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TO THE READER

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1. SAFETY FIRST

⚠ SAFETY FIRST

- **This "Safety Alert Symbol" is used in this manual and on labels on equipment to indicate important issues and warn of the danger of personal injury. Read and follow these warnings carefully.**
- **It is important that you thoroughly read these instructions and safety rules prior to working on the equipment and that you always follow them.**

⚠ DANGER
- **Indicates that failure to follow the warning will result in serious injury or death.**

⚠ WARNING
- **Indicates that failure to follow the warning may result in serious injury or death.**

⚠ CAUTION
- **Indicates that failure to follow the warning may result in injury.**

■ IMPORTANT
- **Indicates that failure to follow the warning may result in damage to or a breakdown of the equipment.**

■ NOTE
- **Indicates supplementary explanations that will be helpful when using the equipment.**

[NOTE]
- Indicates other supplementary information to take note of.

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4. MAIN SPECIFICATIONS

<table>
<tr><td colspan="3"></td><td colspan="4">KUBOTA EXCAVATOR</td></tr>
<tr><td colspan="3">Model name</td><td colspan="4">U35-4</td></tr>
<tr><td colspan="3" rowspan="2">Type</td><td rowspan="2">Canopy</td><td rowspan="2">CAB</td><td colspan="2">Angle Blade Type</td></tr>
<tr><td>Canopy</td><td>CAB</td></tr>
<tr><td colspan="3">Operating weight (including operator's)</td><td>3685 kg
8124 lbs</td><td>3835 kg
8455 lbs</td><td>3845 kg
8478 lbs</td><td>3990 kg
8800 lbs</td></tr>
<tr><td rowspan="5">Engine</td><td colspan="2">Type</td><td colspan="4">Water cooled 4 cycle diesel engine with 3 cylinder</td></tr>
<tr><td colspan="2">Model name</td><td colspan="4">D1703-M-DI-E4</td></tr>
<tr><td colspan="2">Total displacement</td><td colspan="4">1647 cc (100.5 cu.in)</td></tr>
<tr><td colspan="2">Engine power SAE gross</td><td colspan="4">18.5 kW (25 HP)</td></tr>
<tr><td colspan="2">Rated speed</td><td colspan="4">2200 rpm</td></tr>
<tr><td rowspan="6">Performance</td><td colspan="2">Low idle speed</td><td colspan="4">1300 to 1350 rpm</td></tr>
<tr><td colspan="2">Unit swing speed</td><td colspan="4">8.9 rpm</td></tr>
<tr><td rowspan="2">Travel speed</td><td>Fast</td><td colspan="4">4.6 km/h (2.9 mph)</td></tr>
<tr><td>Slow</td><td colspan="4">3.0 km/h (1.9 mph)</td></tr>
<tr><td colspan="2">Ground pressure
(With operator)</td><td>33.7 kPa
0.34 kgf/cm^2
4.8 psi</td><td>35.1 kPa
0.36 kgf/cm^2
5.0 psi</td><td>35.2 kPa
0.36 kgf/cm^2
5.1 psi</td><td>36.5 kPa
0.37 kgf/cm^2
5.3 psi</td></tr>
<tr><td colspan="2">Climbing angle</td><td colspan="4">58 % (30 deg)</td></tr>
<tr><td colspan="2">Angle in case of crossing slope</td><td colspan="4">27 % (15 deg)</td></tr>
<tr><td rowspan="3">Blade</td><td colspan="2">Width × Height</td><td colspan="4">1700 × 343 mm
66.9 × 13.5 in.</td></tr>
<tr><td rowspan="2">Max. swing angle</td><td>Left</td><td colspan="2">–</td><td colspan="2">25 deg</td></tr>
<tr><td>Right</td><td colspan="2">–</td><td colspan="2">25 deg</td></tr>
<tr><td colspan="2" rowspan="2">Boom swing angle</td><td>Left</td><td colspan="4">1.22 rad (70 deg)</td></tr>
<tr><td>Right</td><td colspan="4">0.87 rad (50 deg)</td></tr>
<tr><td rowspan="2">Pressure connection for attachments</td><td colspan="2">Max. displacement
(Theoretical)</td><td colspan="4">60.5 L/min (15.9 U.S.gals/min)</td></tr>
<tr><td colspan="2">Max. pressure</td><td colspan="4">17.2 MPa
175 kgf/cm^2
2494 psi</td></tr>
<tr><td colspan="3">Fuel tank capacity</td><td colspan="4">45.1 L (11.9 U.S.gals)</td></tr>
</table>

■ **NOTE**
- **Above dimensions are based on the machine with rubber trucks.**
- **Specifications subject to change without notice.**

∗ **With unloaded digging bucket. (Q/C BUCKET)**
∗ **Firm compacted soil.**
∗ **Operators must exercise extra caution and follow instructions in the operator's manual.**
∗ **Worse condition or heavier attachment to the above will decrease climbing angle.**

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7. MAINTENANCE

No.	Check points		Measures	Hour meter indicator																	Interval		
				50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1000			
1	Coolant		check	Daily check																			
			change																		every 2 years		
2	Fuel		check	Daily check																			
3	Engine oil		check	Daily check																			
			change										❍							❍	every 500 hrs		
4	Hydraulic oil		check	Daily check																			
			change																	❍	every 1000 hrs	*1	
5	Grease front attachments	Bucket and bucket link pin / Dozer angle pin and angle cylinder boss	–	Daily check																			
		Boom swing fulcrum	–	Daily check																			
		Others	–	Daily check																			
6	Radiator and oil cooler		check	Daily check																			
7	Washer liquid		change	Daily check																			
8	Engine and electrical wiring		check	Daily check																			
9	Fuel tank, Water separator		drain	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	every 50 hrs		
10	Battery condition		check	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	every 50 hrs		
11	Greasing swing bearing teeth		–	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	every 50 hrs		
12	V-belt tension		check	Daily check																			
			adjust				❍				❍				❍				❍	❍	every 200 hrs		
13	Radiator hoses and clamps		change				❍				❍				❍				❍	❍	every 200 hrs		
			replace																		every 2 years		
14	Air filter element	Outer element	clean				❍				❍				❍				❍	❍	every 200 hrs	*2	@
			replace																	❍	every 1000 hrs	*2	
		Inner element	replace																	❍	every 1000 hrs	*2	
15	Greasing swing ball bearing		–				❍				❍				❍				❍	❍	every 200 hrs		
16	Fuel filter cartridge		replace										❍							❍	every 500 hrs		@
17	Engine oil filter		replace										❍							❍	every 500 hrs		
18	Drive unit oil		charge	●									❍							❍	every 500 hrs		
19	Breather filter		replace										❍							❍	every 500 hrs		
20	Hydraulic return filter element		replace					●										❍			every 500 hrs		
21	Hydraulic suction filter element		replace																	❍	every 1000 hrs		
22	Filter in the pilot hydraulic system		replace																	❍	every 1000 hrs		
23	Fuel injection nozzle injection pressure		check																		every 1500 hrs	*4	@
24	Front idler and track roller oil		change																		every 2000 hrs		

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Composition Specification Code	Notes
BASE	ALL-USE
CAB	CAB (8+4)
ACA	Foreign-A/C
ACM	A/C-mode
CNP	Canopy
AI	AutoIdle
AT	Anti-Theft
N_AT	No.Anti-Theft
N_BI	No.Battery Isolator
AT&BI	Anti-Theft & Battery Isolator
AT&N_BI	Anti-Theft & No.Battery Isolator
ES	Engine Stop
BCN	Beacon
TRB	Travel Alarm
AUX1	Grip (R)
AT&AUX1	Anti-Theft & Grip (R)
AT&HS	Anti-Theft & Horn SW
NB	Normal Blade
AB	Angel Blade
BC	Blade Cap
COMMON	ALL-USE

W/H00:RC788-53420 W/H,MAIN,CAB,AC
RC788-53410 W/H,MAIN,CAB,ACAB
RC788-53320 W/H,MAIN,CNP
RC788-53310 W/H,MAIN,CNP,AB
RC788-53430 W/H,MAIN,CAB,ACAB,AT
RC788-53330 W/H,MAIN,CNP,AB,AT
W/H05:RD809-53333 W/H,FUELSENSOR
W/H06:RC788-53390 W/H,BLOWER,A/C
W/H12:RC788-53360 W/H,FRONT
W/H19:RD451-46902 W/H,MAIN,CAB
W/H20:RD451-46913 W/H,WIPERCODE
W/H23:RD451-53380 W/H,CANOPY,4P
W/H30:RC788-53220 CORD,BATTERY(+)
W/H33:RC788-53230 CORD,BATTERY(-)
W/H34:RC411-53241 CORD,BODY EARTH

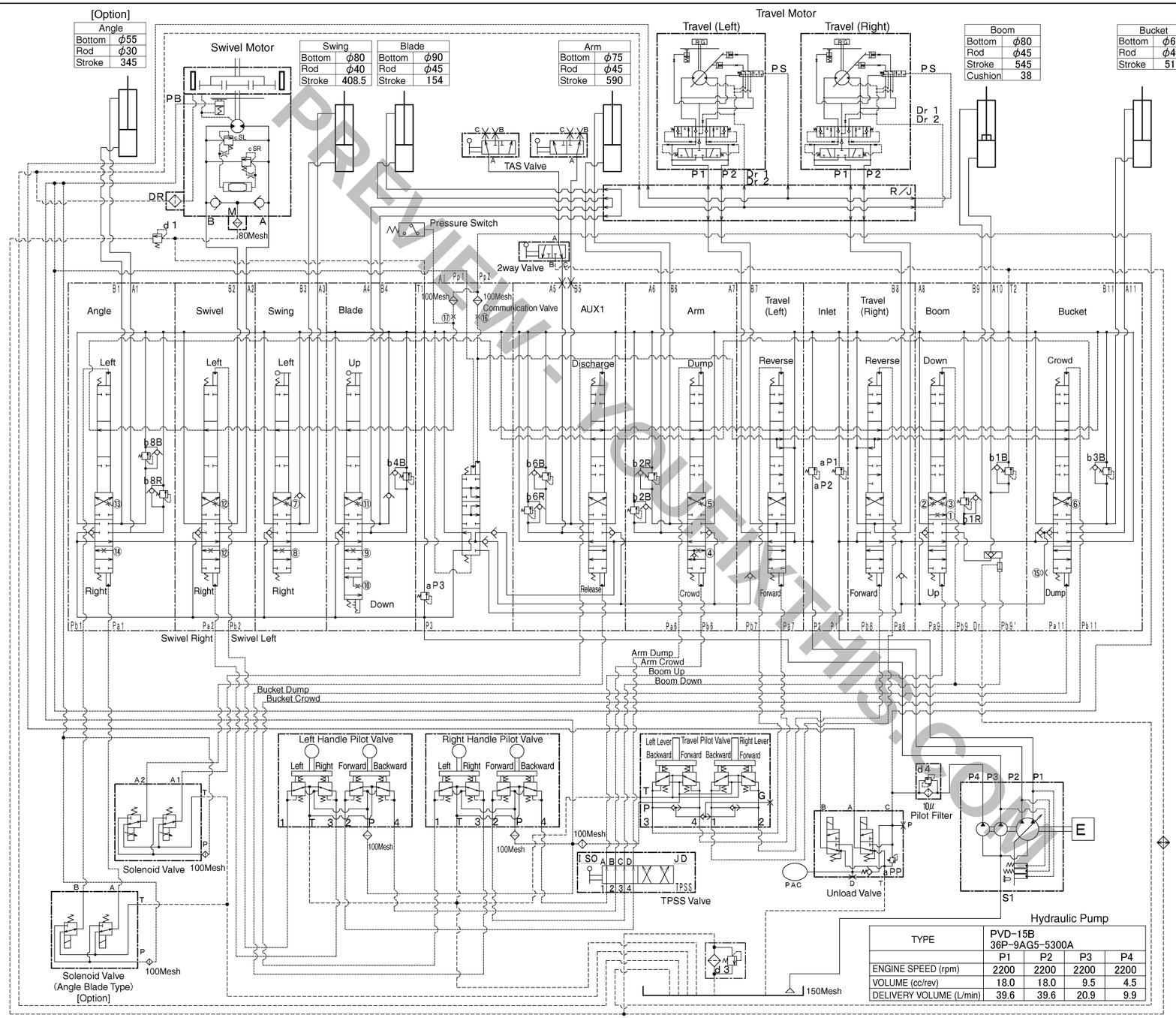
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Electrical Circuit Diagram (U35-4 US, AU, CA)

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1. DAIGRAM OF HYDRAULIC CIRCUIT

[1] DAIGRAM OF HYDRAULIC CIRCUIT [U35-4 CANOPY VERSION (ANGLE BLADE OPTION)]



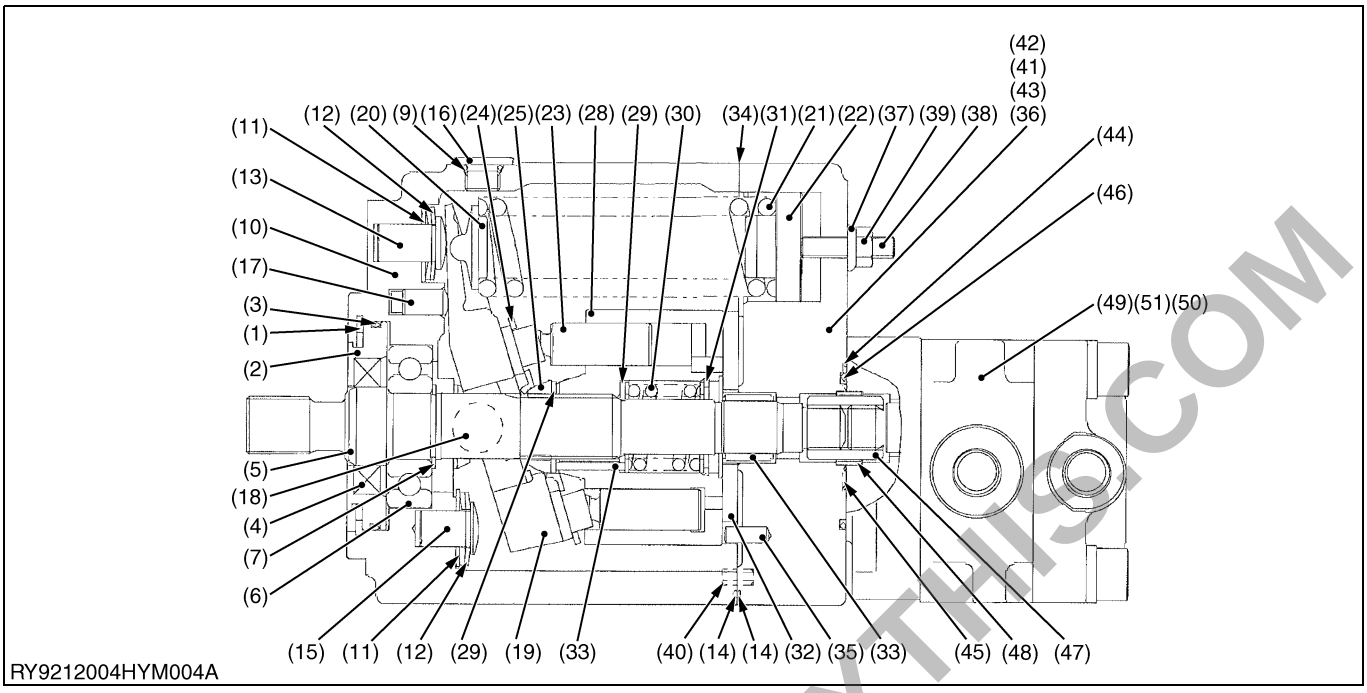
	Relief Pressure (MPa)		
aP1	Main P1		24.5
aP2	Main P2		24.5
aP3	Main P3		19.6
aPP	Pilot Primary		3.9
b1B	Boom	Bottom	27.5
b1R		Rod	27.5
b2B	Arm	Bottom	27.5
b2R		Rod	27.5
b3B	Bucket	Bottom	27.5
b3R		Rod	—
b4B	Blade	Bottom	24.0
b4R		Rod	—
b5B	Swing	Bottom	—
b5R		Rod	—
b6B	AUX1	LH	17.2
b6R		RH	17.2
b8B	Angle Blade	Bottom	17.2
b8R		Rod	27.5
cSL	Swivel Relief	LH	20.6
cSR		RH	20.6
cTF	Travel Relief	Forward	—
cTR		Backward	—
d1	Main Return		0.4
d2	Cooler Return		—
d3	Return Filter By-Pass		0.1
d4	Pilot Line Filter By-Pass		0.15

TYPE	PVD-15B 36P-9AG5-5300A			
	P1	P2	P3	P4
ENGINE SPEED (rpm)	2200	2200	2200	2200
VOLUME (cc/rev)	18.0	18.0	9.5	4.5
DELIVERY VOLUME (L/min)	39.6	39.6	20.9	9.9

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[2] COMPONENTS (STANDARD VERSION)



No.	Name of part	Qty	Notes	No.	Name of part	Qty	Notes
(1)	Snap ring	1		(27)	Pin	3	
(2)	Seal holder	1		(28)	Barrel cylinder	1	
(3)	O-ring	1	JIS B 2401, 1B, G75	(29)	Retainer	2	
(4)	Oil seal	1		(30)	Spring	1	
(5)	Shaft	1		(31)	Snap ring	1	
(6)	Ball bearing	1		(32)	Valve plate	1	
(7)	External circlip	1		(33)	Needle bearing	1	
(8)	Plug	1		(34)	Gasket	1	
(9)	O-ring	2	JIS B 2401 1B P11	(35)	Spring pin	1	
(10)	Body S	1		(36)	Body H	1	
(11)	Metal washer	2		(37)	Seal washer	1	
(12)	Diaphragm spring	4		(38)	Set screw	1	
(13)	Pin	1		(39)	Hex nut	1	JIS B 1181 1 M8
(14)	O-ring	2	JIS B 2401 1B P12	(40)	Hole pin	1	
(15)	Pin	1		(41)	Hex socket plug	5	
(16)	Plug	1		(42)	Spring washer	5	
(17)	Rod	1		(43)	Hex socket bolt	5	JIS B 1176 M10 × 45
(18)	Ball	2		(44)	O-ring	1	JIS B 2401 1B P7
(19)	Swash-plate	1		(45)	O-ring	1	JIS B 2401 1B P8
(20)	Spring holder	1		(46)	O-ring	1	JIS B 2401, 1B, G55
(21)	Compression spring	1		(47)	Connector	1	
(22)	Spring guide	1		(48)	Collar	1	
(23)	Piston, ASSY	10		(49)	Gear pump	1	
(24)	Shoe holder	1		(50)	Flat metal washer	2	
(25)	Barrel holder	1		(51)	Bolt	2	JIS B 1180 M8 × 25
(26)	Metal washer	1					

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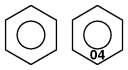
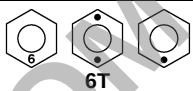
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6. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Screws, bolts and nuts whose tightening torques are not specified in this Workshop Manual should be tightened according to the table below.

Indication on top of bolt	 No-grade or 4T						 7T						 9T		
Indication on top of nut	 No-grade or 4T												 6T		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6	7.9 to 9.3	0.8 to 0.95	5.8 to 6.8	7.9 to 8.8	0.8 to 0.9	5.8 to 6.5	9.81 to 11.2	1.0 to 1.15	7.24 to 8.31	7.9 to 8.8	0.8 to 0.9	5.8 to 6.5	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8	18 to 20	1.8 to 2.1	13 to 15	17 to 19	1.7 to 2.0	13 to 14	24 to 27	2.4 to 2.8	18 to 20	18 to 20	1.8 to 2.1	13 to 15	30 to 34	3.0 to 3.5	22 to 25
M10	40 to 45	4.0 to 4.6	29 to 33	32 to 34	3.2 to 3.5	24 to 25	48 to 55	4.9 to 5.7	36 to 41	40 to 44	4.0 to 4.5	29 to 32	61 to 70	6.2 to 7.2	45 to 52
M12	63 to 72	6.4 to 7.4	47 to 53	–	–	–	78 to 90	7.9 to 9.2	58 to 66	63 to 72	6.4 to 7.4	47 to 53	103 to 117	10.5 to 12	76 to 86.7
M14	108 to 125	11 to 12.8	79.6 to 92.5	–	–	–	124 to 147	12.6 to 15	91.2 to 108	–	–	–	167 to 196	17 to 20	123 to 144
M16	167 to 191	17 to 19.5	123 to 141	–	–	–	197 to 225	20 to 23	145 to 166	–	–	–	260 to 304	26.5 to 31	192 to 224
M18	246 to 284	25 to 29	181 to 209	–	–	–	275 to 318	28 to 32.5	203 to 235	–	–	–	344 to 402	35 to 41	254 to 296
M20	334 to 392	34 to 40	246 to 289	–	–	–	368 to 431	37.5 to 44	272 to 318	–	–	–	491 to 568	50 to 58	362 to 419

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[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	12 to 15	1.2 to 1.6	8.7 to 11	8.9 to 11	0.90 to 1.2	6.5 to 8.6
M10	25 to 31	2.5 to 3.2	18 to 23	20 to 25	2.0 to 2.6	15 to 18
M12	30 to 49	3.0 to 5.0	22 to 36	31	3.2	23
M14	62 to 73	6.3 to 7.5	46 to 54	–	–	–
M16	98.1 to 112	10.0 to 11.5	72.4 to 83.1	–	–	–
M18	172 to 201	17.5 to 20.5	127 to 148	–	–	–

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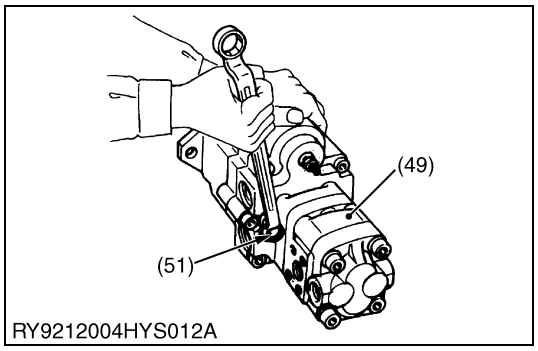
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(1) Disassembly Procedures

After draining the pump of oil, wash off the pump and put a protector, such as clean paper, cloth, rubber mat, etc., on the work surface and proceed with disassembly and reassembly. Use any tools necessary and exercise caution so no parts are damaged and employ sufficient precautions to prevent any foreign matter from getting inside.

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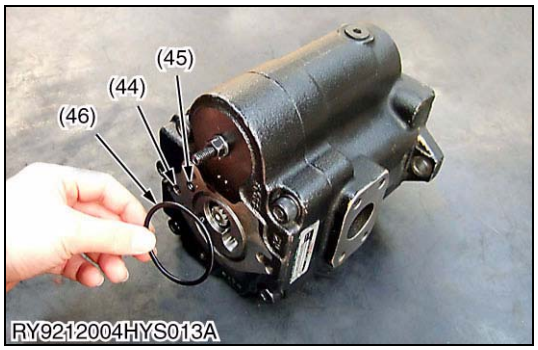
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1. Take off the two bolts and remove the gear pump, the collar and the coupling.

   Tool to use: M13 wrench

(49) Gear pump
(51) Bolt (M8 × 25)

RY9212004HYS0164US0



RY9212004HYS013A

2. Remove the O-ring.

(44) O-Ring
(45) O-Ring
(46) O-Ring

RY9212004HYS0165US0



RY9212004HYS015A

3. Fully loosen the hex nut and remove the set screw.

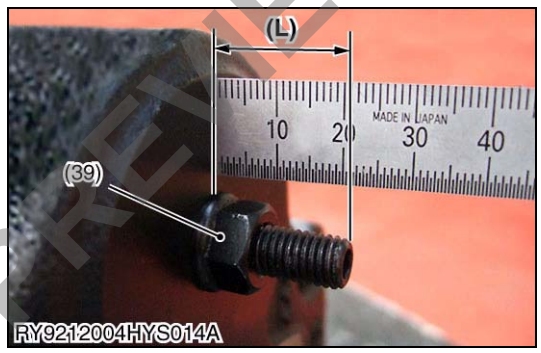
■ **IMPORTANT**

- **Note down the projecting length (L) of the set screw in the previously fixed state.**

   Tool to use: Socket wrench M13

(38) Set screw
(39) Hex nut

RY9212004HYS0166US0



RY9212004HYS014A

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List of Failure Codes

Failure codes		Cause of generation and the measures
ECU (Meter)	Engine Oil Err	Detect the decrease in the engine oil pressure. The oil switch is in trouble or defect in harness, repair or replace it.
	Charging Sys Err	Detect the power generation decrease. The alternator is in trouble or the fan belt came off or defect in harness, repair or replace it.
	Overheat	The machine is overheated and must cool off by idling.Refill the radiator with coolant by its boiled-over amount. Unclog the radiator and other components before use again.Check also the hydraulic system for oil leak and other troubles.
	Fuel Sensor	The fuel sensor is in trouble or defect in harness, repair or replace it.
	Water Temperature Sensor	The water temperature sensor is in trouble or defect in harness, repair or replace it.
	CAN Sys (Main)	Defect in harness or defect in ECU (main), repair or replace it.
	Setting Data Err	Set the model again. It is defective in the meter when still not repaired.
ECU (Main)	Lever Lock Sol	The lever lock Sol is in trouble or defect in harness, repair or replace it.
	2-Speed Sol	The travel 2-speed Sol is in trouble or defect in harness, repair or replace it.
	Multipurpose Sol	The multipurpose Sol is in trouble or defect in harness, repair or replace it.
	AUX1 Knob	The AUX1 port knob is in trouble or defect in harness, repair or replace it.
	AUX1 R Sol	The AUX1 Sol (right) is in trouble or defect in harness, repair or replace it.
	AUX1 L Sol	The AUX1 Sol (left) is in trouble or defect in harness, repair or replace it.
	External 5V	The sensor's 5V power supply is short-circuited, repair or replace it.
	Overvoltage	A jimper cable is connected to a 24V battery or improper device to get the engine started or the alternator is in trouble, repair or replace it.
	Angle R Sol	The Angle Blade Sol (right) is in trouble or defect in harness, repair or replace it.
	Angle L Sol	The Angle Blade Sol (left) is in trouble or defect in harness, repair or replace it.
	Governor Sensor	The governor sensor is in trouble or defect in harness, repair or replace it.
	Accel Sensor	The accelerator sensor is in trouble or defect in harness, repair or replace it.
	AI Motor	The AI motor is in trouble or defect in harness, repair or replace it.
	Antenna	The antenna for anti-theft is in trouble or defect in harness, repair or replace it.

RY9212182ELS0176US0

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16. TROUBLESHOOTING

Troubleshooting Front Systems

All front operations slow or not moving

Cause	Inspection point	Remedy	Reference page
Defect of the engine itself	Engine speed measurement	Adjust each engine part	–
Insufficient hydraulic fluid volume or oil degradation	Check hydraulic tank oil level and oil quality	Replenish the hydraulic fluid supply or change the oil	G-13
Suction line (suction filter) blockage	Inspect the suction line (suction filter)	Wash the suction line Replace the suction line	1-S18
Pilot filter blockage	Pilot filter blockage inspection	Replace pilot filter	–
Pilot relief valve faulty operation or poor pilot pump performance	Measure pilot primary pressure	Adjust, wash or replace pilot relief valve Replace pilot pump	3-S124
Poor main relief valve operation or seating	Main relief valve pressure measurement	Adjust, wash or replace main relief valve	3-S126
Defective pump installation coupling	Pump installation coupling inspection	Replace pump connector	3-S3
Pump drive shaft damaged	Pump drive shaft inspection	Replace shaft	3-S4
Pump internal parts wear or damage	Pump inspection	Repair or replace pump	3-S4

Either pilot valve right or left front does not move or is slow

Cause	Inspection point	Remedy	Reference page
Pilot valve line filter blockage	Pilot valve line filter blockage inspection	Clean pilot valve line filter	–
Defective pilot valve	Pilot secondary pressure measurement of applicable cylinder	Pilot valve disassembly, cleaning or replacement	3-S125

Low power of entire hydraulic system

Cause	Inspection point	Remedy	Reference page
Pilot relief valve faulty operation or poor pilot pump performance	Measure pilot primary pressure	Adjust, wash or replace pilot relief valve Replace pilot pump	3-S124
Poor main relief valve operation or seating	Main relief valve pressure measurement	Adjust, wash or replace main relief valve	3-S3

(To be continued)

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I INFORMATION

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No.	Check points	Measures	Hour meter indicator																	Interval		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1000			
25	Alternator and starter motor	check																		every 2000 hrs		
26	Injection pump	check																		every 3000 hrs	*4	@
27	Radiator system	rinse																		every 2 years		
28	Fuel line and Intake air line	check				❍				❍				❍				❍	❍	every 200 hrs		@
		replace																		every 2 years	*3	

Air-conditioner

No.	Check points	Measures	Hour meter indicator																	Interval		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1000			
1	Air filter	clean				❍				❍				❍				❍	❍	every 200 hrs	*2	
		replace																	❍	every 1000 hrs	*2	
2	Air conditioner condenser	clean				❍				❍				❍				❍	❍	every 200 hrs		
3	Air conditioner pipes and hoses	check																		every 1 year		
		replace																		every 2 years		
4	Refrigerant (gas)	check																		service as required		

■ **IMPORTANT**

- **● : First operation**
- ***1 : When using a hydraulic hammer, change hydraulic oil and return filter according to the table on "Hydraulic Oil" Change (Including Exchange of the Suction Filter in the Hydraulic Tank) under "EVERY 1000 SERCVICE HOURS" in the chapter "REGULAR CHECKS AND MAINTENANCE WORK".**
- ***2 : Clean and replace the air filter more frequently if used under dusty conditions. When the filter is very dirty from dusty conditions, replace the filter.**
- ***3 : Replace only if necessary.**
- ***4 : Consult your local KUBOTA dealer for this service.**
- **The items listed above (@ mark) are registered as emission related critical parts by KUBOTA in the U.S.EPA non-road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the instruction. Please see the warranty Statement in detail.**

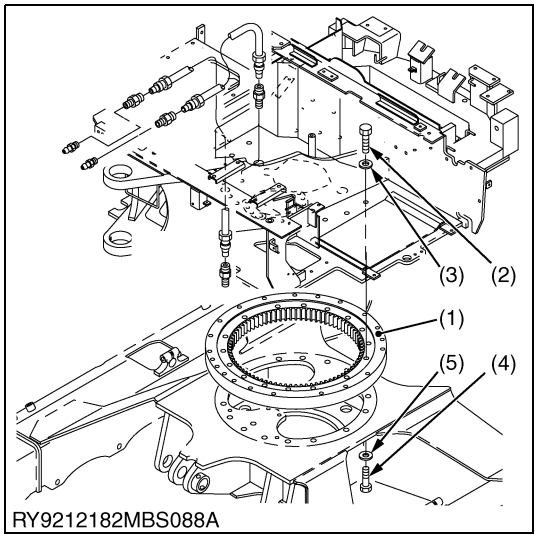
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3. TRACK FRAME

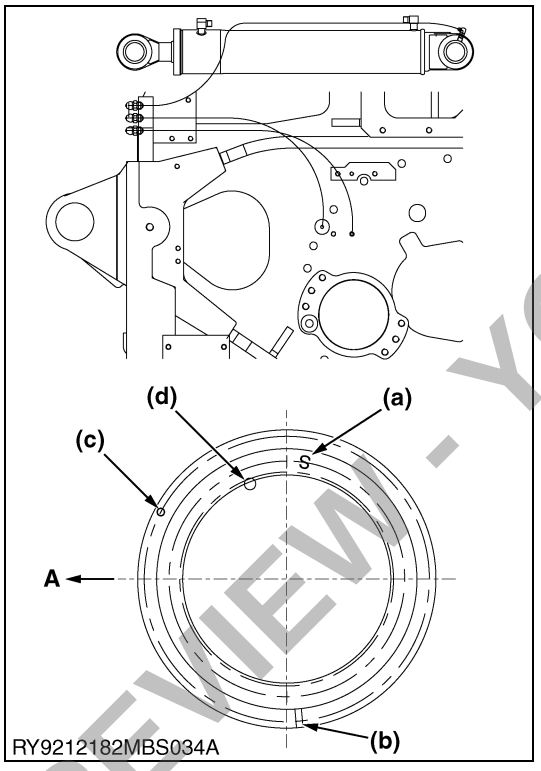
[1] SWIVEL BEARING



RY9212182MBS088A

No.	Part Name	Q'ty
(1)	Swivel bearing	1
(2)	Bolt (M16 × 45)	16
(3)	Diaphragm spring	16
(4)	Bolt (M16 × 45)	20
(5)	Diaphragm spring	20

RY9212182MBS0098US0



RY9212182MBS034A

Swivel bearing assembly procedure

1. Swivel bearing installation position
   Mount the inner tire soft zone ('S' mark) **(a)** on the right side of the body.
2. Fastening torque of swivel bearing
   After lightly tightening, tighten to the torque indicated below from a diagonal angle.

Tightening torque	Swivel bearing mounting bolts	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.0 lbf·ft

   Apply thread lock (Loctite 271).
3. Apply grease to the tooth surfaces
   Apply grease so that it covers the entire bearing teeth surfaces.

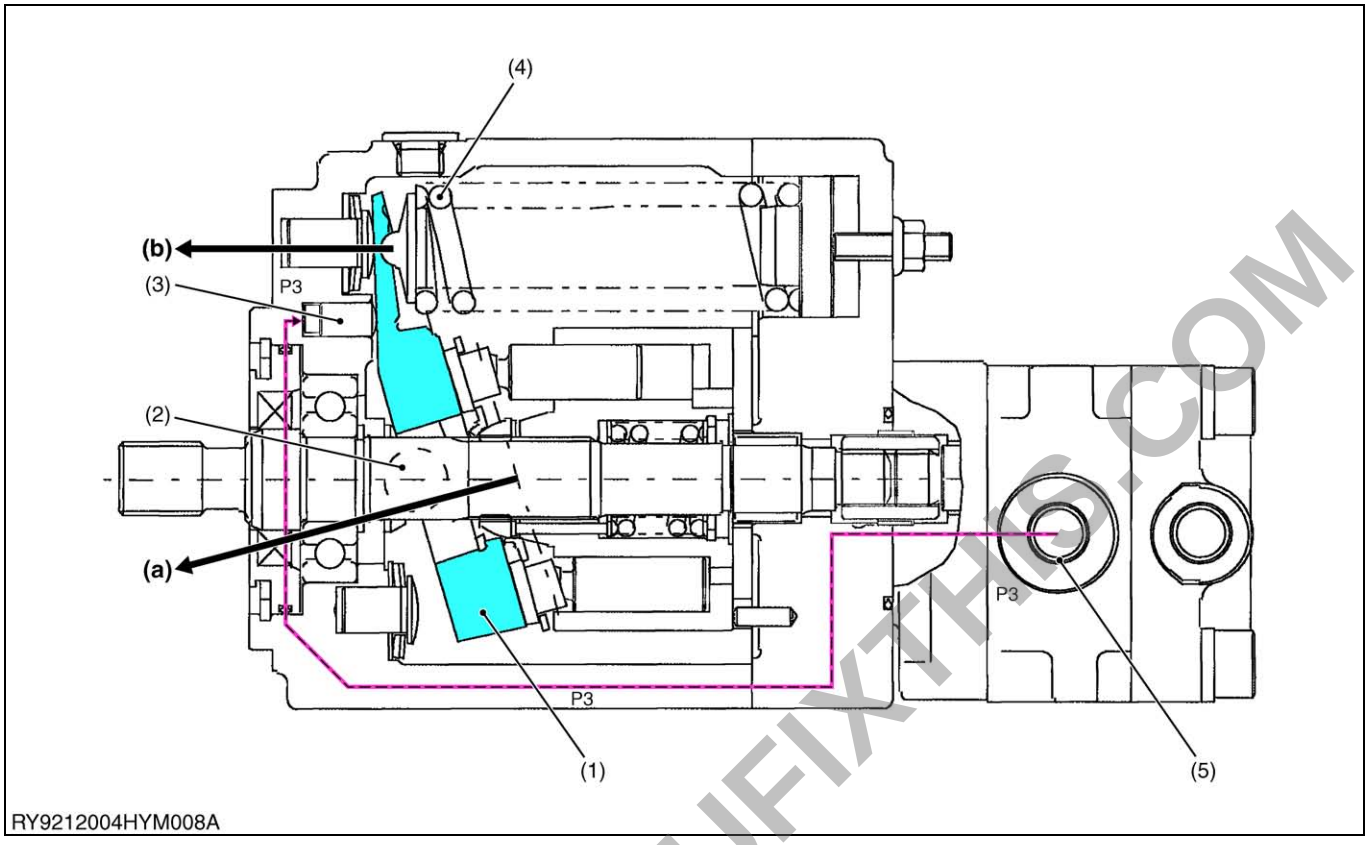
A : Front of machine
(a) "S" mark (inner tire soft zone)
(b) Ball insert groove (outer tire soft zone)
(c) Port for applying grease to the ball (mate with hole in swivel frame)
(d) Tooth surface grease application zone

RY9212182MBS0099US0

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(2) Pump Hosepower Control Mechanism



RY9212004HYM008A

(1) Swash-plate
(2) Ball
(3) Rod G
(4) Spring
(5) P3
(a) Load F1
(b) Spring force F2

Constant power variation mechanism

The pump capacity is altered by varying the swash-plate angle, and the swash-plate angle can be used to control the pump to a constant power by a simple direct-action variation mechanism based on a spring.

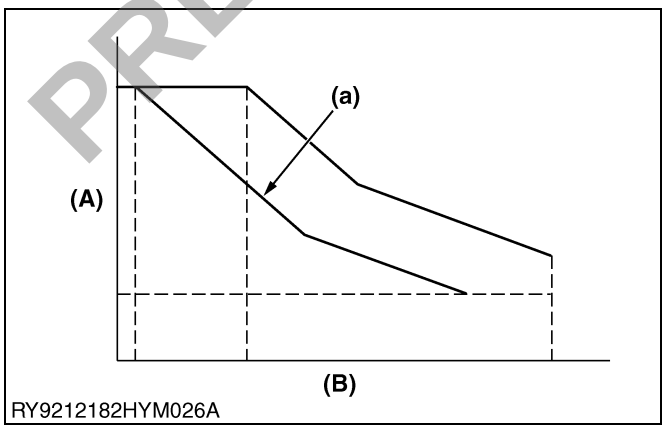
The centre of rotation of the swash-plate is the ball on the rear surface, and the load F1 from the piston side acts in the direction shown above and produces a rightward turning moment in the swash-plate. A spring (spring force F2) for setting a constant power is provided to act in the opposite direction to this moment, and is set to a prescribed load.

As the pressure rises, the rightward turning moment increases and when it becomes greater than the leftward turning moment created by the force of the spring, the spring warps and the angle of the swash-plate decreases, thus reducing the discharge flow, so that the pump power is kept uniform.

When the pressure of P3 acts on the rod, a rightward turning moment proportional to the pressure acts on the swash-plate, and therefore the P-Q characteristics shift and the power is kept uniform, including the gear pump. (Overall power control mechanism)

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P-Q characteristics



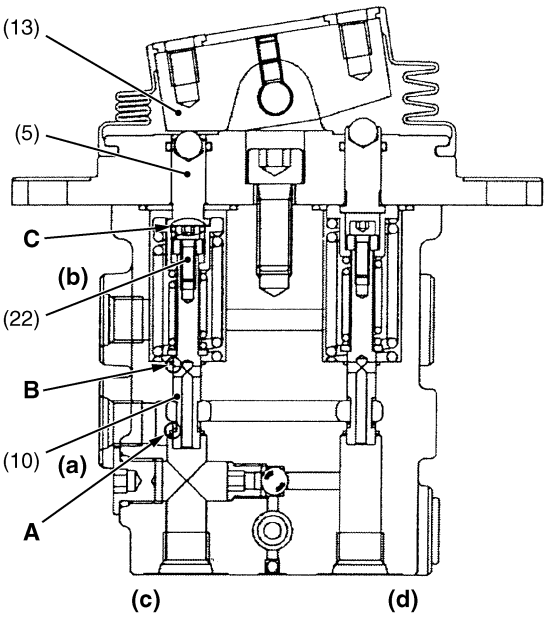
RY9212182HYM026A

(A) Discharge flow Q1, Q2
(B) P1 + P2 discharge pressure
(a) Shifted curve

RY9212182HYM0041US0

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RY9212001HYM170A

3. When the control lever has been actuated (during short-circuit)

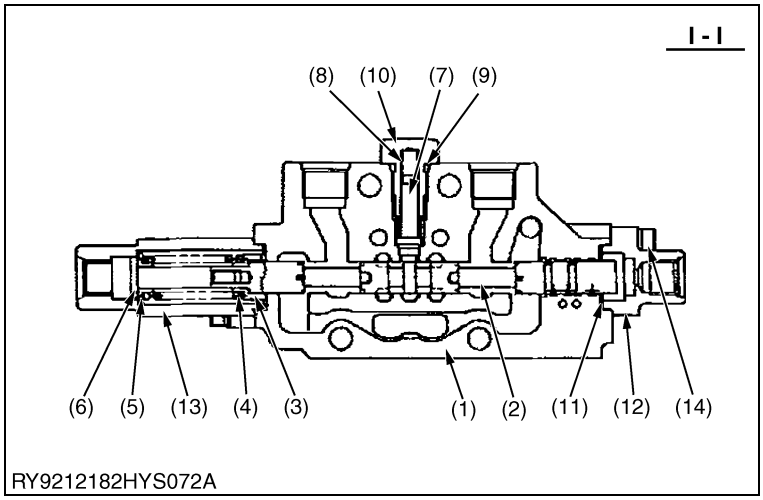
When the cam (13) operating angle exceeds 7.8 °, the pushrod (5) and the hex socket bolt (22) come in contact at part **C** and the spool (10) stops providing control by balancing the pressure. As a result, part **A** is left open, part B is left closed and the pressures of port P and port 1 equalize.

(5) Pushrod	**(a) Port P**
(10) Spool	**(b) Port T**
(13) Cam	**(c) Port 1**
(22) Hex Socket Bolt	**(d) Port 2**

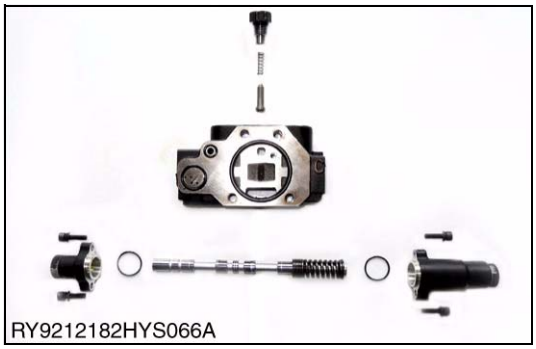
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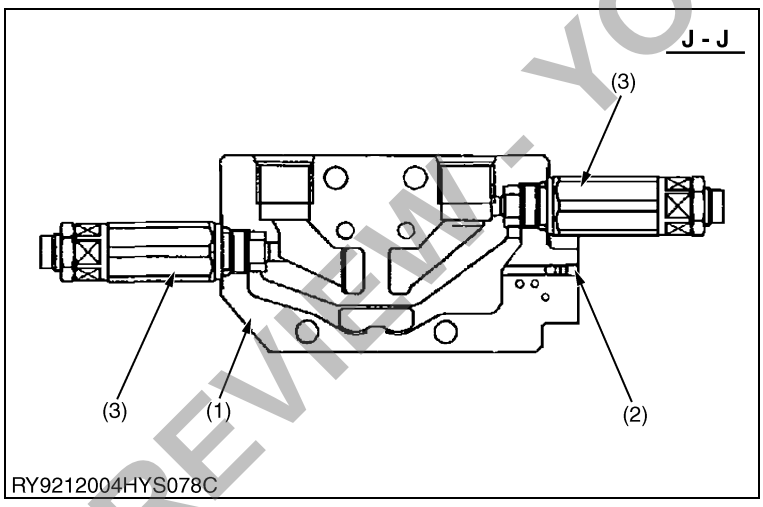

RY9212182HYS066A

8. Travel left section Components

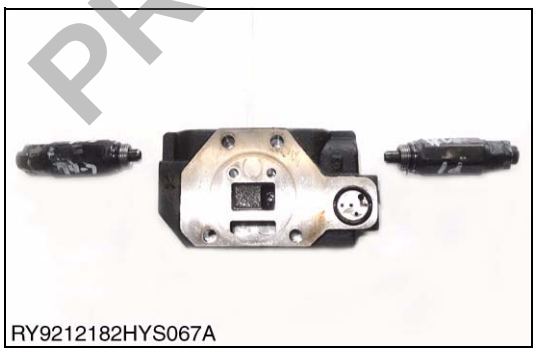
No.	Name of part	Q'ty	Tightening torque	Notes
(1)	Body	1		
(2)	Spool	1		
(3)	Spring seat	1		
(4)	Spring	1		
(5)	Spring seat	1		
(6)	Spool end	1	4.41 ± 0.49 N·m 0.45 ± 0.05 kgf·m 3.25 ± 0.36 lbf·ft	*1
(7)	Poppet	1		
(8)	Compression spring	1		
(9)	O-ring (1B, P11)	1		
(10)	Plug	1	39.20 ± 1.96 N·m 4.0 ± 0.2 kgf·m 28.90 ± 1.45 lbf·ft	
(11)	O-ring (1B, S22)	2		
(12)	Cap	1		
(13)	Cap	1		
(14)	Bolt	4	6.37 ± 0.49 N·m 0.65 ± 0.05 kgf·m 4.70 ± 0.36 lbf·ft	

*1: Loctite

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RY9212004HYS078C


RY9212182HYS067A

9. Supply section Components

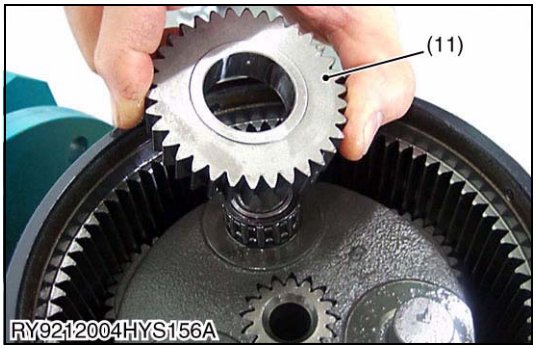
No.	Name of part	Q'ty	Tightening torque	Notes
(1)	Body	1		
(2)	Plug	1		

No.	Valve ASSY (Overload relief) Pressure Setting	Tightening torque	Notes
(3)	24.5 MPa 250 kgf/cm^2 3550 psi	39.20 ± 1.96 N·m 4.0 ± 0.2 kgf·m 28.90 ± 1.45 lbf·ft	

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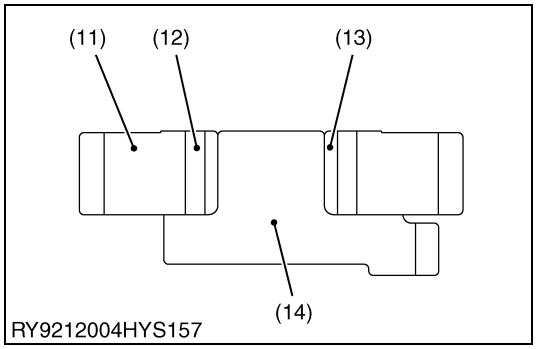
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19. Install the holder and assemble the collar, needle bearing and planetary gear A on it.

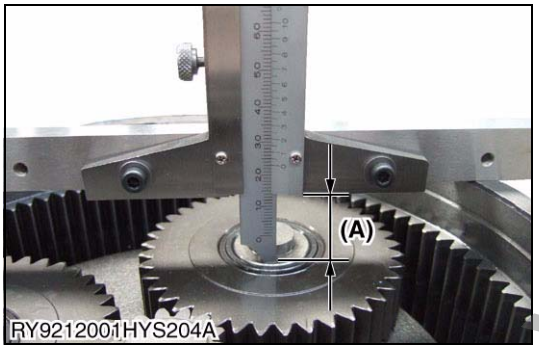
■ **IMPORTANT**
- **Make sure the projecting surface is facing upwards.**



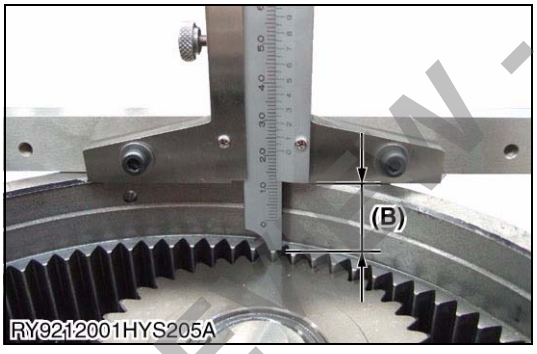
(11) Planetary gear A
(12) Needle bearing
(13) Collar
(14) Holder

RY9212004HYS0087US0

20. Measure the distance between the edge of the holder and the gear case.
This is measurement A **(A)**.
Measure the distance between the gear case tooth surface and the gear case.
This is measurement B **(B)**.



- Tool to use: depth gauge

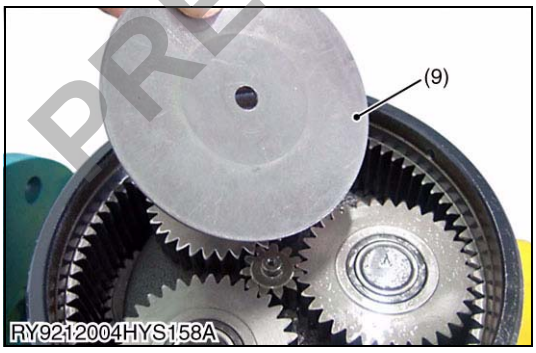


- Subtract measurement B **(B)** from measurement A **(A)** to calculate measurement C.
Select the appropriate plate to suit the value of measurement C.

Measurement C	Plate thickness
0.65 to 1.10 mm (0.020 to 0.043 in.)	1.6 mm (0.063 in.)
1.10 to 1.80 mm (0.043 to 0.071 in.)	2.3 mm (0.091 in.)
1.80 to 2.35 mm (0.071 to 0.093 in.)	3.0 mm (0.12 in.)

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21. Install the selected thrust plate.

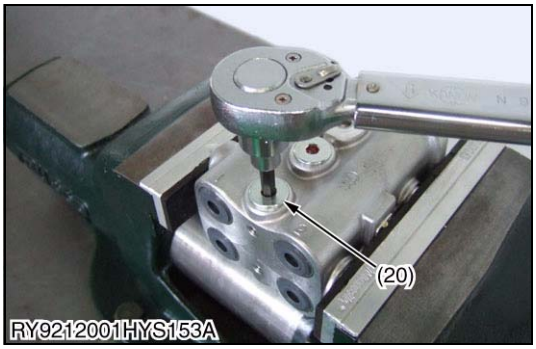


(9) Thrust plate

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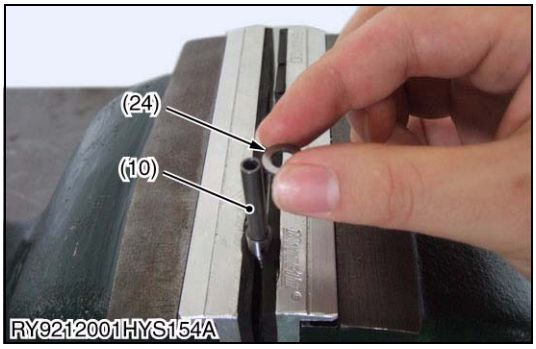
4. Install the flanged plug.

Tightening torque	Flanged plug (20)	24.5 N·m 2.5 kgf·m 18.1 lbf·ft

- Tool to use : M6 hex socket

(20) Flanged Plug

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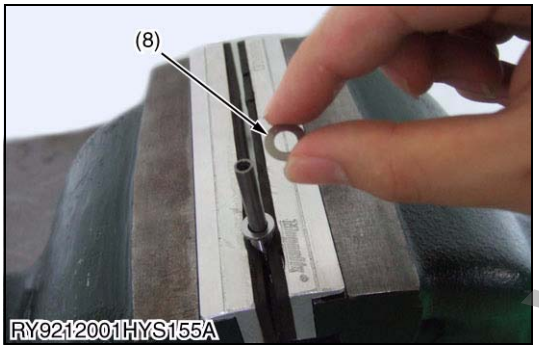


5. Clamp the spool in a vice and install the flat metal washer.

■ **IMPORTANT**
- **Be careful to follow the order of installation.**
- **Use a copper plate in the vice to prevent it from scratching the spool.**
- **Be careful not to overtighten the vice as this will deform the spool.**

(10) Spool (24) Flat Metal Washer

RY9212001HYS0525US0

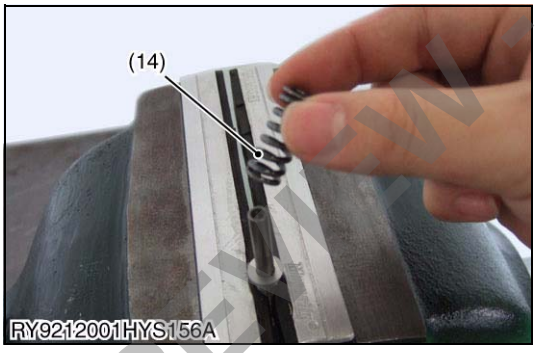


6. Install the shim.

■ **IMPORTANT**
- **Be careful to follow the order of installation.**

(8) Shim

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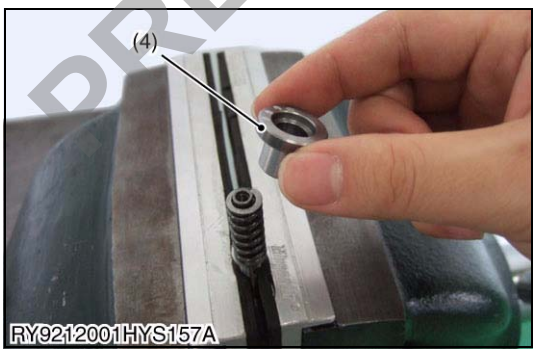


7. Install the spring.

■ **IMPORTANT**
- **Be careful to follow the order of installation.**

(14) Spring

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8. Install the sleeve.

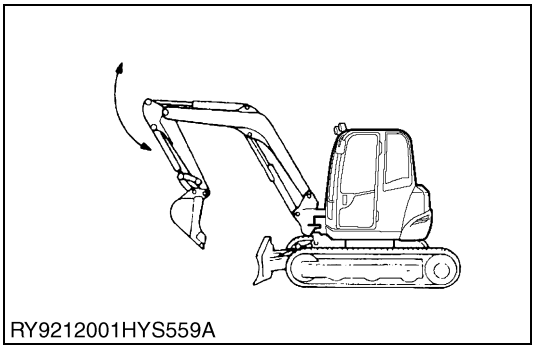
■ **IMPORTANT**
- **Be careful to follow the order of installation.**

(4) Sleeve

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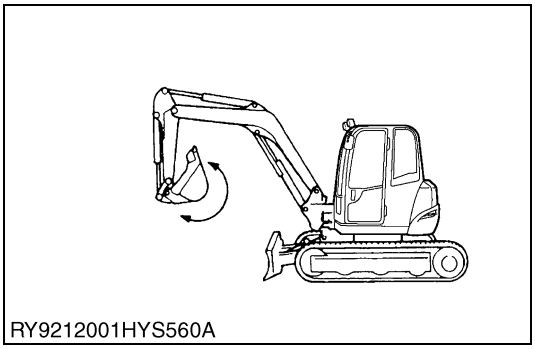
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RY9212001HYS559A

Arm cylinder measurement

1. Before measuring, repeat front equipment operations to fully warm up each cylinder. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. With the engine at maximum rpm, operate the arm control lever to full stroke, and measure the time required for arm in and out.

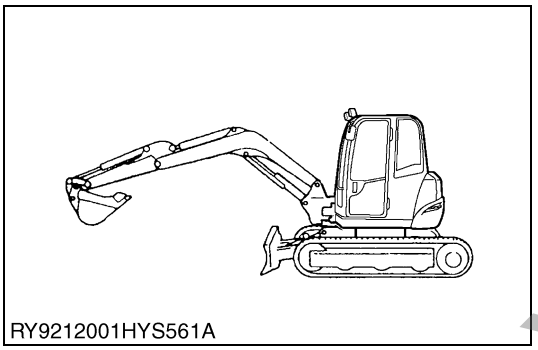
RY9212182HYS0100US0


RY9212001HYS560A

Bucket cylinder measurement

1. Before measuring, repeat front equipment operations to fully warm up each cylinder. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. With the engine at maximum rpm, operate the bucket control lever to full stroke, and measure the time required for bucket rake and dump.

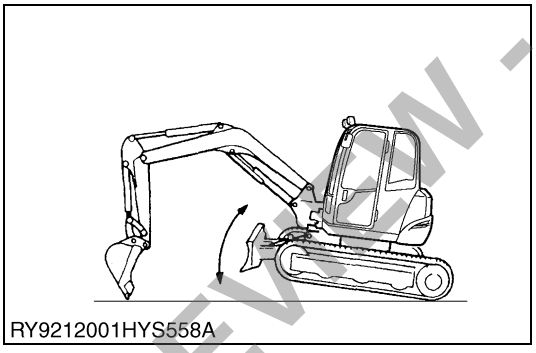
RY9212182HYS0101US0


RY9212001HYS561A

Swing cylinder measurement

1. Before measuring, repeat front equipment operations to fully warm up each cylinder. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. The front attitude should be with the arm cylinder fully compressed, bucket cylinder fully extended, and bucket bottom approximately 1 m above ground level.
3. At maximum engine rpm, perform a full throttle stroke swing from left to right and right to left, and measure the time required to achieve this.

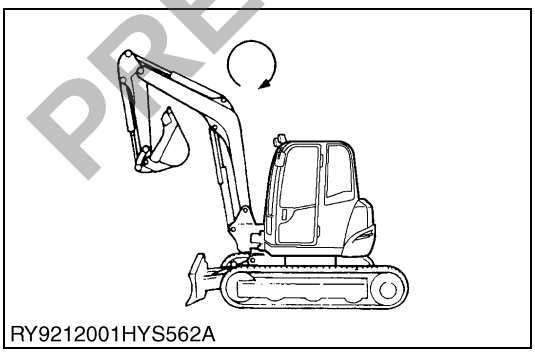
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RY9212001HYS558A

Blade cylinder measurement

1. Before measuring, repeat front equipment operations to fully warm up each cylinder. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. The vehicle attitude for measurement should be jacked up by the front, assuring full stroke of cylinder, top to bottom.
3. With the engine at maximum rpm, operate the blade control lever to full stroke, and measure the time required for blade up and down operation.

RY9212182HYS0103US0


RY9212001HYS562A

Measurement of required swivel time

1. Before measuring, repeat left-right swivel operations to thoroughly warm up the swivel motor. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. The attitude for measurement should be with maximum extension of the boom cylinder, arm cylinder and bucket cylinder.
3. At maximum engine rpm, operate the swivel control lever at full stroke, and measure the time taken for three turns of the swivel unit.

⚠ CAUTION

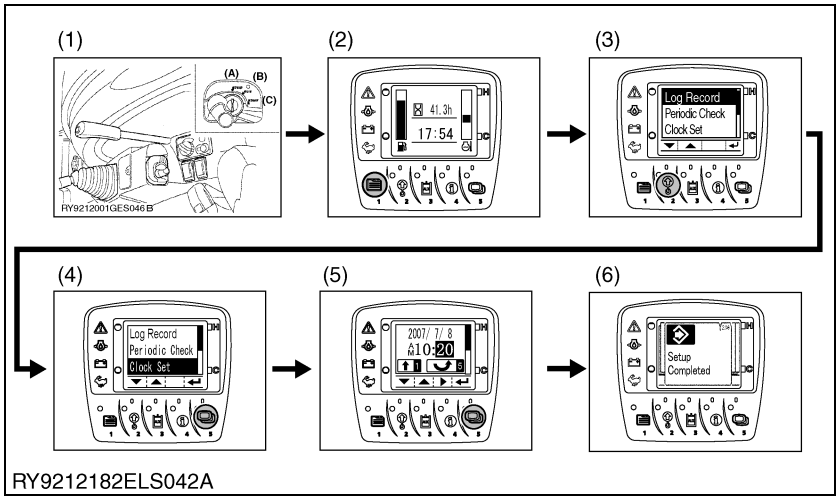
- **Before commencing measurement, make sure there are no persons or obstacles within the swivel range.**

RY9212182HYS0104US0

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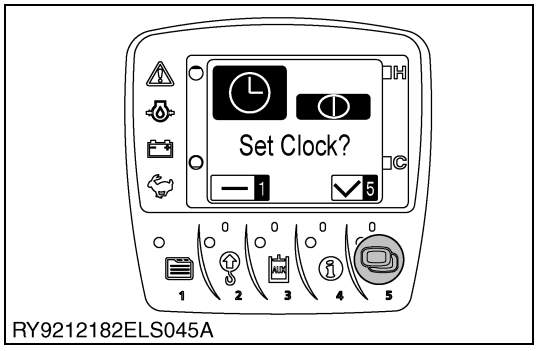
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(4) How to set the Clock



RY9212182ELS042A

(1)	Starter key at **[RUN]** position. **(A)STOP, (B)RUN, (C)START**
(2)	Press switch 1 (user settings).
(3)	Press switch 2 to select "Clock Set".
(4)	With "Clock Set" selected, press switch 5.
(5)	Set the clock and then press switch 5.
(6)	Setup complete



RY9212182ELS045A

[Clock setting guide]

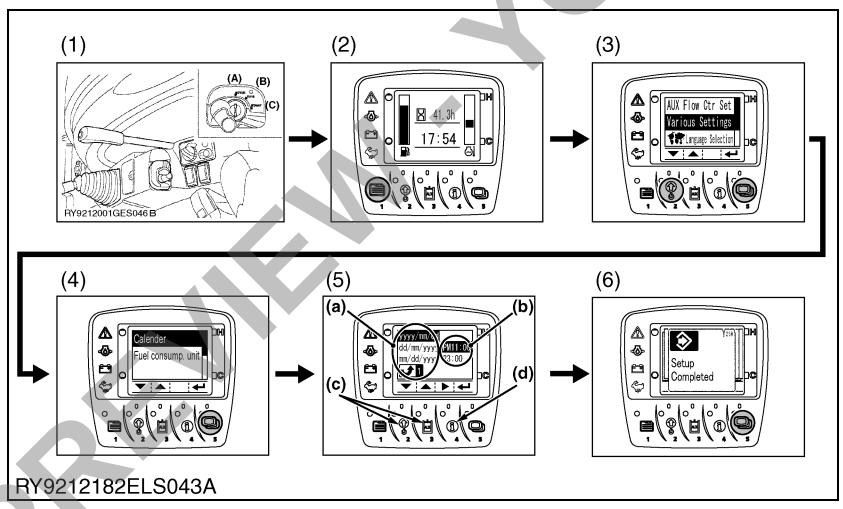
- Pressing switch 4 (▶) changes the setting item from Yr→ Mo→ Day→ Hr→ Min→ Yr.
- Pressing switch 2 (▼) reduces the number.
- Pressing switch 3 (▲) increases the number.
- Pressing switch 1 while on the clock setting screen takes the screen back without changing the time.

■ **NOTE**

- **The display shown left appears when the clock stops, due to disconnection of the battery, etc. Press the Set switch (switch 5) to set the clock again.**

RY9212182ELS0043US0

(5) Switching-over of the items of "AM/PM · 24 hours"



RY9212182ELS043A

(1)	Starter key at **[RUN]** position. **(A)STOP, (B)RUN, (C)START**
(2)	Press switch 1 (user settings).
(3)	Press switch 2 to select "Various Settings" and then press switch 5.
(4)	Select "Calendar / Time display settings" and then press switch 5.
(5)	Choose the display order: yyyy/mm/dd, dd/mm/yyyy, mm/dd/yyyy, and AM/PM or 24-hr display.
(6)	When the setting has been changed, press switch 5 to complete.

(a) Day/Month/Year Display
(b) Clock Display
(c) Cursor Movement Switches (Switches 2 and 3)
(d) Item Movement Switch (Switch 4)

Scroll the selected item up and down with the cursor movement switches (switches 2 and 3), to change the Year/Month/Day order on side **(A)**. (This change is reflected in the Year/Month/Day order on the time adjustment screen.)

Move the cursor to side **(B)** with the item movement switch (switch 4), and select either "AM/PM" or "24 hour".

Press the Set switch (switch 5) to make the changes and exit the procedure.

Press "Completed" with the direction cursor switch (switch 1) to exit without making changes.

RY9212182ELS0044US0

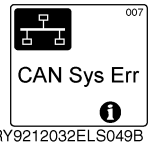
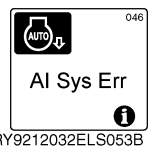
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[5] LIST OF WARNING ALARM DISPLAYS

(1) Warning Display List

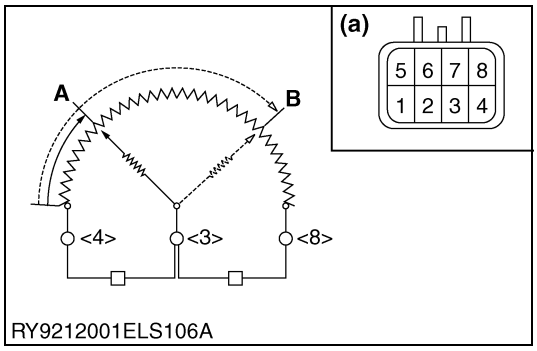
When needed, pressing switch 4 ⓑ displays a detailed description.

Display	Lamp	Pressing SW4 ⓑ	Message in fail record	Problem or failure (Circumstances)	Behaviour of machine (provisional action)
 RY9212032ELS044B	Red	–	Meter Engine oil pressure error	Fall in oil pressure in engine lubrication system	Risk of engine seizure : stop engine immediately
 RY9212032ELS045B	Red	–	Meter Over heat	Cooling water temperature above set temperature	Halt work until the message disappears. Keep engine idling.
 RY9212032ELS046B	Red	–	Meter Charging System Error	Failure or charging error in charging system	The machine will operate until the battery dies.
 RY9212032ELS047B	Red	–	Meter Fuel Sensor Error	Failure in fuel sensor system	The fuel level indicator is not displayed on the meter. Other functions of the machine can be used.
 RY9212032ELS049B	Red	CANSys (main)	Meter CAN Sys (Main)	Failure in communications system	The engine may start and the machine may move. However, the machine cannot carry out any work.
		CANSys (CRS)	Meter CAN Sys (CRS)		
 RY9212032ELS051B	Red	2-speed SOL	Main 2-speed solenoid	Failure in 2-speed switching system	Machine continues at low speed rather than switching to high speed. Other functions can be used.
 RY9212148ELS040A	Red	AUX1 knob	Main AUX1 knob	AUX1 Port system failure	The engine restarts and the machine moves. But AUX1 is not usable. If other equipment is functioning, then work can be continued.
		AUX1 right SOL	Main AUX1 right solenoid		
		AUX1 left SOL	Main AUX1 left solenoid		
 RY9212032ELS052B	Red	Over voltage	Main Over voltage	• Jump start cable connected to 24V battery or unsuitable device • Failure in alternator	If connected to 24V battery, stop immediately
 RY9212148ELS061A	Red	Angle right solenoid	Main Angle right solenoid	Failure in angle system	The engine restarts and the machine moves. But the angle is not usable. If other equipment is functioning, then work can be continued.
		Angle left solenoid	Main Angle left solenoid		
 RY9212032ELS053B	Red	Accelerator sensor	Main Aceelerator sensor	Failure in accelerator dial	Engine doesn't return automatically to idling, but other functions can be used.

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[D] Testing the Equipment Itself



RY9212001ELS106A

1. Testing the accelerator sensor

[Measurement Conditions]

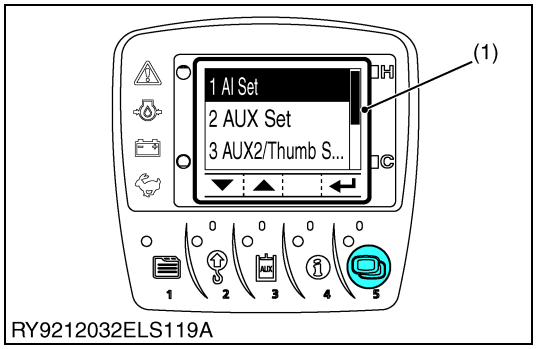
1. Key switch : OFF
2. Disconnect the accelerator sensor from the machine and test it separately.

Factory specification	Min.	Max.
Accelerator sensor 4 to 8	1 kΩ ± 10 %	1 kΩ ± 10 %
Accelerator sensor 3 to 4	720 Ω	380 Ω
Accelerator sensor 3 to 8	380 Ω	720 Ω

Criteria
Regular : Within factory specification
Irregular : Outside factory specification

(a) Accelerator Dial Terminal Numbers

RY9212166ELS0125US0



RY9212032ELS119A

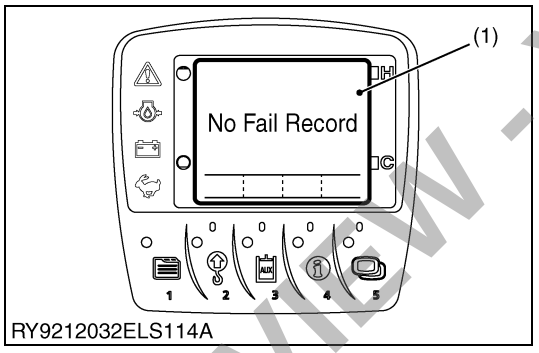
2. Settings after replacing device

1. Select the AI setting.

Criteria
Regular : setting complete
Irregular : setting failed

(1) AI Set
AUX Set
AUX2/Thumb Set

RY9212032ELS0005US0



RY9212032ELS114A

3. Erasing failure history

1. After completing repairs, select Erase Failure History and erase the records.
2. After erasing the records, read the failure history again and make sure there are no failures.

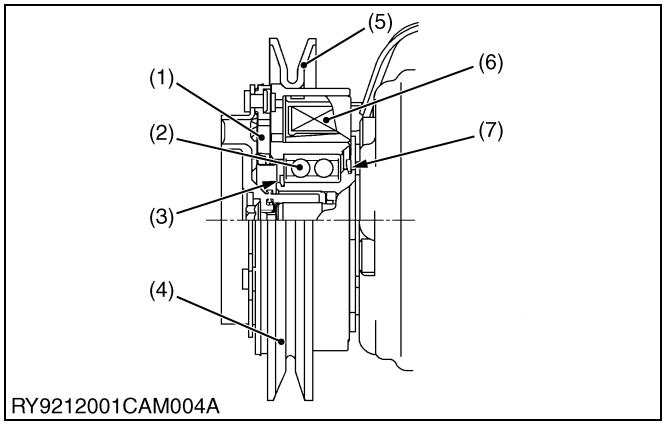
Criteria
Regular : Failure history erased
Irregular : failure history not erased

(1) No Fail Record

RY9212032ELS0003US0

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RY9212001CAM004A

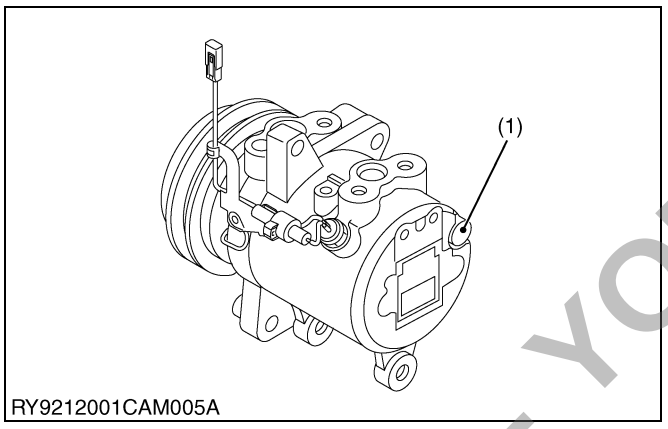
Magnetic Clutch

A magnetic clutch is a device that governs the mechanical linkage between the engine and the compressor. When the engine is rotating and the AC switch is on, air at cabin temperature comes out and when the temperature reaches the temperature set with the temperature control switch, or when the cabin gets hot, the clutch works to stop or to drive the compressor, respectively.

The hub of the magnetic clutch is attached to the compressor shaft and when it is not driving the compressor, it is separate from the rotor and just the pulley turns. When the AC switch is turned on, current flows into the stator coil, making the stator into a magnet, which then holds onto the hub and the pulley turns along with the compressor.

(1) Pressure Plate
(2) Ball Bearing
(3) Snap Ring
(4) Pulley
(5) Rotor w/ Pulley
(6) Stator
(7) Snap Ring

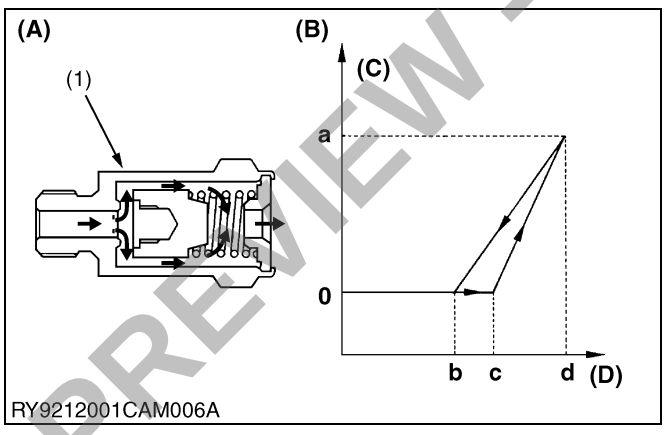
RY9212001CAM0006US0



RY9212001CAM005A

B. Safety Valve

The valve opens when the refrigerant pressure reaches the specified pressure, thus relieving the pressure. When the pressure becomes abnormally high, it overcomes the force of the spring, allowing refrigerant to leak out of the relief port; when the pressure drops the reverse happens--the spring overcomes the pressure and the safety valve closes. When an error occurs, this also keeps the discharge of refrigerant to a minimum.



RY9212001CAM006A

(1) Safety Valve
(A) Refrigerant Leak Route
(B) Functional Characteristics
(C) Amount of Refrigerant Leaked
(D) Pressure

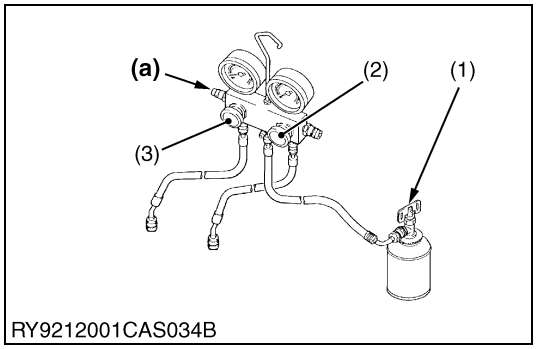
a : 113 L/min., 27.2 U.S.gals./min., 24.86 Imp.gals./min.
b : 2.75 MPa, 28.1 kgf/cm^2, 399.7 psi
c : 3.43 MPa, 35.0 kgf/cm^2, 497.8 psi
d : 4.12 MPa, 42.0 kgf/cm^2, 598.0 psi

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(3) Charging from the High-Pressure Side



RY9212001CAS034B

Charging from the High-pressure Side

CAUTION
- **Important : do not start the engine. If the engine is running, the gas will flow back and burst either the service canister or a hose.**

■ **IMPORTANT**
- **Do not open the low-pressure valve of the manifold gauge.**
- **If the service canister has been changed, be sure to expel any air out of the charging hose (green).**

1. Without starting the engine, open the high-pressure valve and charge with approx 500g of gas.
2. While charging, once the low-pressure gauge indicates approx 0.10 MPa (approx 1 kgf/cm^2), close the high-pressure valve and the service canister valve for the time being.
3. Use a gas detector to check the hoses and pipe connections for gas leaks; if any exist, repair them. If there are no leaks, continue charging the refrigerant.
4. When charging on the high-pressure side stops, close the high-pressure valve on the manifold gauge and the service canister valve, and then charge from the low-pressure side.

(1) Service Canister Valve
(2) High-Pressure Valve
(3) Low-Pressure Valve
(a) Press Valve Core to Expel Air

RY9212001CAS0031US0

(4) Charging from the Low-Pressure Side

Charging from the Low-Pressure Side

CAUTION
- **Never open the manifold gauge's high-pressure valve when charging refrigerant while the engine is running. (If the high-pressure valve is opened, high-pressure gas will flow back up the line and rupture the service canister or a charging hose.)**
- **Always keep the service canister upright when charging.**

■ **IMPORTANT**
- **If the service canister has been changed, be sure to expel any air out of the charging hose (green).**

1. Check and make sure the manifold gauge's high-pressure valve is closed.
2. After starting the engine, set it to approx 1500 rpms and open all of the doors.
3. Turn the AC switch on and set the temperature control to maximum cooling.
4. Open the manifold gauge's low-pressure valve and the service canister valve and charge with the specified amount of gas.
5. After completing refrigerant charging, close the manifold gauge's low-pressure valve and the service canister valve and stop the engine.
6. Check for any gas leaks with the gas leak tester.

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