucket dump is slow

No.	Sections	Contents/normal value		Corrective action, others
1	Bucket dump pressure sensor	Carry out service diagnosis	-See Service Diagnosis Data List Operation No.14 Bucket dump full lever and relief	Check and replace pressure sensor Check remote control valve
2	Remote control valve	Measure directly remote control pressure of bucket dump	Check that pressure is 3.0MPa or more in bucket dump full lever and high idling operation	Check remote control valve When equipped with multi control valve, check it while changing lever pattern
3	Pump pressure sensor	Carry out service diagnosis for P1, P2 pump pressures in operation.	-See Service Diagnosis Data List Operation No.15 Bucket dump full lever and in operation	When there is difference between P1 and P2 pump pressures, check high pressure sensor
4	Actual measuring current value of P1/ P2 unload proportional valve	Carry out service diagnosis	-No.8 D-1 P1 unload valve (cut valve) D-1 P2 unload valve (cut valve) -See Service Diagnosis Data List Operation No.14 Bucket dump full lever & relief	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
5	Secondary pressure of P1, P2 unload proportional valve	Measure the proportional valve secondary pressure directly at the ports A7 and A5 of 8 sections solenoid block	Check that P1/P2 unload secondary pressures are within the range of 0.5 to 1.2MPa in bucket dump full lever and high idling operation. Replace proportional valve	Replace proportional valve
6	Actual measuring current value of P1/ P2 pump proportional valve Carry out service diagnosis.	Carry out service diagnosis	-No.9 E-1 P1 pump E-2 P2 pump -See Service Diagnosis Data List Operation No.15 Bucket dump full lever & in operation	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
7	Secondary pressure of P1, P2 pump proportional valve	Measure the pump proportional valve secondary pressure directly (Ports a3, a4)	Check that P1 pump proportional valve pressures is 2.7MPa or more and P2 pump proportional valve pressure is 0.9 to 1.4MPa in bucket dump full lever and high idling operation.	Replace proportional valve
8	Actual measuring current value of travel straight proportional valve	Carry out service diagnosis	-See Service Diagnosis Data List Operation No.14 Bucket dump full lever & relief	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.

(22)Selector valve for option malfunctions: Nibbler circuit is not obtained.
(Indication of failure is displayed. For reference, see "Table : Action of optional selector solenoid valve")

No.	Sections	Contents/normal value		Corrective action, others
1	N&B selector spool	Visual check	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring is free from breakage.	Replace (Check on the casing side for damage)
2	N&B selector solenoid	Carry out service diagnosis	-No.11 F-4 Option selector is A mode COMP OFF, MEAS OFF Spool position N Selector switch NIB	Check solenoid valve Check harness



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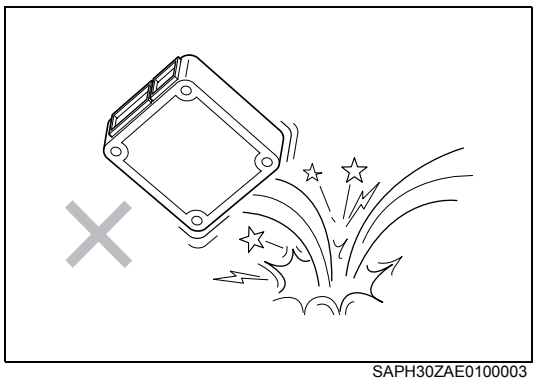
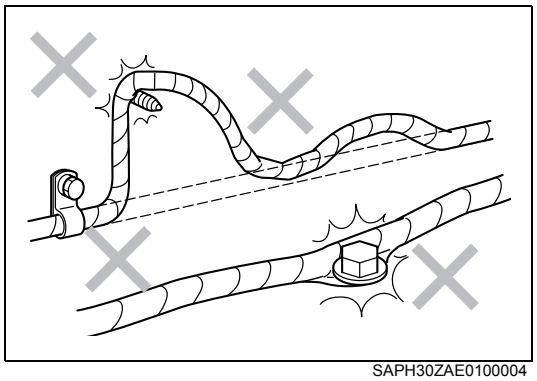

SAPH30ZAE0100003


SAPH30ZAE0100004

3. Precautions for electric system

(1) Removal of battery cable

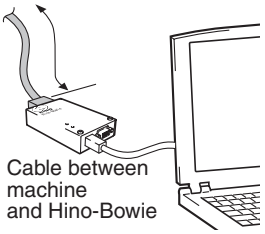
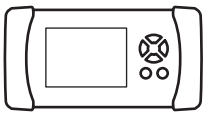
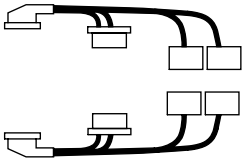
a. In an electric system, remove the cable from the battery minus (-) terminal to prevent burnout due to short-circuit.
b. When the battery cable is removed, the battery terminal may be damaged. Loosen the nut completely and never pry it for removal.

(2) Handling of electronic parts

a. Do not give impact on electronic parts such as computer and relay.
b. Do not place electronic parts at a high temperature and humidity area.
c. Do not expose electronic parts to water in washing of a vehicle.

(3) Handling of wire harness

a. Mark clamps and clips to prevent interference of a wire harness with body edge, sharp edge and bolts. Be sure to reassemble it to the original position.
b. When parts are assembled, be careful not to pinch a wire harness.

Part name	Part No.	External shape	General description and function
Cable between machine and Hino-Bowie	S0904-21220 (09042-1220)		Cable for machine side diagnosis connector.
DENSO DST-i set			Computer inter face
without LCD without Bluetooth®	95171-01020		
without LCD with Bluetooth®	95171-01040		
with LCD without Bluetooth®	95171-01030		
with LCD with Bluetooth®	95171-01050		
Signal check harness	09843-E4010		Interrupting installation between vehicle harness and ECU allows inspection with a tester rod while the power is supplied.

***1: To use Hino-Bowie (interface box) 09993-E9070, update the hardware. For details, refer to the user's manual in the HinoDX CD-ROM.**
Keep updating the firmware (software built in the Hino-Bowie) using the software in the HinoDX CD-ROM. For details, refer to the user's manual in the HinoDX CD-ROM.
***2: HinoDX (Ver. 3.0.5 or later), only when use DST-i.**

Cooling

Standard value

JP31ZAJ020205009

Inspection item	Standard value	Action
Thermostat valve open temperature	74.5 - 78.5° C {166.1 - 173.3° F}	Replace
Thermostat valve lift (Set temperature 95 ° C {203° F})	10mm {0.3937 in.} or more	Replace

Lubrication

Standard value

JP31ZAJ020205010

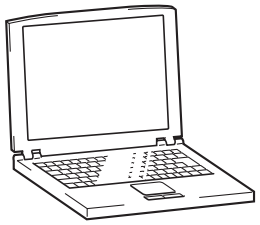
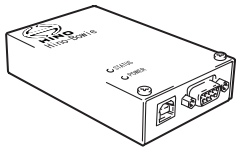
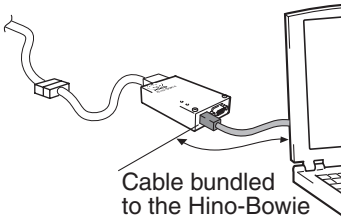
Unit : mm {in.}

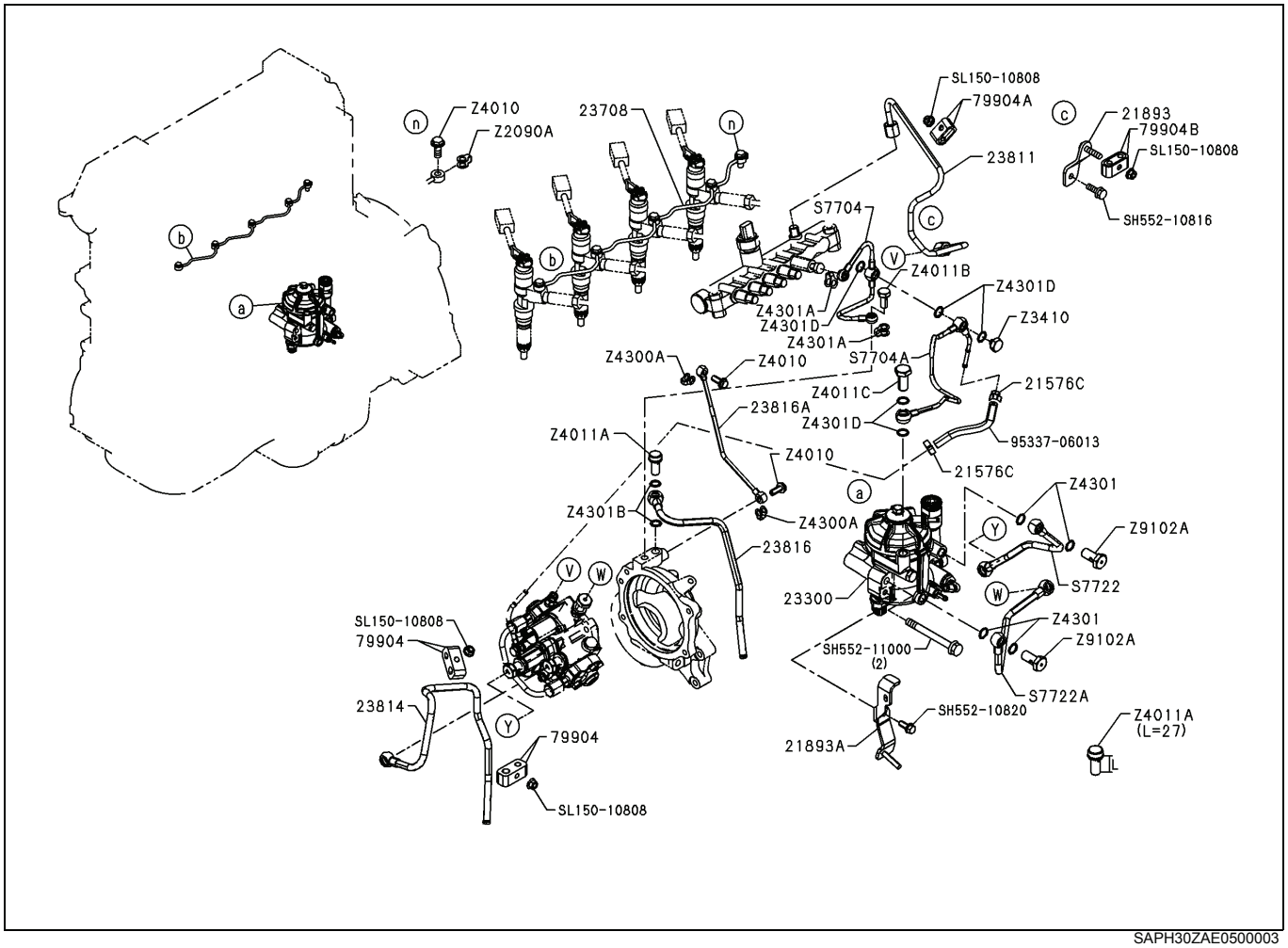
Inspection item		Standard value	Repair limit	Service limit	Action
Oil pressure warning switch operation pressure		39kPa {0.4kgf/cm^2, 5.66 lbf/in.^{2}}	—	—	
Oil pump	Outer diameter of drive gear	54 {2.1260}	—	—	
	Cylinder block side Oil pump chamber inner diameter	54 {2.1260}	—	—	
	Clearance between drive gear and cylinder block	0.093-0.252 {0.0037-0.0099}	—	0.30 {0.0118}	Replace oil pump
	Drive gear width	28.5 {1.1220}	—	—	
	Cylinder block side Depth of oil pump chamber	28.5 {1.1220}	—	—	
	Drive gear end play	0.047-0.150 {0.0019-0.0059}	—	0.15 {0.0059}	Replace drive gear or oil pump
	Outer diameter drive gear shaft	18 {0.7087}	—	—	
	Inner diameter of cylinder block bushing	18 {0.7087}	—	—	
	Clearance between drive gear shaft outer diameter and bushing inner diameter at cylinder block side	0.040-0.099 {0.0015-0.0038}	—	—	Replace oil pump
	Outer diameter of driven gear shaft	18 {0.7087}	—	—	
	Cylinder block hole diameter	18 {0.7087}	—	—	
	Clearance between driven gear shaft outer diameter and cylinder block hole diameter	0.030-0.075 {0.0012-0.0029}	—	—	Replace oil pump

Engine Failure Diagnosis

Special tool

JP30ZAE030901014

Shape	Part No.	Name	Remark
	–	Personal computer (DOS-V)	• Operating system(OS):Windows95, Windows98 (IE5.0 or later), Windows2000 (SP3, IE5.0 or later), WindowsXP (SP1a, IE6.0 or later) WindowsVista*2, Windows7*2 • CPU and memory: Conditions that assure operation of the above operating system • Display: 800 x 600, 256 colors or more
	–	Hino Diagnostic eXplorer (Hino DX)	Failure diagnosis software (CD-ROM) **NOTICE:** **Install the software in the PC.** **For the installation method, refer to the instruction manual accompanying the CD.**
	09993-E9070*1	Hino-Bowie (Interface box)	**Computer interface** **NOTICE:** **It is necessary to update hardware.**
	—		• The cable between the personal computer and the Hino-Bowie is bundled to the Hino-Bowie. • Please use either RS-232C or USB.



SAPH30ZAE0500003

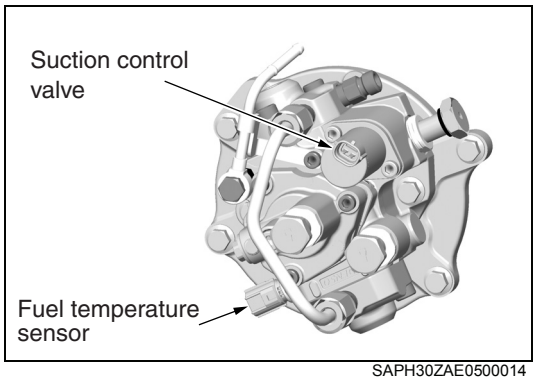
23081	Leakage pipe	Z4301	Gasket*
23811	Pressure feed pipe	Z4301A	Gasket*
Z2090A	Gasket*	A4301B	Gasket*
Z4300A	Gasket*	Z4301D	Gasket*

*Parts not to be reused.

Tightening torque

23811	44N· m{450kgf· cm}	

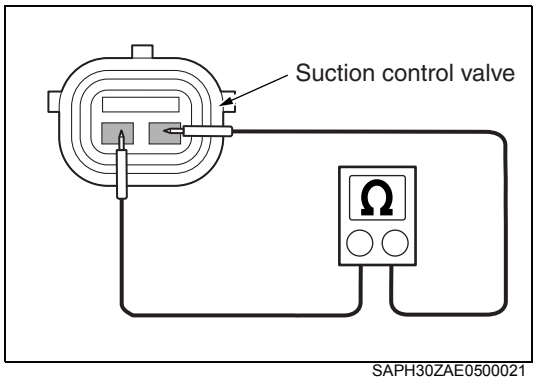
Inspecting the components



SAPH30ZAE0500014

1. Inspection of the suction control valve and fuel temperature sensor

(1) Inspect operation of the suction control valve and the fuel temperature sensor using Hino DX. If it is faulty, replace the supply pump.

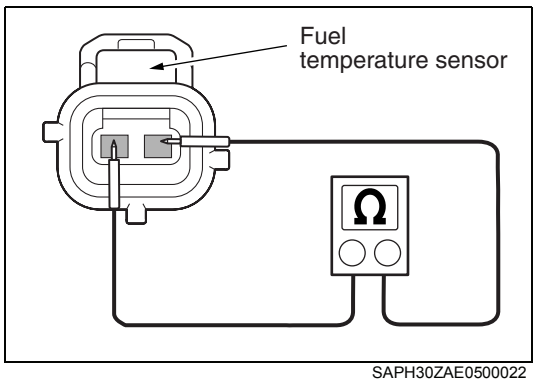


SAPH30ZAE0500021

2. Inspection of the suction control valve

(1) Measure the resistance between terminals with a circuit tester. If the value exceeds the standard value, replace the supply pump.

Standard value (at 20° C {68° F})	**7.65-8.15Ω**



SAPH30ZAE0500022

3. Inspection of the fuel temperature sensor resistance

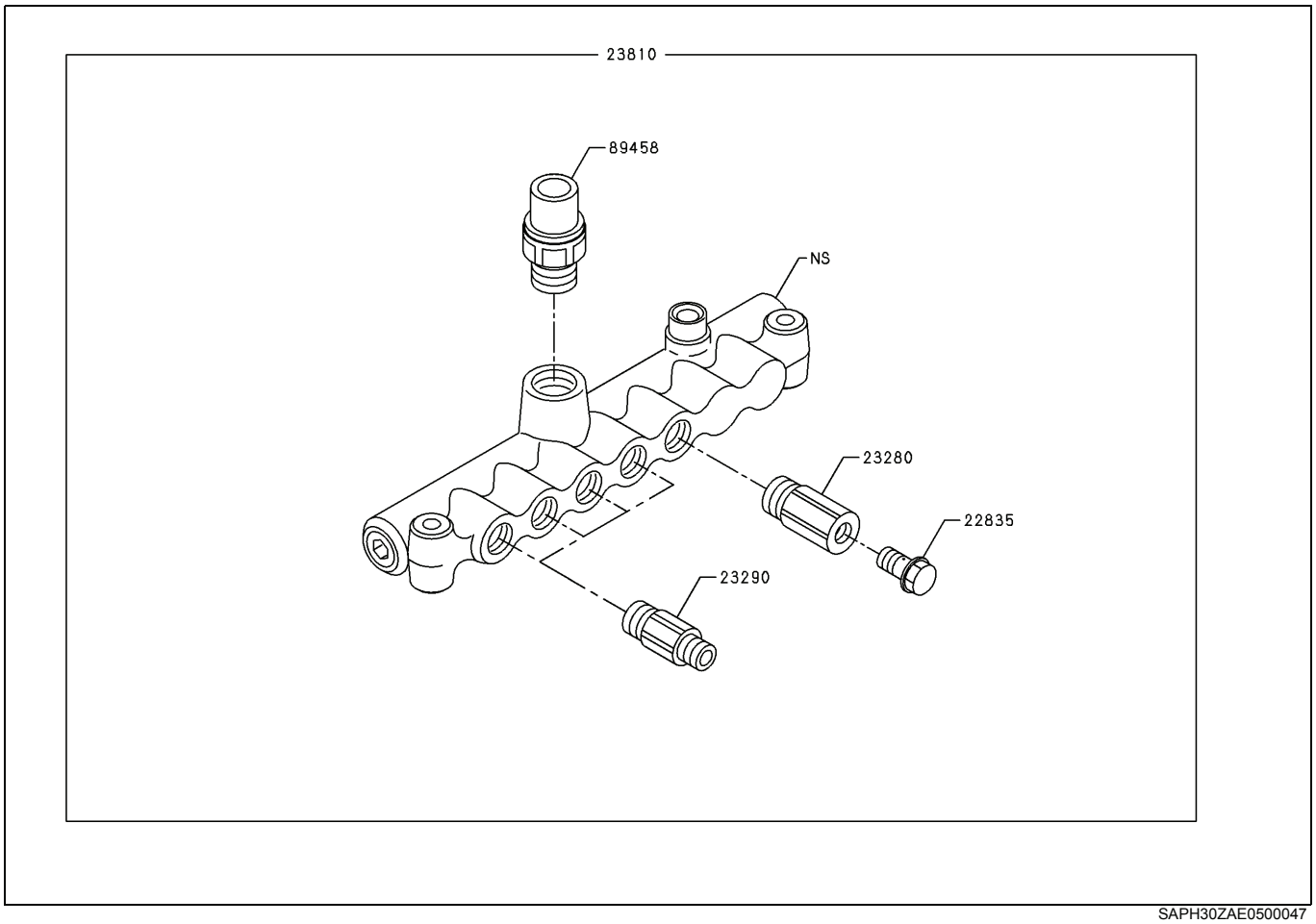
(1) Measure the resistance between terminals with a circuit tester. If the value exceeds the standard value, replace the supply pump.

Temperature (° C {° F})	Resistance (kΩ)
-20 {-4}	**13.84-16.33**
20 {68}	**2.32-2.59**
80 {176}	**0.310-0.326**
110 {230}	**0.1399-0.1435**

Common rail

Part layout

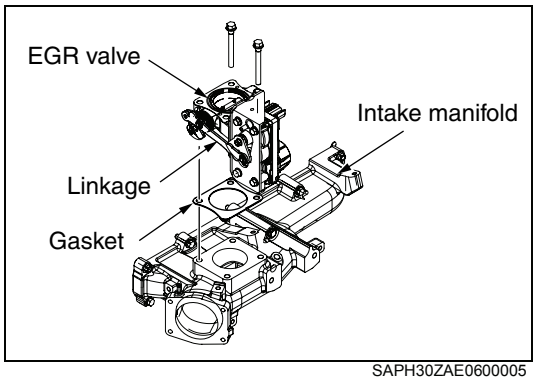
JP30ZAJ050704008



SAPH30ZAE0500047

23280	Pressure limiter	23810	Common rail
23290	Flow damper	89458	Common rail pressure sensor

Mounting the EGR valve & cooler



SAPH30ZAE0600005

1. Mounting The Egr Valve

(1) Replace with a new gasket and temporarily attach the EGR valve to the intake manifold.

(2) Connect the EGR valve to the connector.

2. Mounting the EGR cooler

(1) Replace with a new gasket and mount the EGR cooler to the exhaust manifold with 3 bolts.
Tightening torque:
69 N· m {700 kgf· cm, 50 lbf· ft}

⚠ **CAUTION** • **Do not hold the pipe and shell while working to avoid defects such as dent and water leakage.**

(2) Mount the bracket to the EGR cooler with 2 bolts.
Tightening torque:
28.5 N· m {290 kgf· cm, 21 lbf· ft}

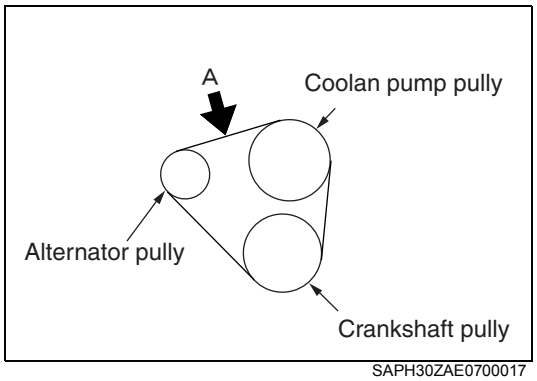
Installation of the alternator

JP31199070702004

1. Installation of the alternator

(1) Fasten the alternator provisionally with the through bolt and nut.

(2) Fasten the adjusting bolt and fixing bolt provisionally.



SAPH30ZAE0700017

2. Adjusting of the V-belt deflection

Measuring item	New V-belt	When inspection
Deflection (mm {in.})	3-5 {0.1}	4-6 {0.2}

Special tool : S0944-41210 (09444-1210) Compression gauge (used at the time of measuring the deflection amount)
[Reference push force 98N {10kgf, 22lbf}]
MITSUBOSHI BELTING LTD.; Belt Tension Meter (DOCTOR TENSION® TYPE-III) (used at the time of measuring the tension force)

⚠ **CAUTION**

- **When the V-belt has been replaced by a new one, the V-belt will become loose because of initial run-in, so that the V-belt tension should be adjusted again after running the engine for 3 to 5 minutes.**

NOTICE

- **At the time of inspection, the new V-belt has reached the value after complete initial stretching. A new V-belt completes initial stretching after running the engine for approximately two hours.**

(1) Tighten the through bolt.
Tightening torque: 83 N· m {846 kgf· cm, 61 lbf· ft}

(2) Tighten the mounting bolt and nut on the brace side.
Tightening torque: 51 N· m {520 kgf· cm, 38 lbf· ft}

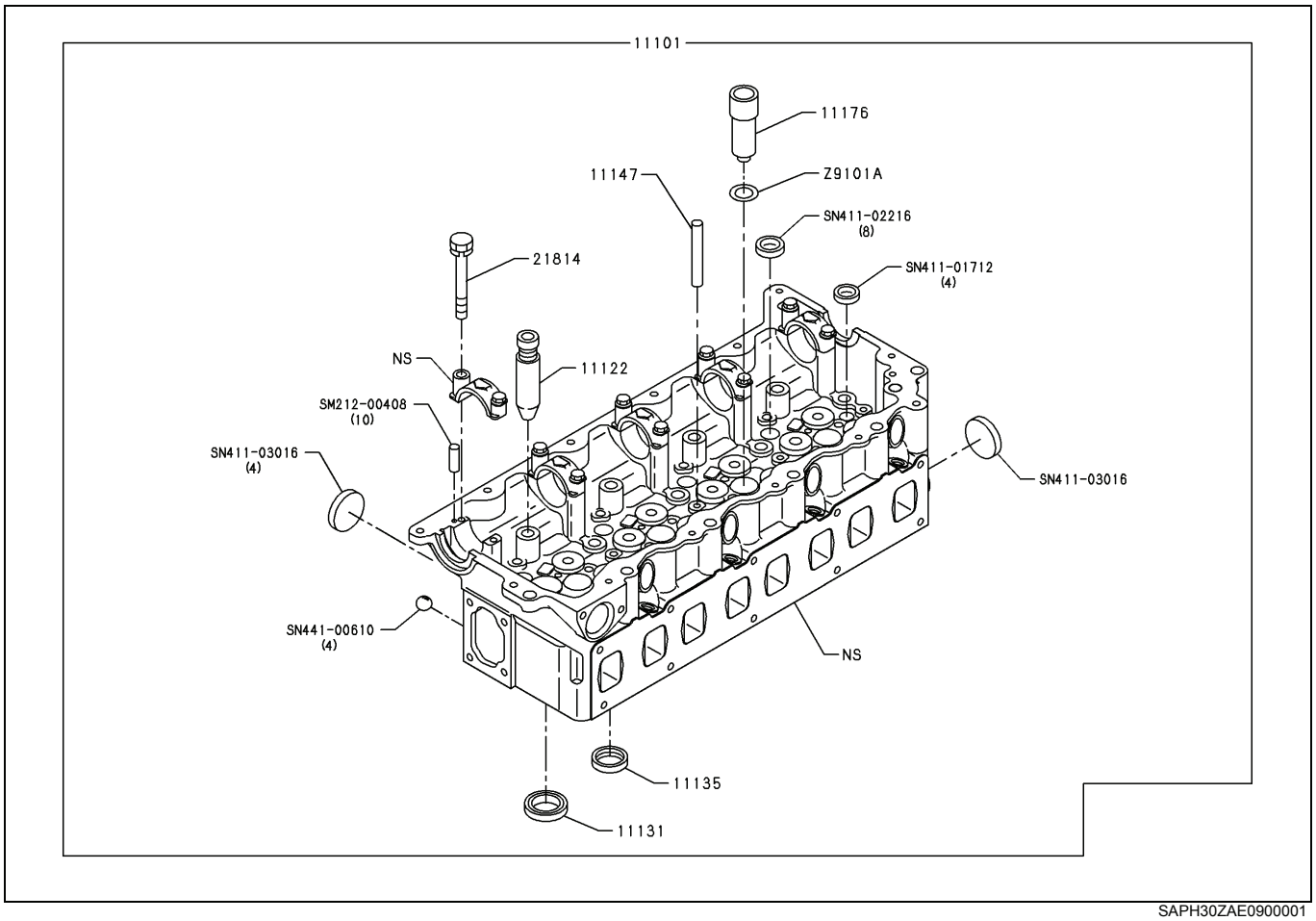
(3) Tighten the adjusting bolt and make sure it is locked in place.
Tightening torque: 5.9 N· m {60 kgf· cm, 4.3 lbf· ft}

(4) Connect the ground terminal for alternator firmly.
Tightening torque: 4 N· m {40 kgf· cm, 3 lbf· ft}

Cylinder head

Part layout

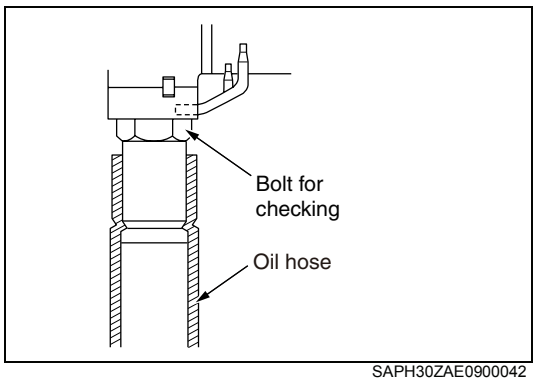
JP31ZAJ090402001



SAPH30ZAE0900001

11101	Cylinder head assembly	11135	Exhaust valve seat
11122	Valve guide	11176	Nozzle seat
11131	Intake valve seat	Z9101A	O-ring*

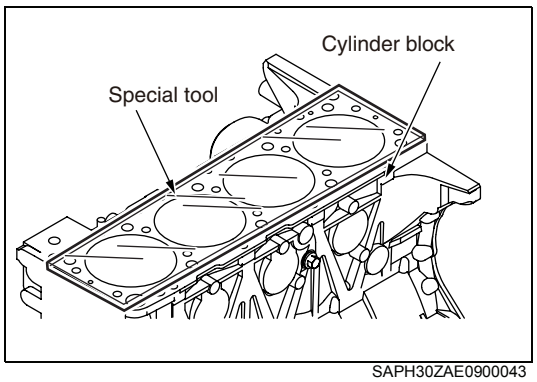
*Parts not to be reused.



SAPH30ZAE0900042

(2) Connecting the oil hose for injection test to the special tool from under the cylinder block.

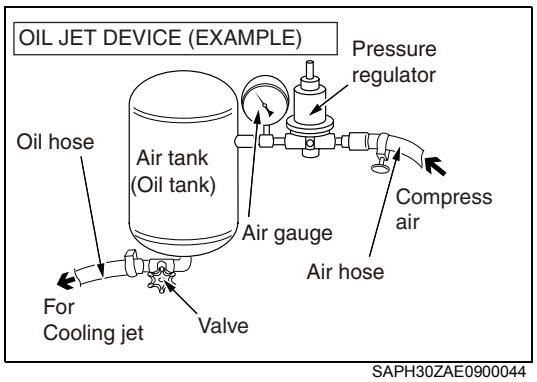
⚠ **CAUTION** • **Using new engine oil for injection.**



SAPH30ZAE0900043

(3) Setting the special tool to the upper surface of cylinder block.

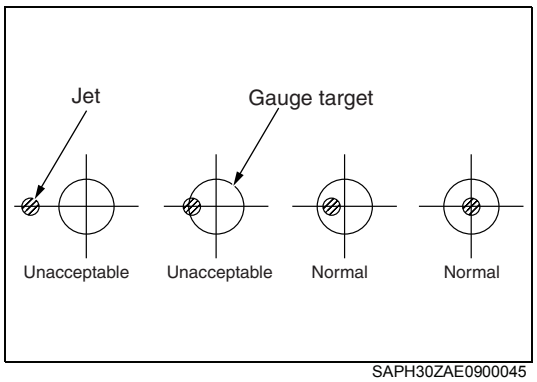
Special tool : 09219-E4030 Gauge



SAPH30ZAE0900044

(4) Inject oil from the cooling jet nozzle at 196 kPa {2 kgf/cm^2, 28 lbf/in^2}.

NOTICE • **See the figure for the oil injection device.**



SAPH30ZAE0900045

(5) When the injection center hits within the specified line of the gauge, it is considered normal.

⚠ **CAUTION** • **Oil may splash and catch fire, causing fire. Keep from flame.**
• **Working in a well-ventilated area.**

(6) Make sure that the jet position check gauge hole at the tool assembly end may not interfere with the cooling jet pipe.

(7) If the injection does not hit the target circle, replace with a new cooling jet.

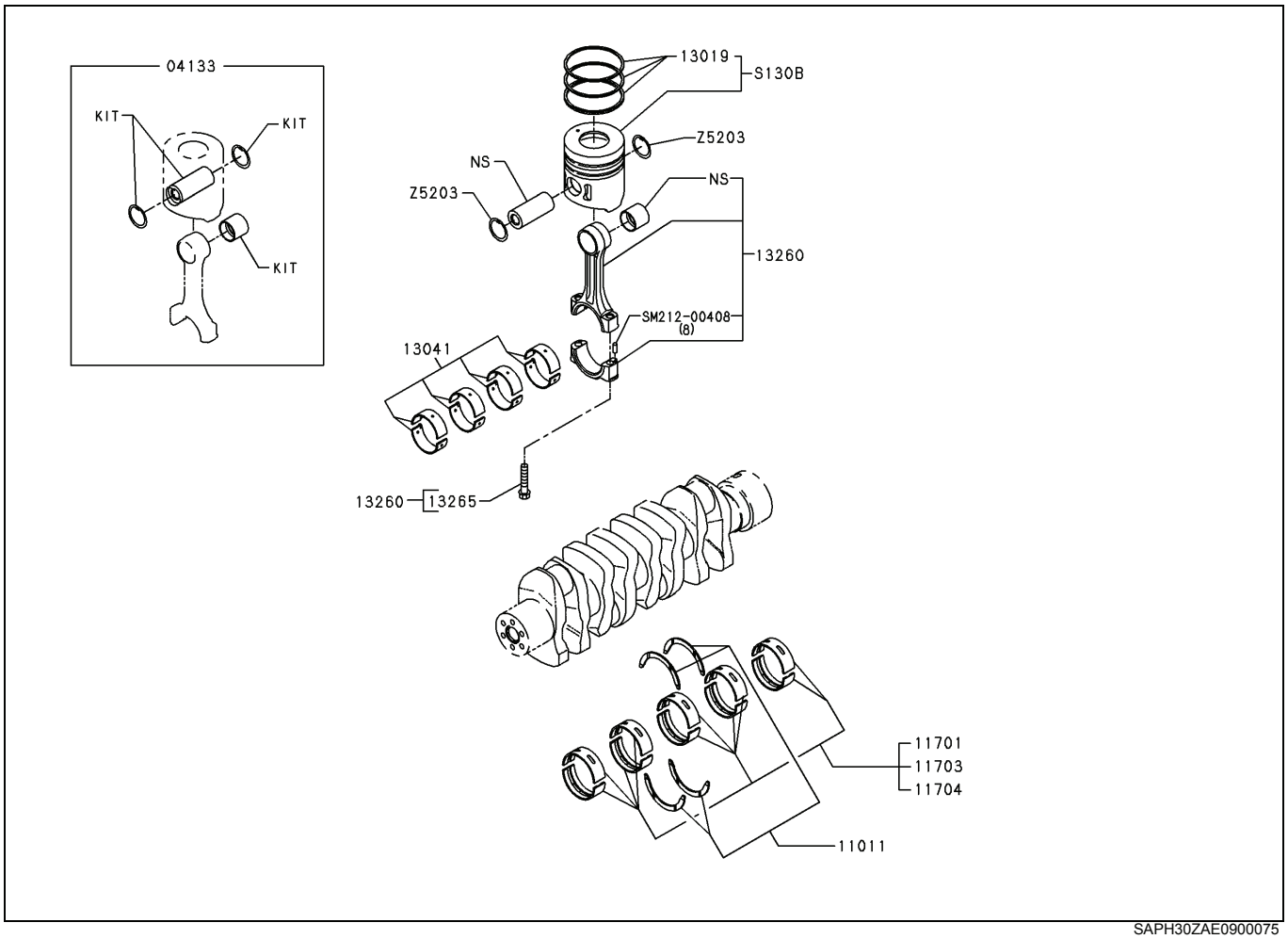
(8) Unfastening the special tool (bolt for checking) and use a proper union bolt to secure the cooling jet on the cylinder block.

Tightening torque: 22 N· m {220 kgf· cm, 16 lbf· ft}

Main moving parts

Part layout

JP31ZAJ090402004



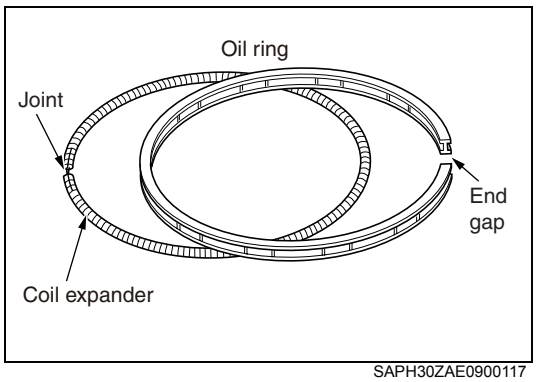
SAPH30ZAE0900075

04133	Piston pin kit	13041	Connecting rod bearing
11011	Thrust bearing	13260	Connecting rod assembly
11701	Main bearing	S130B	Piston, piston ring set
11703	Main bearing US 0.25	Z5203	Retainer ring*
11704	Main bearing US 0.50		

*Parts not to be reused.

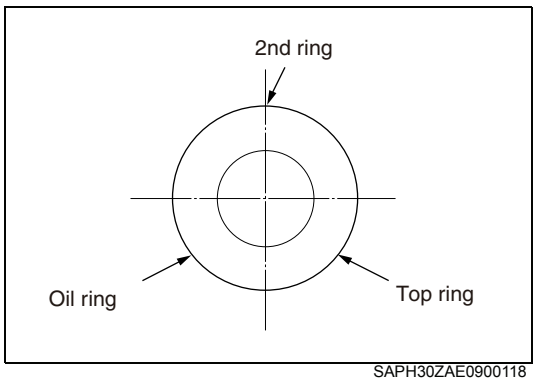
Tightening torque

13265	69N· m{700kgf· cm, 51 lbf· ft}+90° +45°	



SAPH30ZAE0900117

(2) Connecting the joint of the coil expander and then set it inside the oil ring. Stagger the coil expander joint and ring closed gap 180° apart.



SAPH30ZAE0900118

(3) Positioning the piston rings with the ring ends positioned at an equal interval away from one another as shown in the figure.

Mounting the piston and connecting rod

1. Mounting the piston and connecting rod

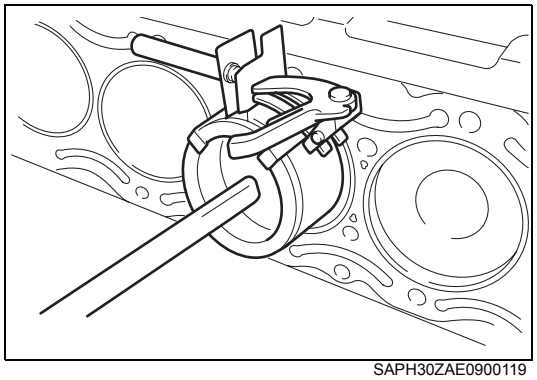
(1) The crankshaft of the cylinder to which the piston & connecting rod are inserted must be at the top dead center.

⚠ **CAUTION** • **If the crankshaft is not at the top dead center, the connecting rod touches the cooling jet.**

(2) Applying engine oil to the piston periphery, cylinder liner inner surface and connecting rod bearing. Add engine oil into the connecting rod oil hole.

(3) Using the special tool to compress the piston ring and set it to the cylinder liner.

Special tool : S0944-11370 (09441-1370)
Piston ring holder

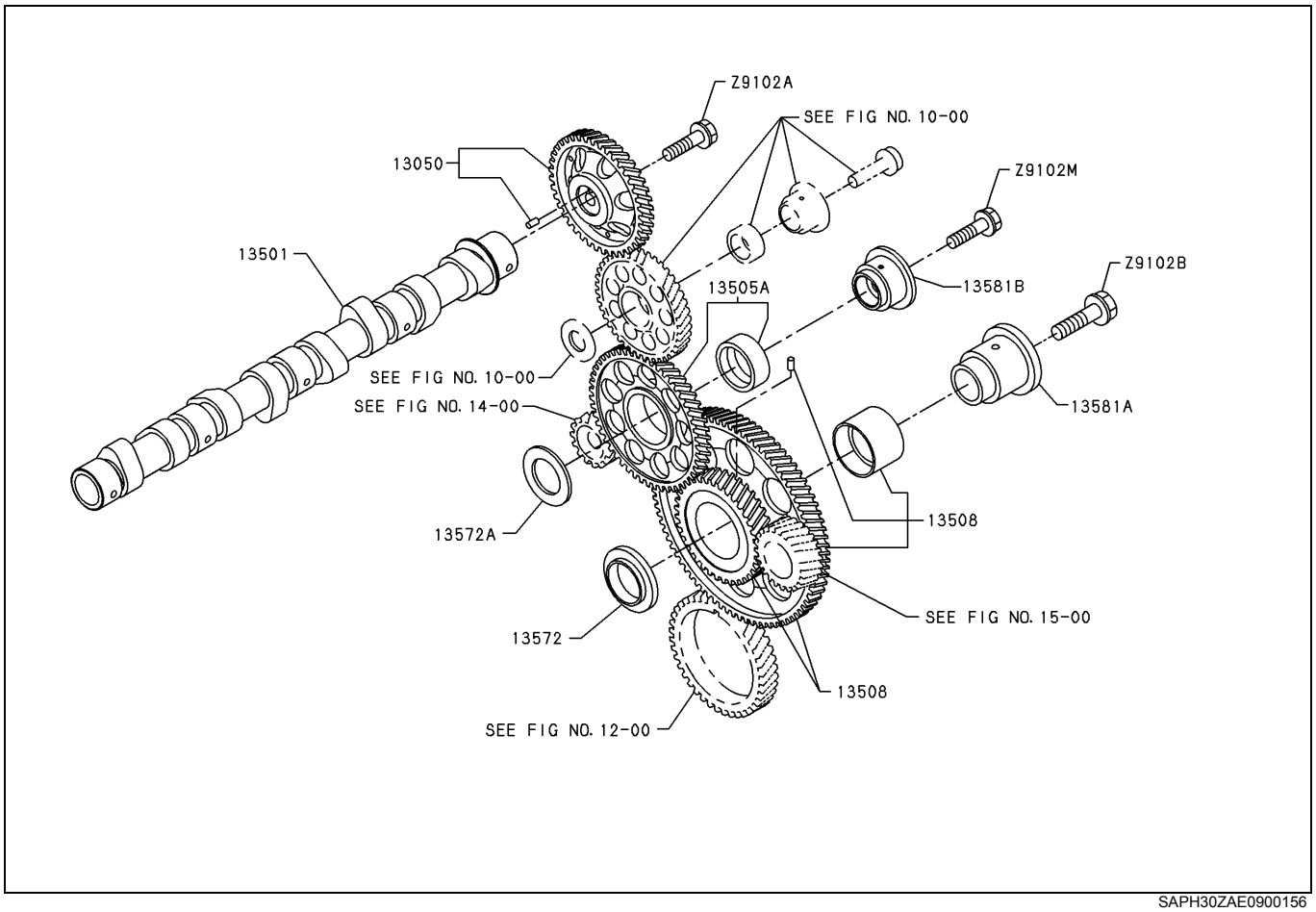

SAPH30ZAE0900119

⚠ **CAUTION** • **Assembling the pistons and connecting rods in the order of cylinder numbers as identified before removal.**
• **Checking the special tool for deformation or scratches.**

Camshaft and ildle gear

Part layout

JP31ZAJ090402005

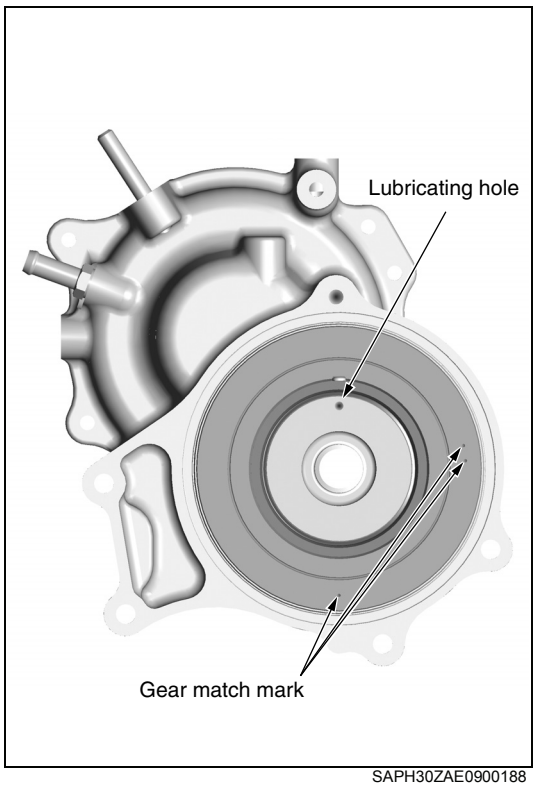


SAPH30ZAE0900156

13050	Camshaft gear	13572	Idle gear thrust plate
13501	Camshaft assembly	13572A	Idle gear thrust plate
13505A	Sub idle gear	13581A	Idle gear shaft
13508	Main idle gear	13581B	Idle gear shaft

Tightening torque

Z9102A	59N· m{600kgf· cm, 44 lbf· ft}+90°	Z9102M	108N· m{1,100kgf· cm, 80 lbf· ft}
Z9102B	172N· m{1,750kgf· cm, 126 lbf· ft}		



SAPH30ZAE0900188

3. Mounting the bearing case assembly

(1) Mount the idle gear thrust plate.
(2) Install the gear shaft on the sub-idle gear.
(3) Face the gear match mark and lubricating hole of the gear shaft and install it on the bearing case.
(4) Install the sub-idle gear shaft mounting bolt.
Tightening torque: 132 N· m {1,346 kgf· cm, 97 lbf· ft}
(5) Replace with the new O-ring and set the gear as shown in the figure and install the bearing case assembly to the flywheel housing concaves.
Tightening torque: 28.5 N· m {290 kgf· cm, 21 lbf· ft}

⚠ **CAUTION** • **Be careful not to drop the O-ring.**

Adjusting the valve clearance

JP31ZAJ090706001

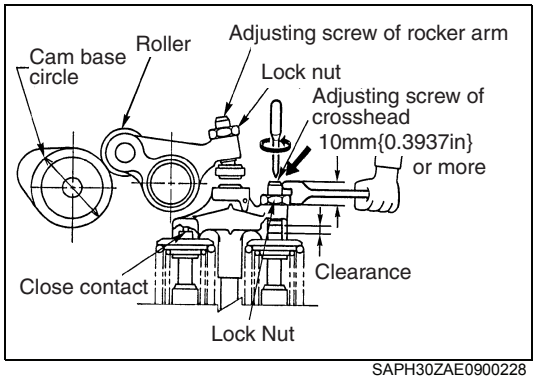
1. Cautions before adjustment

⚠ CAUTION

- **Before adjustment, make sure that the tightening bolts of the rocker arm support, nozzle clamp, cylinder head, and camshaft bearing cap are tightened with the specified torque.**
- **Making sure that there is no dirt in the crosshead and valve stem head.**

2. Valve clearance adjustment

(1) Turning the crankshaft forward to align the cylinder for adjustment with the compression stroke top dead center.



SAPH30ZAE0900228

⚠ CAUTION

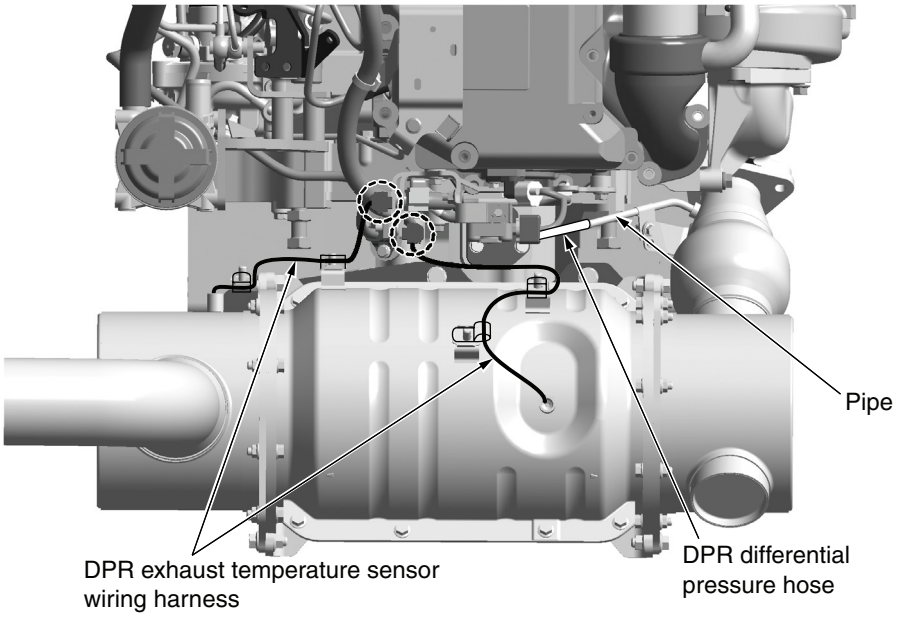
- **Checking that the rocker arm to be adjusted is not lifted to the cam of the camshaft.**

NOTICE

- **If the No.1 cylinder is at the compression stroke top dead center, you can adjust the valve clearance with a mark on the table. If the No.4 cylinder is at the compression stroke top dead center, the cylinder with mark can be adjusted.**

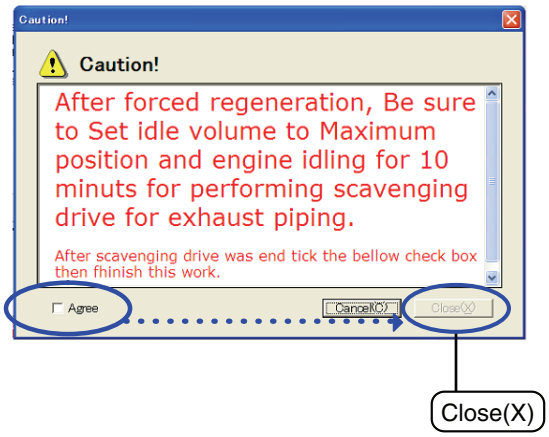
Cylinder No.	1		2		3		4	
Valve arrangement	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust	Intake	Exhaust
No.1 cylinder at the compression stroke top dead center	○	○	○			○		
No.4 cylinder at the compression stroke top dead center				○	○		○	○

(9) Install the DPR back pressure hose to the pipe.
(10) Connect the connector of the DPR exhaust gas temperature sensor in the shown orientation. (The opposite orientation is not possible.)



SAPH30ZAE1000010

(9) When the manual regeneration is completed, the "Caution window" will appear.



SAPH30ZAE1000032

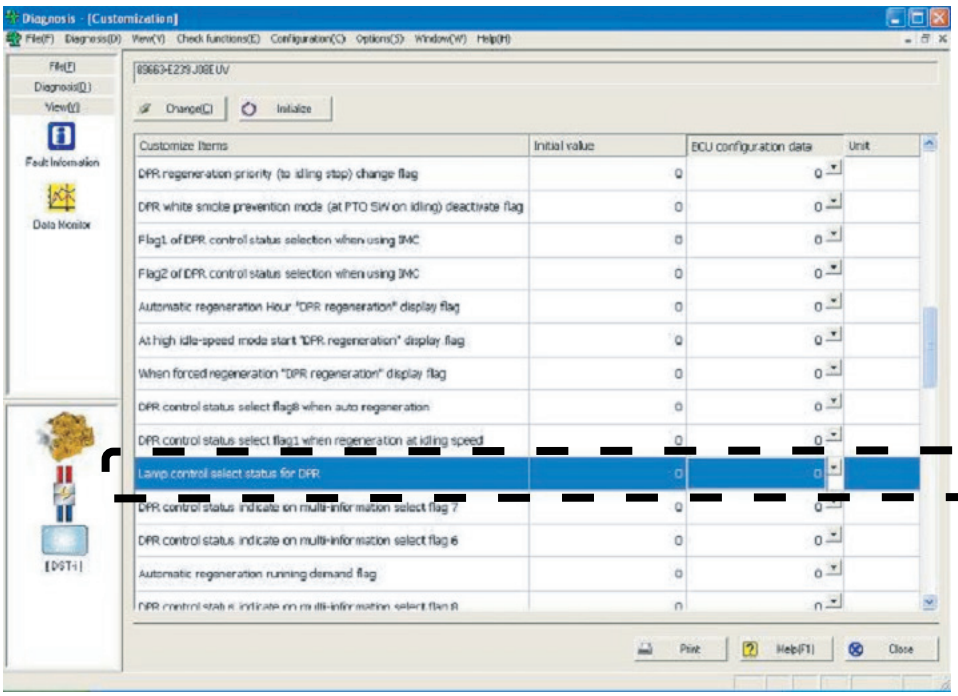
a. Perform the "Scavenging operation" according to the directions on screen.

⚠ **CAUTION**

- **About the scavenging operation**
  During DPR regeneration, the air returned to the intake side through the EGR contains fuel. If the engine stops immediately after regeneration, this means that this fuel is solidified and it may effect the engine's operations.
  For scavenging the air that contains fuel, always perform the scavenging operation for 10 minutes.

b. When the scavenging operation is completed, click "Agree". Then click "Close" under the caution contents, and the manual forced regeneration window will be closed.

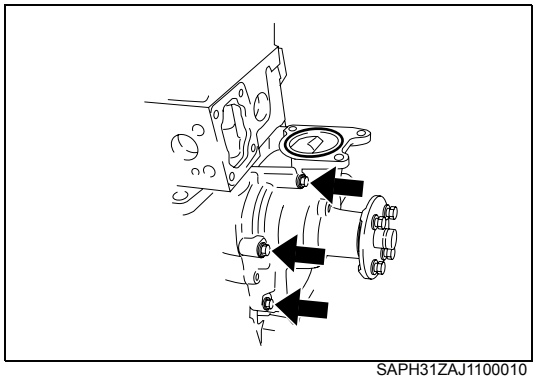
(10) After the regeneration is finished reset the "Lamp control select status for DPR" (1-->0).
To reset it, select it and then click on the [change] button on the upper left.



SAPH30ZAE1000039

Replacement of coolant pump

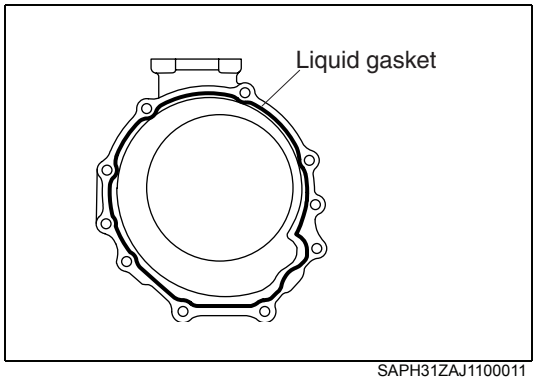
JP31ZAJ110704002



SAPH31ZAJ1100010

1. Removal of coolant pump

(1) Remove the bolts and remove the coolant pump.



SAPH31ZAJ1100011

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.

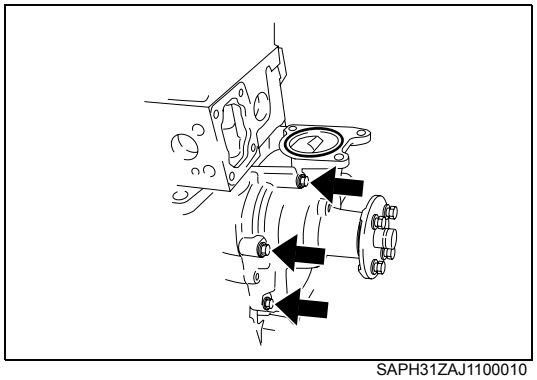
⚠ CAUTION

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

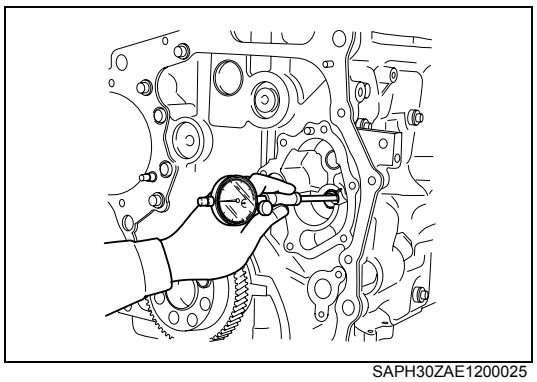
(3) Install the coolant pump to the dowel pin of the cylinder block.

NOTICE

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



SAPH31ZAJ1100010

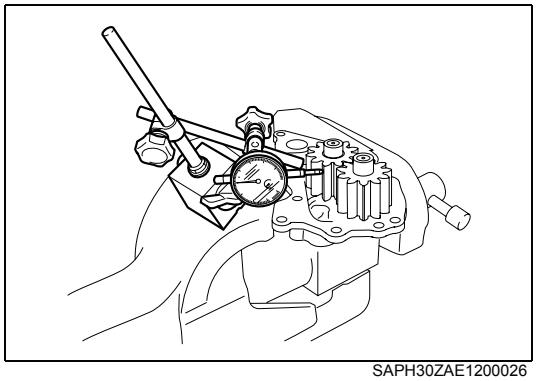

SAPH30ZAE1200025

(2) Using the cylinder gauge, measure the cylinder block side hole diameter.

Measured item	Standard value (mm {in.})
Cylinder block hole diameter	18.0 {0.709}

(3) Calculate the difference between the outer diameter of the driven gear shaft and the cylinder block side hole diameter. If the value exceeds the standard value, replace the oil pump.

Standard value (mm {in.})	0.030-0.075 {0.0012-0.0030}

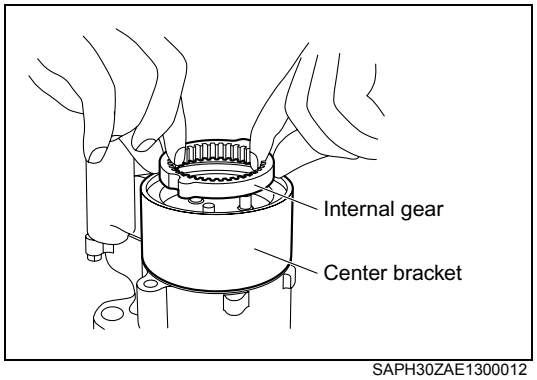

SAPH30ZAE1200026

6. Inspecting the backlash of the drive gear

(1) Using the vise, secure the oil pump.

(2) Using the dial gauge, measure the backlash between the drive gear and driven gear. If exceeding the operation limit, replace the oil pump.

Standard value (mm {in.})	Operation limit (mm {in.})
0.073-0.207 {0.0029-0.0081}	0.30 {0.012}

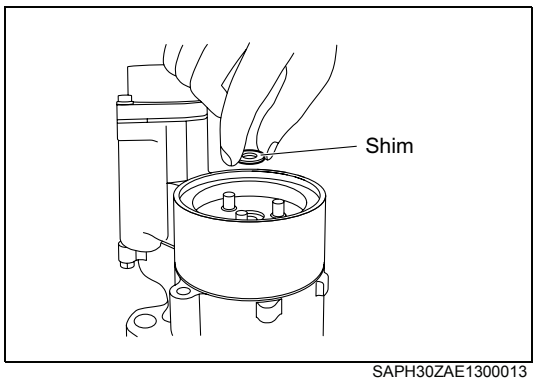


SAPH30ZAE1300012

10. Removal of internal gear

(1) Remove the internal gear from the center bracket.

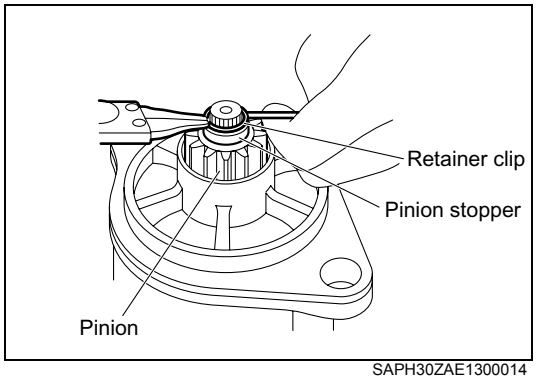
⚠ **CAUTION** • **Make sure that the gear is not damaged or chipped.**



SAPH30ZAE1300013

11. Removal of shim washer

(1) Remove the shim washer from the center bracket.



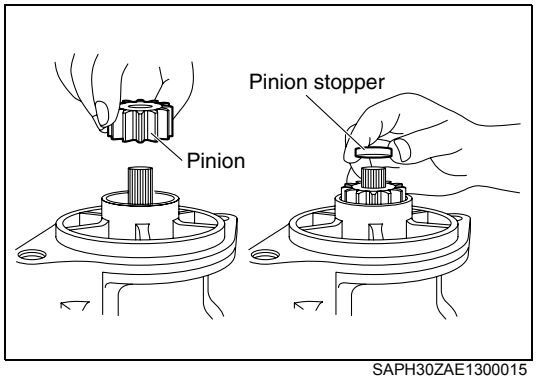
SAPH30ZAE1300014

12. Removal of pinion

(1) Remove the retainer clip using a tool such as snap ring pliers.

⚠ **CAUTION** • **Retainer clip must not be reused. Replace it with a new one.**

NOTICE • **Push upward or pull out the chipped part of the clip mouth.**



SAPH30ZAE1300015

(2) Remove the pinion stopper.

(3) Remove the pinion.

⚠ **CAUTION** • **Make sure that the gear is not damaged or chipped.**

Table of lubricant

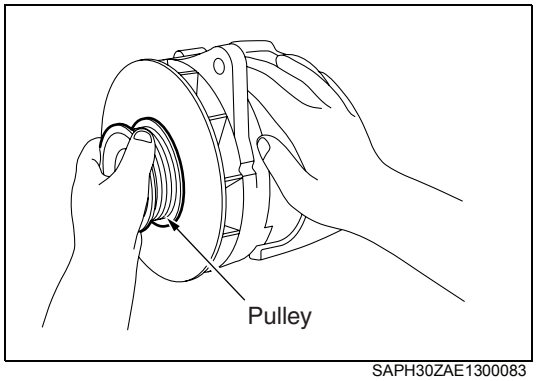
Code	Lubricating point	Lubricant used	Amount (g{oz})	Remark	Lubricant manufacturer
1	Pinion case metal and grease reservoir	Multemp AC-N	0.8 - 1.5 {0.03 - 0.05}		Kyodo Yushi
2	Bracket center metal and grease reservoir	Multemp AC-N	0.8 - 1.5 {0.03 - 0.05}		Kyodo Yushi
3	Shim washer	Multemp AC-N	0.2 - 0.5 {0.01 - 0.02}	Applied to both sides of washer.	Kyodo Yushi
4	Armature front metal	Multemp AC-N	0.5 - 1 {0.02 - 0.04}		Kyodo Yushi
5	Shim washer	Multemp AC-N	0.2 - 0.5 {0.01 - 0.02}	Applied to both sides of washer.	Kyodo Yushi
6	Internal gear Armature gear Planetary gear	Multemp AC-N	7 -11 {0.25 - 0.39}		Kyodo Yushi
7	Pinion straight Spline	Multemp AC-N	0.5 - 1 {0.02 - 0.04}		Kyodo Yushi
8	Inner sleeve metal	Multemp AC-N	0.3 - 0.6 {0.01 - 0.02}		Kyodo Yushi
9	Helical spline	Multemp AC-N	0.5 - 1 {0.02 - 0.04}		Kyodo Yushi
10	Clutch case lever shifter	Pyroknock No.2	1 - 2 {0.04 - 0.07}		Nippon Oil Corporation
11	Bracket rear bearing housing	Pyroknock No.2	0.2 - 0.5 {0.01 - 0.02}		Nippon Oil Corporation
12	Planetary gear metal	Multemp AC-N	1 - 2 {0.04 - 0.07}		Kyodo Yushi
13	Lever holder	Multemp AC-N	0.4 - 0.8 {0.01 - 0.03}		Kyodo Yushi
14	Lever roller rod	Pyroknock No.2	0.2 - 0.5 {0.01 - 0.02}	Assemble the roller after application of grease to prevent fall of the roller in assembly.	Nippon Oil Corporation

Inspection after assembly (60A)

JP30ZCE130703003

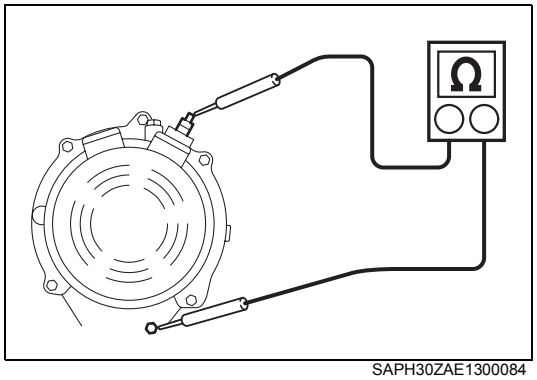
1. Inspection of rotation

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



SAPH30ZAE1300083

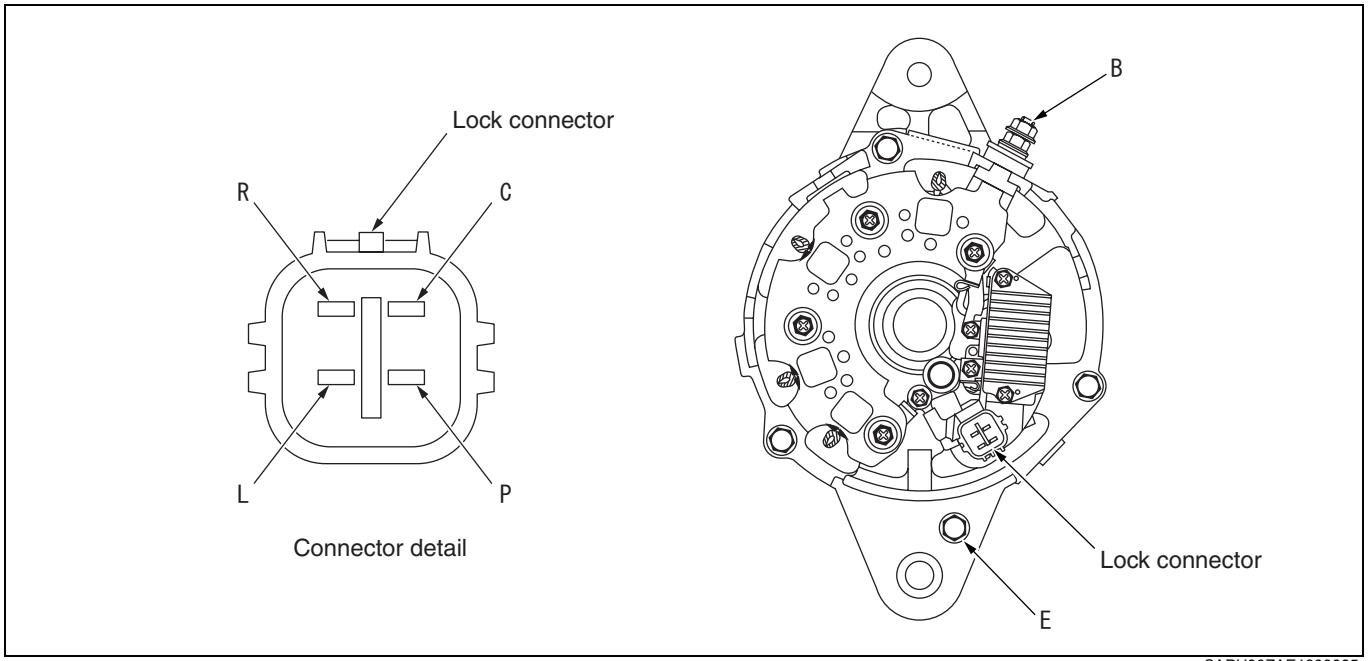
(1) Turn the pulley with hand to check if there is no interference with internal parts and if rotation is smooth.



SAPH30ZAE1300084

(2) Measure the resistance between B - E terminals and between P - E terminals using a circuit tester, if it is exceeds the standard value (e.g. 0Ω), disassemble it again and reassemble the unit correctly.

Circuit tester lead		Standard value
(+)	(-)	
B	E	Approx. 20 Ω
E	B	Infinite
P	E	Approx.7 Ω
E	P	Infinite



SAPH30ZAE1300085

Starter

JP30002150601003

Status	Cause	Action
Starter does not turn. Turning is low.	Faulty connection of starter key	Repair connecting area
	Flat battery	Charge or replace
	Disconnection, loosening or corrosion of battery terminal	After cleaning, tighten
	Grounding wire is disconnected	Be sure to connect it
	Use of incorrect engine oil	Replace with correct oil
	Faulty contact of start magnet switch assembly	Replace start magnet switch assembly
	Faulty contact or failure of starter relay	Replace starter relay
	Wear of starter brush	Replace brush
	Seizure of commutator	Repair commutator
	Wear of commutator	Undercut
	Shorting of armature	Replace armature assembly
	Insufficient tension of brush spring	Replace brush spring
	Faulty operation of clutch	Clean or replace

SAE CODE	TCCS 2-DIGT CODE	TROUBLE (Estimated failure cause)
P1215	68	Fuel injector driver circuit 2 - circuit (Circuit high)
P1427	28	Differential pressure sensor - out of range (Out of range low)
P1428	28	Differential pressure sensor - out of range (Out of range high)
P1458	81	Valve position control failure - DC motor out of range, functional
P1459	81	EGR actuator malfunction 2
P1601	2	Fuel injector adjustment data error
P200C	91	DPF over temperature
P2032	27	Exhaust gas temperature sensor (DPR outlet) - out of range (Out of range low)
P2033	27	Exhaust gas temperature sensor (DPR outlet) - out of range (Out of range high)
P2100	31	DC motor for intake throttle valve - circuit [Open circuit (circuit low)]
P2101	31	Intake throttle valve - functional
P2103	31	DC motor for intake throttle valve - circuit [Short circuit (circuit high)]
P2120	22	Accelerator pedal position sensor 1 - out of range (Out of range high)
P2123	22	Throttle/Pedal Position Sensor / Switch "D" Circuit
P2128	22	Accelerator pedal position sensor 2 - out of range (Out of range high)
P2228	15	Barometric pressure sensor - out of range (out of range low)
P2229	15	Barometric pressure sensor - out of range (out of range high)
P244A	91	Filtering performance (missing substrate)
P244B	92	Incomplete regeneration
P2458	93	DPR regeneration duration
P2463	92	DPF clogged
P24A2	93	DPR regeneration incomplete by fuel consumption over
P2635	76	Fuel Pump "A" Low Flow/Performance
U0073	8	Engine ECU CAN communication bus for Emission control system - bus off
U1001	9	Engine ECU CAN communication bus for vehicle control bus off
U110A	9	Engine ECU CAN communication (Vehicle control ECU)
U1122	8	Engine ECU CAN communication (EGR valve controller)
U1123	8	Engine ECU CAN communication (VNT controller)
P2121	22	Accelerator pedal position sensor 1 malfunction (Abnormal voltage)
P2122	22	Accelerator pedal position sensor 1 malfunction (Low)

DTC code P0016 [13]

/Crankshaft position sensor and Camshaft position sensor - rationality

JP31ZEE170601004

1	CHECK THAT THE CAM GEAR IS PROPERLY ASSEMBLED

NO → Assemble the cam gear normally

YES

2	CHECK THAT THE FLYWHEEL IS ASSEMBLED

NO → Assemble the flywheel normally

YES

3	CHECK THAT CRANKSHAFT POSITION SENSOR AND CAMSHAFT POSITION SENSOR ARE INSTALLED IN PROPER LOCATIONS RESPECTIVELY

NO → Install the crankshaft position sensor and camshaft position sensor in proper locations respectively

YES

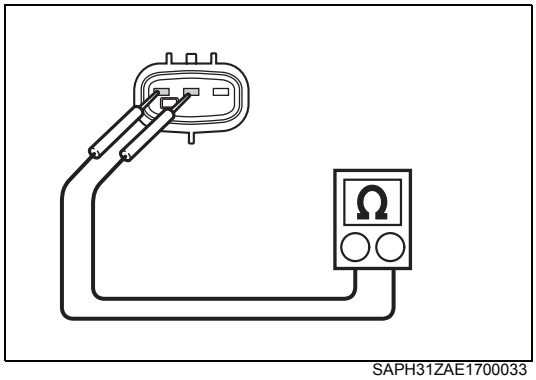
Delete the DTC and reload

DTC code P0108 [25]

/Boost pressure sensor - out of range (Out of range high)

JP31ZEE170601009

1	MEASURING RESISTANCE BETWEEN SENSOR TERMINALS



SAPH31ZAE1700033

1. Set the starter switch "LOCK" position.
2. Disconnect the connector of boost pressure sensor.
3. Measure the resistance between VCC and SIG terminal of the boost pressure sensor connector.

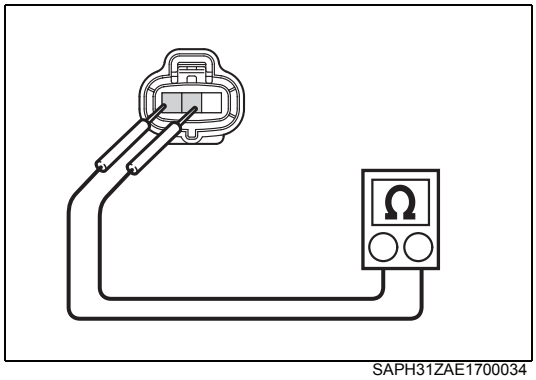
NOTICE • **If it is difficult to check only the sensor, proceed to Step 5.**

Standard value: 2-15 kΩ

NO → Fault in boost pressure sensor

YES

2	MEASURING RESISTANCE BETWEEN SENSOR TERMINALS



SAPH31ZAE1700034

1. Measure resistance between the terminals SIG and GND of the boost pressure sensor connector (engine sub harness side).

Standard value: 209-231 kΩ

NO →
- Fault in harness
- Irregular contact of connectors

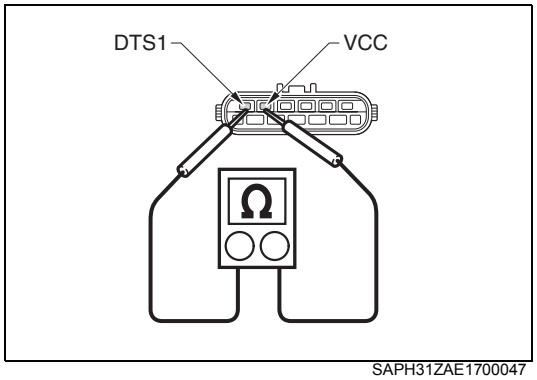
YES

DTC code P0123 [32]

/Intake throttle valve position sensor 1 - out of range (Out of range high)

JP31ZEE170601013

1	MEASURING RESISTANCE BETWEEN SENSOR TERMINALS



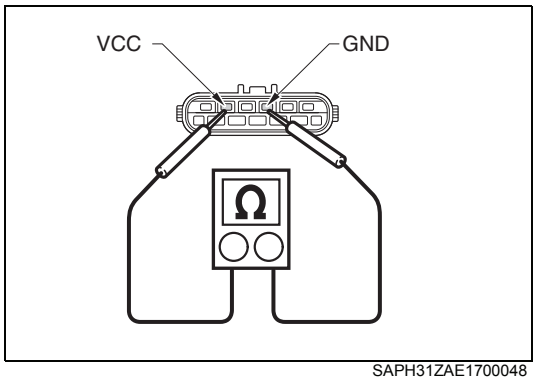
SAPH31ZAE1700047

1. Set the starter switch "LOCK" position.
2. Disconnect the connector of the intake throttle valve position sensor 1.
3. Measure resistance between the terminals VCC and DTS1 of the intake throttle valve position sensor 1 connector.

NOTICE

- **If it is difficult to check only the sensor, proceed to Step 5.**

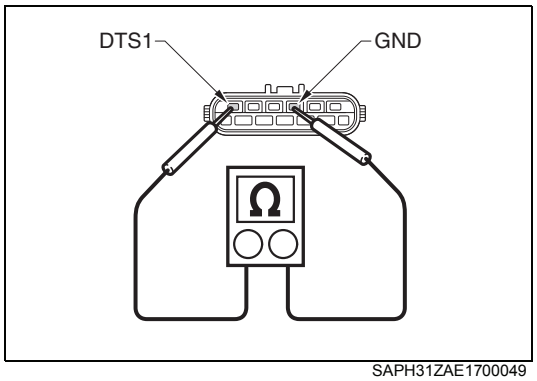
Standard value: Approx. 180 Ω



SAPH31ZAE1700048

4. Check continuity between the terminals VCC and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approx. 3 kΩ



SAPH31ZAE1700049

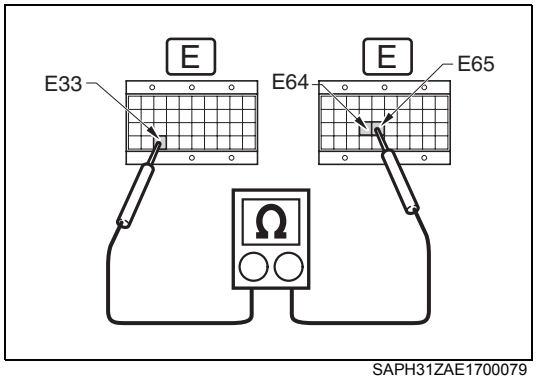
5. Check continuity between the terminals DTS1 and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approx. 3 kΩ

NO → Fault in intake throttle valve position sensor 1

YES

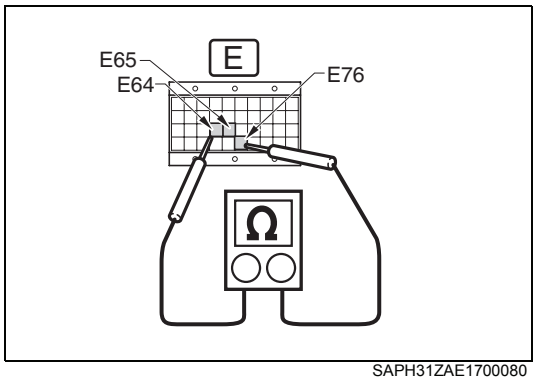
3	MEASURING RESISTANCE BETWEEN TERMINALS



SAPH31ZAE1700079

1. Connect the signal check harness on the engine side (blue).
2. Disconnect the connector on the engine ECU side.
3. Measure resistance between the terminals AVC2 (E33), PCR3 (E64) and PCR4 (E65).

Standard value: 2 Ω or more



SAPH31ZAE1700080

4. Measure resistance between the terminals AGD2 (E76), PCR3 (E64) and PCR4 (E65).

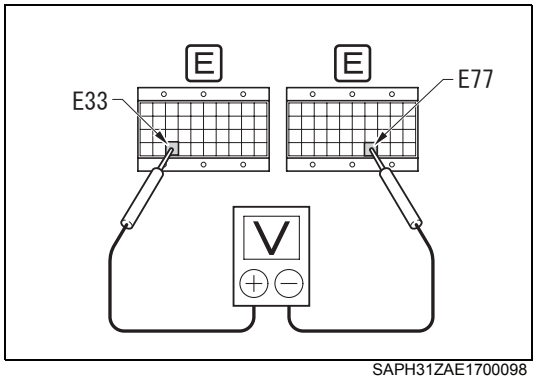
Standard value: 2 Ω or more

NO

- Improper connection of connector
- Fault in harness

YES

5	MEASURING VOLTAGE BETWEEN TERMINALS



SAPH31ZAE1700098

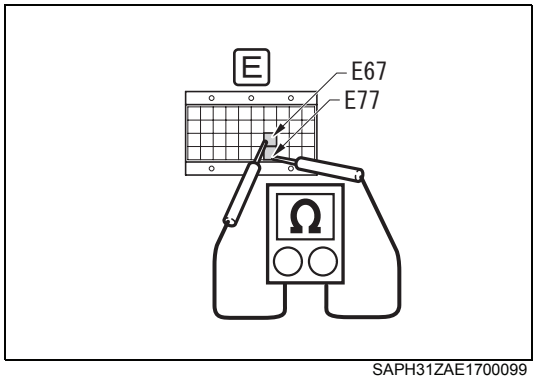
1. Connect the connectors on the engine ECU side.
2. Disconnect the connector on the harness side.
3. Set the starter switch to "ON" position.
4. Measure voltage between the terminals AVC2 (E33) and ADG4 (E77).

Standard value: 4.5-5.5 V

NO → Fault in engine ECU

YES

6	MEASURING RESISTANCE BETWEEN TERMINALS



SAPH31ZAE1700099

1. Measure resistance between the terminals PIM (E67) and AGD4 (E77).

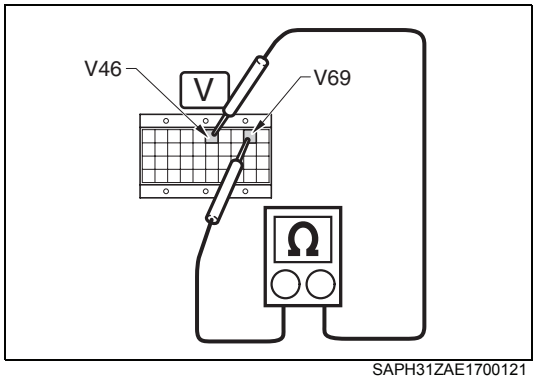
Standard value: 209-231 kΩ

NO → Fault in engine ECU

YES

Bad contact of harness connector

3	MEASURING RESISTANCE BETWEEN TERMINALS



SAPH31ZAE1700121

1. Set the starter switch to "LOCK" position.
2. Connect the signal check harness on the unit side.
3. Disconnect the connector on the engine ECU side.
4. Measure resistance between the terminals ET3+ (V69) and ADG9 (V46).

Standard value

Resistance	Temperature (°C{°F})
9.75 kΩ	**50 {122}**
3.77 kΩ	**100 {212}**
1.80 kΩ	**150 {302}**

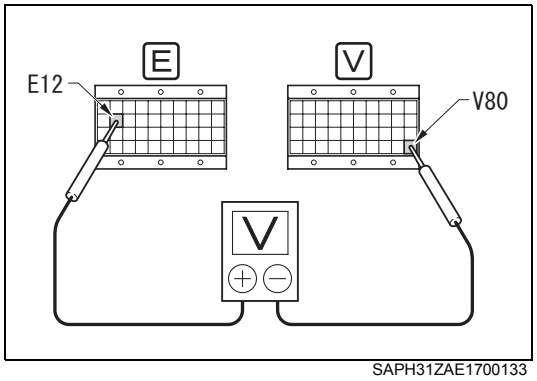
NO

- Faulty exhaust gas temperature sensor (DPR inlet)
- Faulty harness
- Faulty sensor connector

YES

Fault in engine ECU

3	MEASURE THE VOLTAGE BETWEEN TERMINALS



SAPH31ZAE1700133

1. Set the starter switch to "ON" position.
2. Measure the voltage between the terminals AFVB (E12) and PGD4 (V80).

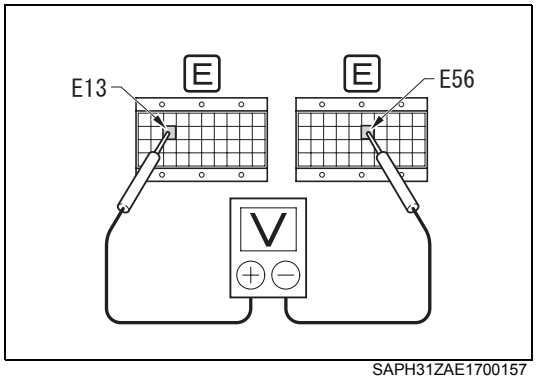
Standard value: 11.5-13.5 V

NO → Fault in engine ECU

YES

Faulty ECU connector
Faulty harness

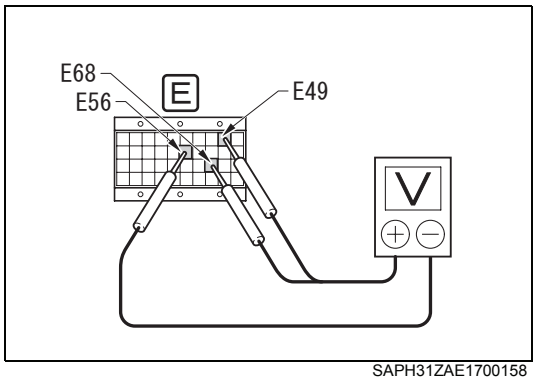
5	MEASURING VOLTAGE BETWEEN TERMINALS



SAPH31ZAE1700157

1. Set the starter switch to "ON" position.
2. Measure voltage between the terminals AVC1 (E13) and AGD1 (E56).

Standard value: 4.5-5.5 V



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3. Measure voltage between the terminals PCR2 (E68), PCR1 (E49) and AGD1 (E56).

Standard value: 4.5-5.5 V

NO → Fault in engine ECU (ECU connector)

YES

Replace the rail assembly and harness