WSM

Minor change Addenda Version

WORKSHOP MANUAL
KUBOTA EXCAVATOR

KX101-3α3,U35-3α3

Information contained in the following pages of this WSM explains only about the minor changed points from -3 alpha 2 to -3 alpha 3-series.

Kubota

CONTENTS

TO THE READER

Information contained in the following pages of this WSM explains only about the changed points from -3 alpha 2 to -3 alpha 3-series.
Therefore the main technical information of the entire machine is to be taken from the following original WSM.

Model	U35-3α3, KX101-3α3	Document
WSM Code No.	97899-61520	WSM U35S / U35-3S / U35-3α U35S2 / U35-3S2 / U35-3α2 KX91-3S / KX91-3α / KX101-3α KX91-3S2 / KX91-3α2 / KX101-3α2

SUMMARY OF THE CHANGES

Main Renewed Items
Partitions structure modification around the driver's seat
Bonnets shape modification
Hydraulic system modification
New engine model (Change D1503-M into D1803-M)
Automatic speed reduction system is added to the travel motors
Increase in the AUX Max. flow
New supplier (Swing Cylinder and Blade Cylinder)

All of the illustrations, specifications and other information in this manual were created based on the latest model at the time of publication.
Please be aware that changes to the content may be made without prior notice.

■ **NOTE**

- **Corresponding model list**

Machine Model		Engine Model
U35-3α3 KX101-3α3	For European Union	D1803-M-E3-EU1

■ **IMPORTANT**

- **Refer to the information of the engine below.**
- **Engine WSM Title: 03-M-E3B SERIES, 03-M-DI-E3B SERIES, 03-M-E3BG SERIES**
- **Web PDF-Code: No. 9Y111-02570**
- **Hard Copy-Code: No. 9Y121-02570**
- **CD-ROM-Code: No. 9Y131-02570**

June, 2011

G GENERAL

GENERAL

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1. MINOR CHANGE NEW FEATURE

Following new features are incorporated in the minor change models for EU-version machine: KX101-3α3, U35-3α3.

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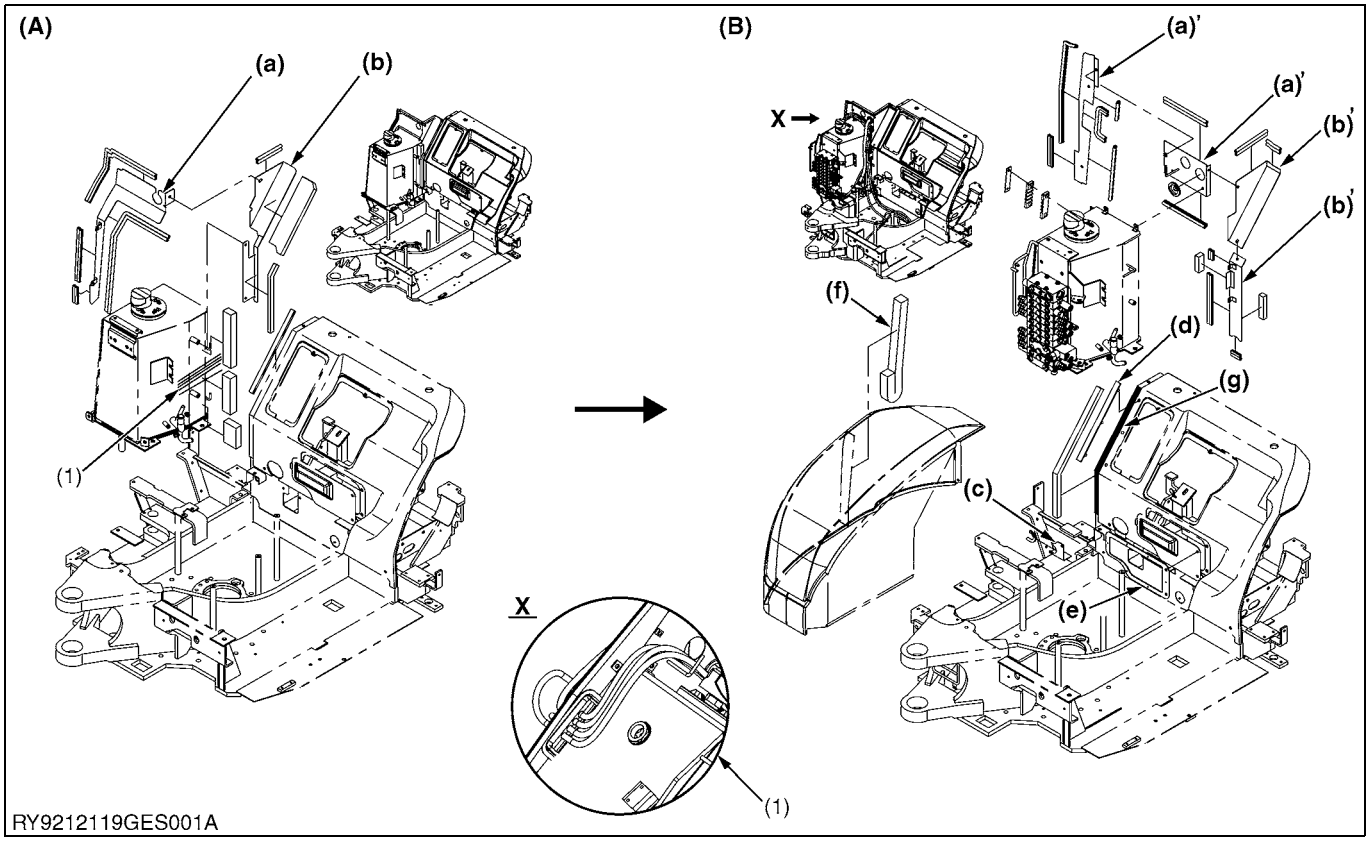
[1] PARTITIONS STRUCTURE MODIFICATION AROUND THE DRIVER'S SEAT



(1) Pilot Hose Routing (around the hydraulic oil tank) **(A) KX101-3α2, U35-3α2** **(B) KX101-3α3, U35-3α3**

Measures against Hot Air in the Cabin

1. Improve the quality of the seal
   - All the trims between the partition plates **(a)'** and the tank will be thinner to the tightening direction.
   - Change the five hoses route from the unload valve for the partition structure improvement.
   - Add the partition plate **(c)** between the oil cooler return hose and the swivel frame.
   - Add the seal materials **(f)** on the bonnet (R) to adhere to the partition plate **(a)'**.
   - Place **(g)** and the partition plates **(b)'** to lap slightly each other.

2. Prevent the strain of the bonnet (block heat coming into the cabin)
   - Add the reinforcing materials **(d)**, **(e)**.

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(1) Seal materials and trims are added to the right bonnet side

(1) Seal material (2) Trims

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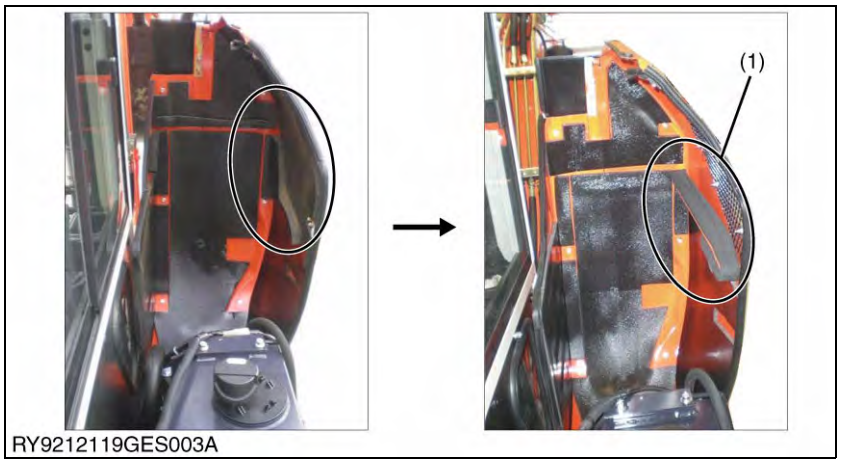

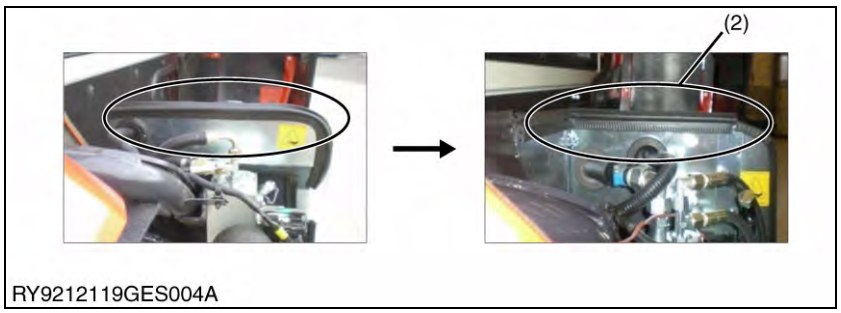

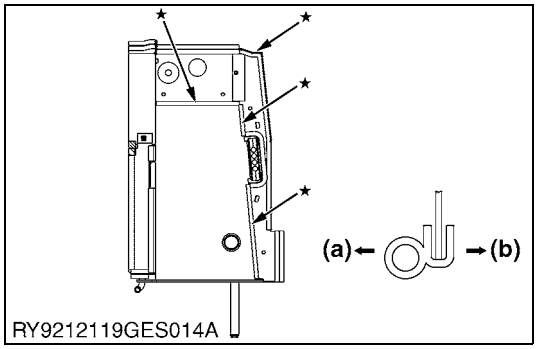

★Marked trims installation direction

(a) Tank Side (Front) **(b) Engine Room Side (Rear)**

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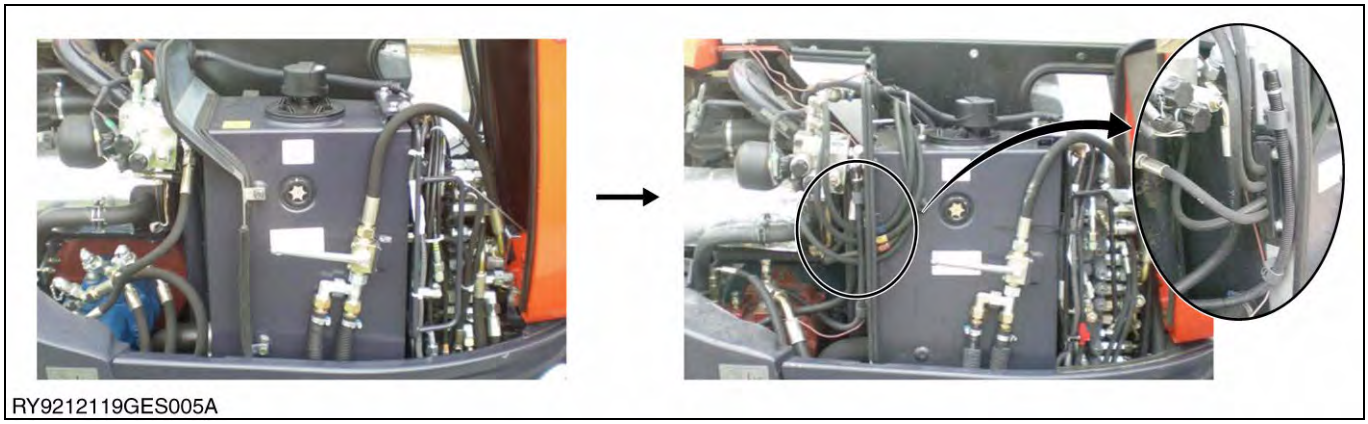
(2) The positions of some hydraulic hoses are changed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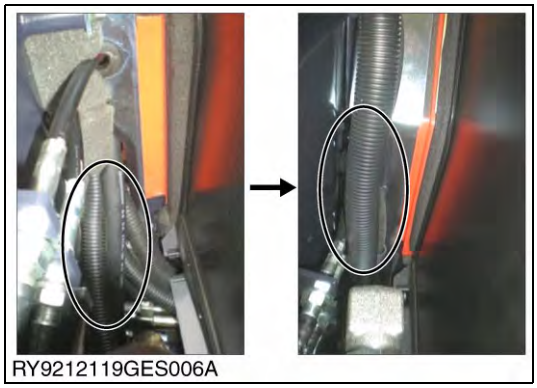
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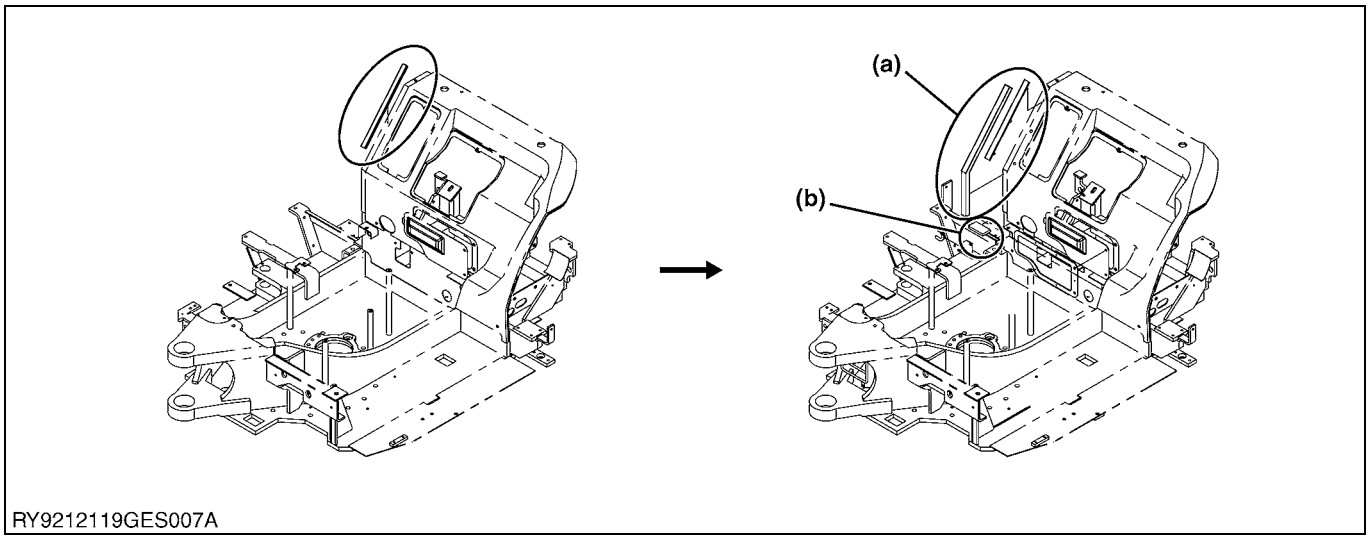
(3) Resin parts behind seat are reinforced



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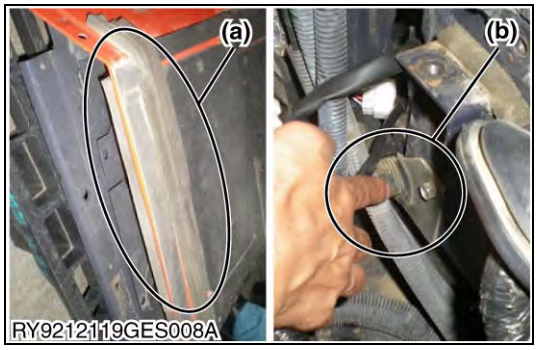

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[2] BONNETS SHAPE MODIFICATION

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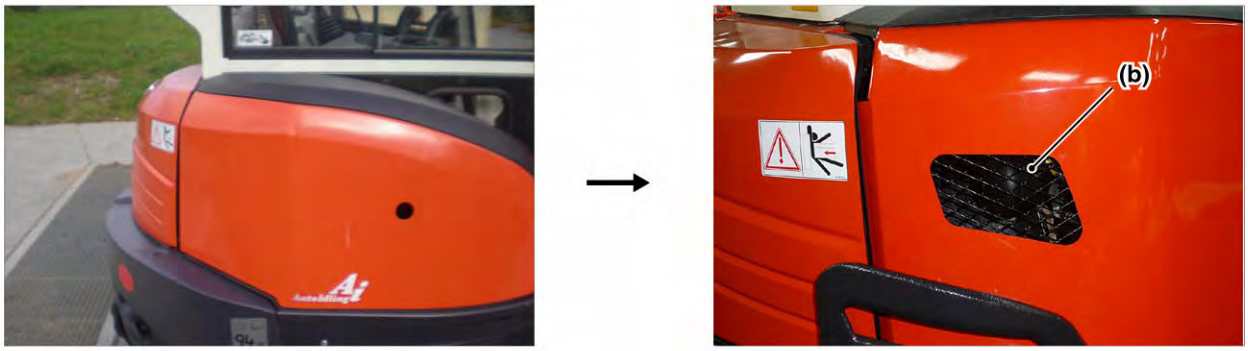

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■ **NOTE**

- **(a): The left side bonnet (air intake side) open area dimension is increased about 60% for more air intake.**
- **(b): The slits are added to the right side bonnet (air exhaust side) for more air exhaust.**

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[3] HYDRAULIC SYSTEM MODIFICATION

As all operations in this one-pump system are under LS control, it leads to improved fuel consumption.

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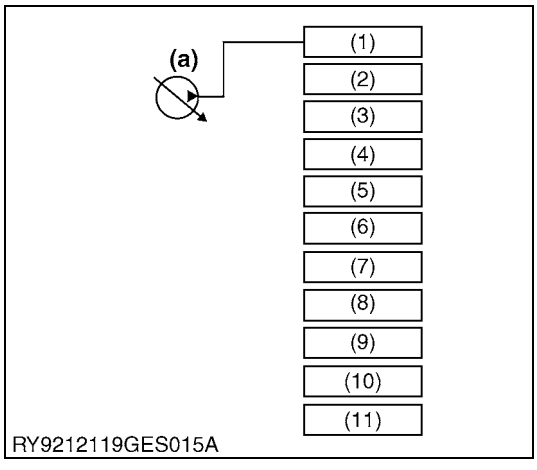

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Open → 1-Pump LS control

LS control section	(1) Inlet
	(2) Swivel
	(3) Swing
	(4) Blade
	(5) AUX1
	(6) Arm
	(7) Travel Left
	(8) Travel Right
	(9) Boom
	(10) Bucket
	(11) Outlet

- The pressure regulator valve controls the flow without affecting the load. The pump uses a swash-plate to control the required flow volume.

(a) Pump

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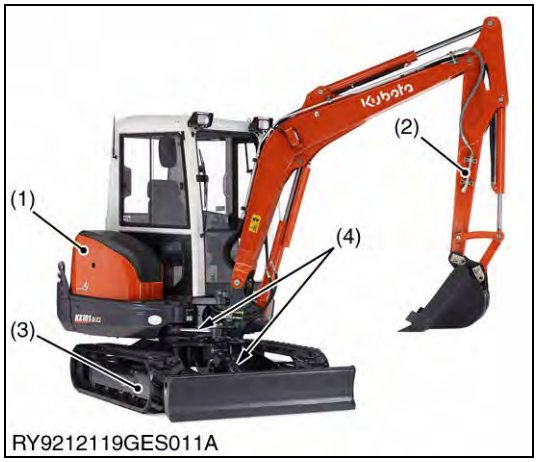
[4] OTHER CHANGED POINTS



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(1)	New engine model • D1503-M →D1803-M
(2)	Increase in the AUX Max. flow • Theoretical flow [L (U.S.gal) / min] 39.1 (10.3) →55.0 (14.5)
(3)	Automatic speed reduction system is added to the travel motors
(4)	New supplier • Swing cylinder Leduc → Hendry • Blade cylinder Leduc → Hendry

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[5] CHANGED POINTS OF SPECIFICATIONS

Actuators speed

		KX101-3α3			U35-3α3		
		Standard value	Range of value		Standard value	Range of value	
			Lower limit	Upper limit		Lower limit	Upper limit
Boom	Up	2.5 sec	2.8 sec	2.2 sec	2.4 sec	2.7 sec	2.1 sec
	Down	2.8 sec	3.1 sec	2.5 sec	2.7 sec	3.0 sec	2.4 sec
Arm	Crowd	2.9 sec	3.2 sec	2.6 sec	2.9 sec	3.2 sec	2.6 sec
	Dump	2.6 sec	2.9 sec	2.3 sec	2.6 sec	2.9 sec	2.3 sec
Bucket	Crowd	3.0 sec	3.3 sec	2.7 sec	3.0 sec	3.3 sec	2.7 sec
	Dump	2.0 sec	2.3 sec	1.7 sec	2.0 sec	2.3 sec	1.7 sec
Swing	Left	4.8 sec	5.1 sec	4.5 sec	4.6 sec	4.9 sec	4.3 sec
	Right	6.5 sec	6.8 sec	6.2 sec	6.2 sec	6.5 sec	5.9 sec
Blade	Up	2.7 sec	3.0 sec	2.4 sec	2.7 sec	3.0 sec	2.4 sec
	Down	2.9 sec	3.2 sec	2.6 sec	2.9 sec	3.2 sec	2.6 sec
Swivel	Left	9.0 rpm	9.9 rpm	8.1 rpm	9.0 rpm	9.9 rpm	8.1 rpm
	Right						
Travel	1F Forward	3.0 km/h 1.86 mph	3.3 km/h 2.05 mph	2.7 km/h 1.86 mph	3.0 km/h 1.86 mph	3.3 km/h 2.05 mph	2.7 km/h 1.86 mph
	1F Backward						
	2F Forward	5.1 km/h 3.17 mph	5.6 km/h 3.48 mph	4.6 km/h 2.86 mph	5.1 km/h 3.17 mph	5.6 km/h 3.48 mph	4.6 km/h 2.86 mph
	2F Backward						

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[6] WATER AND OIL QUANTITY

		KX101-3α3	U35-3α3	Remarks
Radiator		5.6 L 1.5 U.S.gal		KUBOTA LLC-N-50F 50%
Reserve tank		1.6 L 0.42 U.S.gal		
Engine crank case		5.3 L 1.40 U.S.gal		SAE 10W-30 (CF or CI-4)
Hydraulic oil	Full	55 L 14.53 U.S.gal		ISO VG46
	Tank	36 L 9.51 U.S.gal		ISO VG46
Travel motor		0.6 L 0.16 U.S.gal		SAE90 (API GL-4)
Track roller		70 mL 4.0 cu.in		SAE30 (CD)
Carrier roller		60 mL 3.66 cu.in		SAE30 (CD)
Front idler		80 mL 4.88 cu.in		SAE30 (CD)
Fuel tank		68 L 18.0 U.S.gal		Diesel Fuel JIS #3 (Initial)

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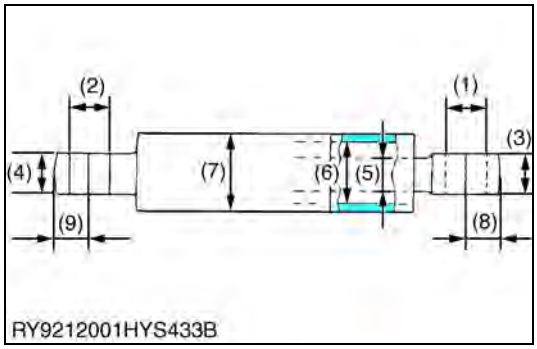
[7] HYDRAULIC CYLINDER

(1) Swing Cylinder and Blade Cylinder



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New supplier

	Swing	Blade
(1)	40 mm 1.57 in.	45 mm 1.77 in.
(2)	40 mm 1.57 in.	45 mm 1.77 in.
(3)	50 mm 1.97 in.	
(4)	50 mm 1.97 in.	
(5)	40 mm 1.57 in.	45 mm 1.77 in.
(6)	80 mm 3.15 in.	85 mm 3.35 in.
(7)	93 mm 3.66 in.	100 mm 3.94 in.
(8)	40 mm 1.57 in.	45 mm 1.77 in.
(9)	40 mm 1.57 in.	50 mm 1.97 in.
Max. Compressed length	692.5 mm 27.26 in.	492 mm 19.37 in.
Stroke	408.5 mm 16.1 in.	154 mm 6.06 in.

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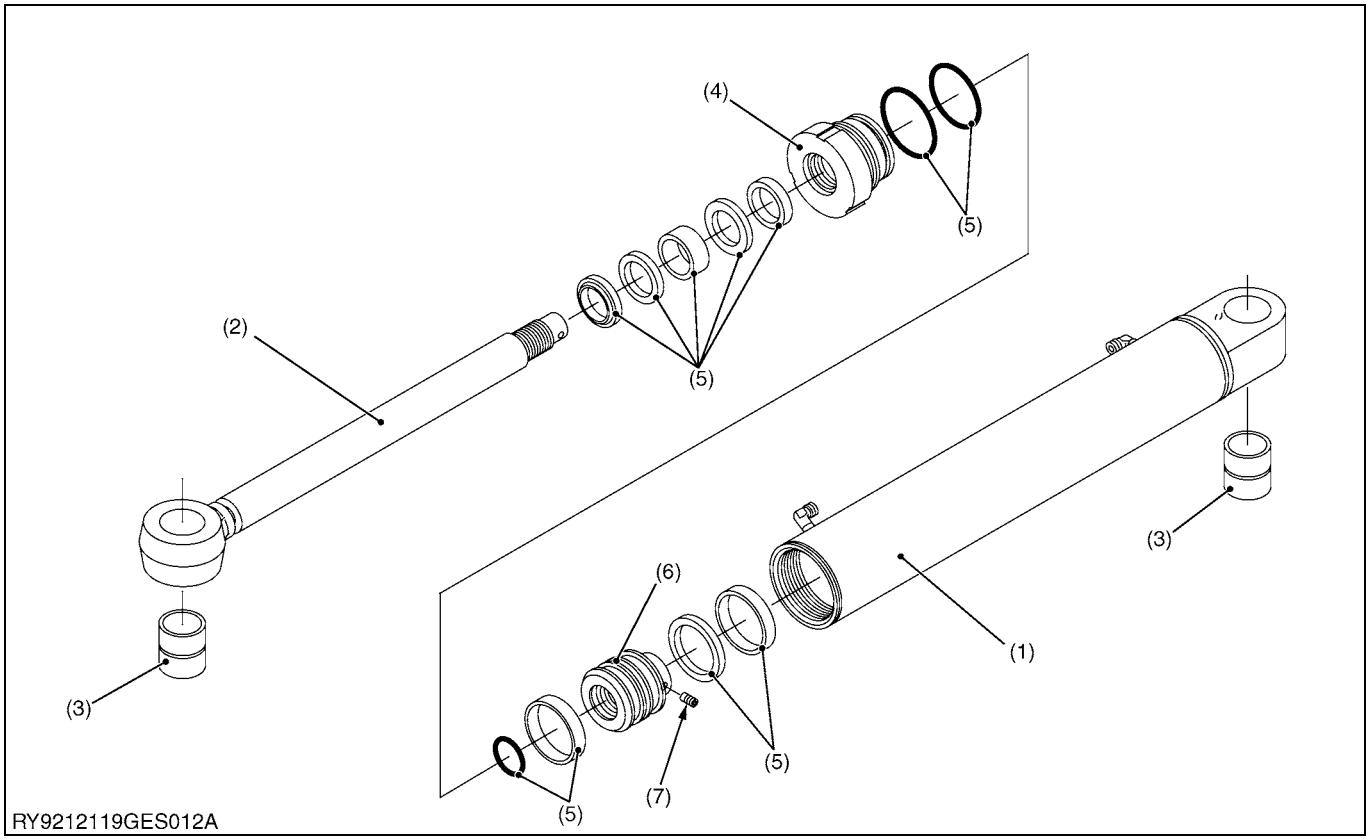
[A] Swing Cylinder Components



No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Cylinder Tube	1		(5)	Seal Kit	1	
(2)	Piston Rod	1		(6)	Piston	1	
(3)	Bushing	2		(7)	Set Screw	1	
(4)	Cylinder Head	1					

Tightening torque	Cylinder Head	250 to 280 N·m 25.5 to 28.5 kgf·m 184 to 207 lbf·ft
	Piston	250 to 280 N·m 25.5 to 28.5 kgf·m 184 to 207 lbf·ft

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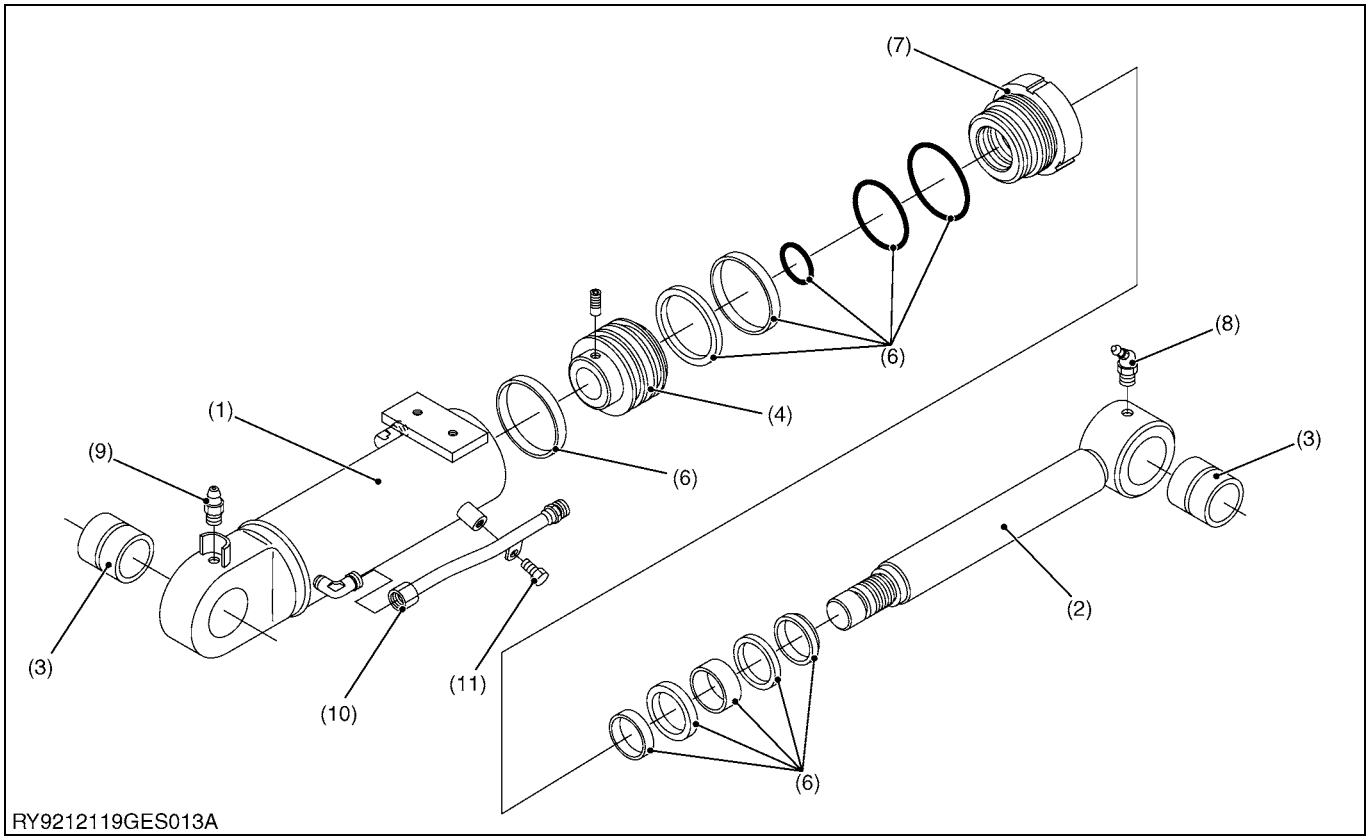
[B] Blade Cylinder Components



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No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Cylinder Tube	1		(7)	Cylinder Head	1	
(2)	Piston Rod	1		(8)	Grease Nipple	1	
(3)	Bushing	2		(9)	Grease Nipple	1	
(4)	Piston	1		(10)	Pipe Assy	1	
(5)	Set Screw	1		(11)	Bolt	1	
(6)	Seal Kit	1					

Tightening torque	Cylinder Head	250 to 280 N·m 25.5 to 28.5 kgf·m 184 to 207 lbf·ft
	Piston	250 to 280 N·m 25.5 to 28.5 kgf·m 184 to 207 lbf·ft

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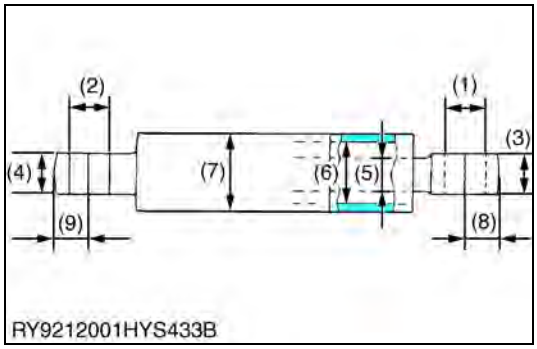
(2) FYI (For your Information)

Boom cylinder, arm cylinder and bucket cylinder are common parts for KX101-3α, U35-3α series.



		Boom	Arm	Bucket
(1)		40 mm 1.57 in.	45 mm 1.77 in.	40 mm 1.57 in.
(2)		45 mm 1.77 in.	45 mm 1.77 in.	40 mm 1.57 in.
(3)		55 mm 2.17 in.	60 mm 2.36 in.	50 mm 1.97 in.
(4)		60 mm 2.36 in.	60 mm 2.36 in.	50 mm 1.97 in.
(5)		45 mm 1.77 in.	45 mm 1.77 in.	40 mm 1.57 in.
(6)		85 mm 3.35 in.	75 mm 2.95 in.	65 mm 2.56 in.
(7)		99 mm 3.9 in.	87 mm 3.42 in.	76 mm 3.0 in.
(8)		40 mm 1.57 in.	45 mm 1.77 in.	40 mm 1.57 in.
(9)		53 mm 2.09 in.	45 mm 1.77 in.	40 mm 1.57 in.
Max. Compressed length	KX101-3α3	834 mm 32.8 in.	896.5 mm 35.3 in.	834 mm 32.4 in.
	U35-3α3	828.5 mm 32.6 in.		
Full Stroke	KX101-3α3	506 mm 19.9 in.	583.5 mm 22.97 in.	539 mm 21.2 in.
	U35-3α3	501.5 mm 19.8 in.		

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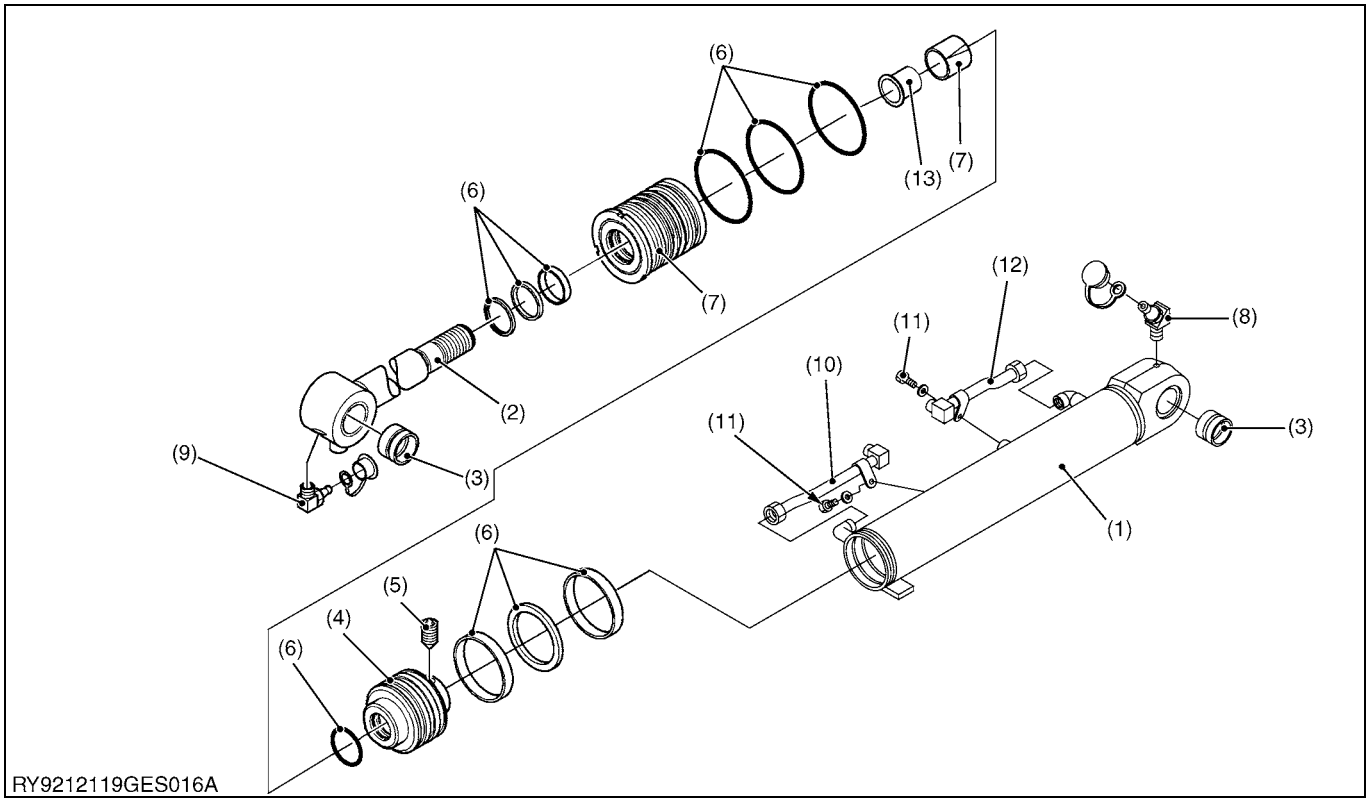
[A] Boom Cylinder Components



No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Cylinder Tube	1		(8)	Grease Nipple	1	
(2)	Piston Rod	1		(9)	Grease Nipple	1	
(3)	Bushing	2		(10)	Pipe Assy	1	
(4)	Piston	1		(11)	Bolt	2	
(5)	Set Screw	1		(12)	Pipe Assy	1	
(6)	Seal Kit	1		(13)	Spacer	1	
(7)	Cylinder Head Assy	1					

Tightening torque	Cylinder Head	350 to 400 N·m 35.7 to 40.8 kgf·m 258 to 295 lbf·ft
	Piston	480 to 720 N·m 48.9 to 73.4 kgf·m 354 to 531 lbf·ft
	Set Screw (Locked with loctite 243)	20 N·m 2.04 kgf·m 14.8 lbf·ft

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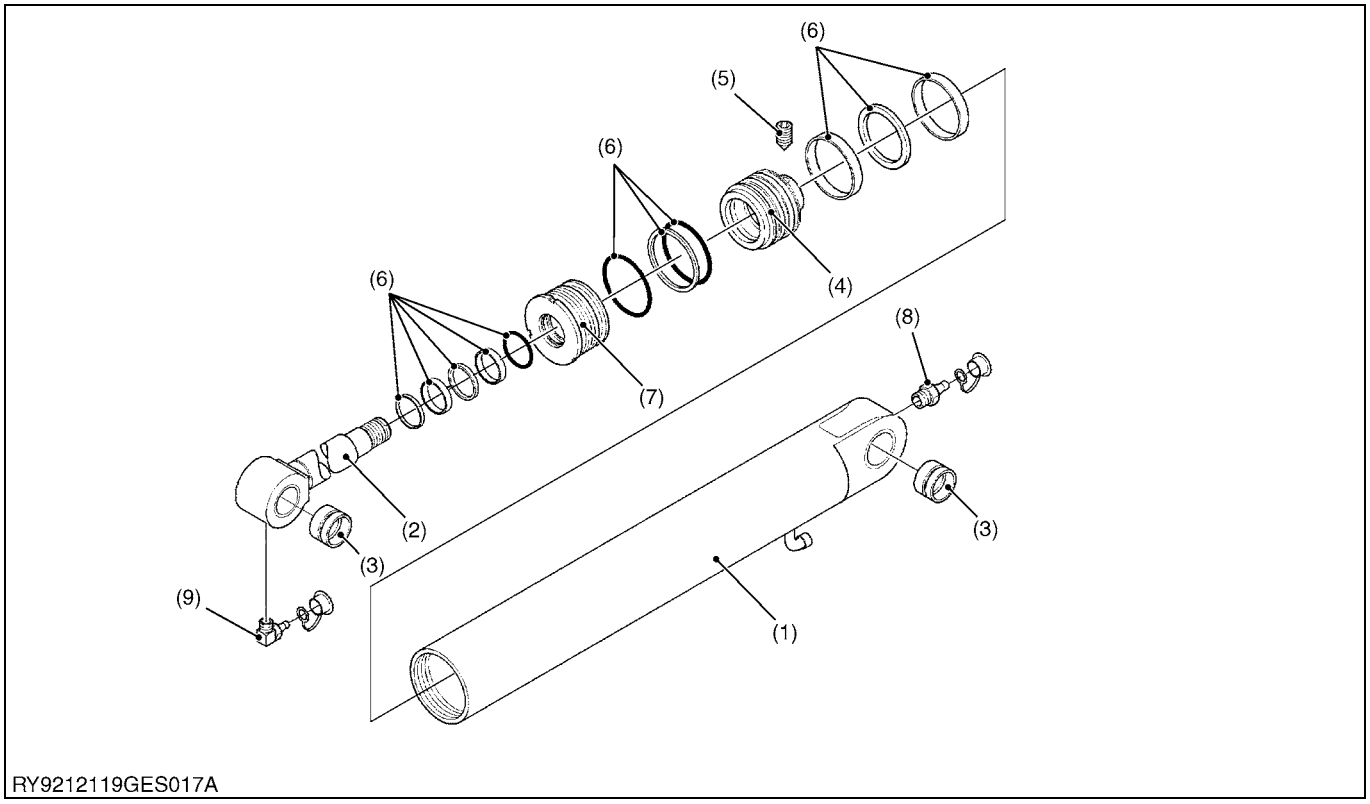
[B] Arm Cylinder Components



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No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Cylinder Tube	1		(6)	Seal Kit	1	
(2)	Piston Rod	1		(7)	Cylinder Head	1	
(3)	Bushing	2		(8)	Grease Nipple	1	
(4)	Piston	1		(9)	Grease Nipple	1	
(5)	Set Screw	1					

Tightening torque	Cylinder Head	350 to 400 N·m 35.7 to 40.8 kgf·m 258 to 295 lbf·ft
	Piston	480 to 720 N·m 48.9 to 73.4 kgf·m 354 to 531 lbf·ft
	Set Screw (Locked with loctite 243)	20 N·m 2.04 kgf·m 14.8 lbf·ft

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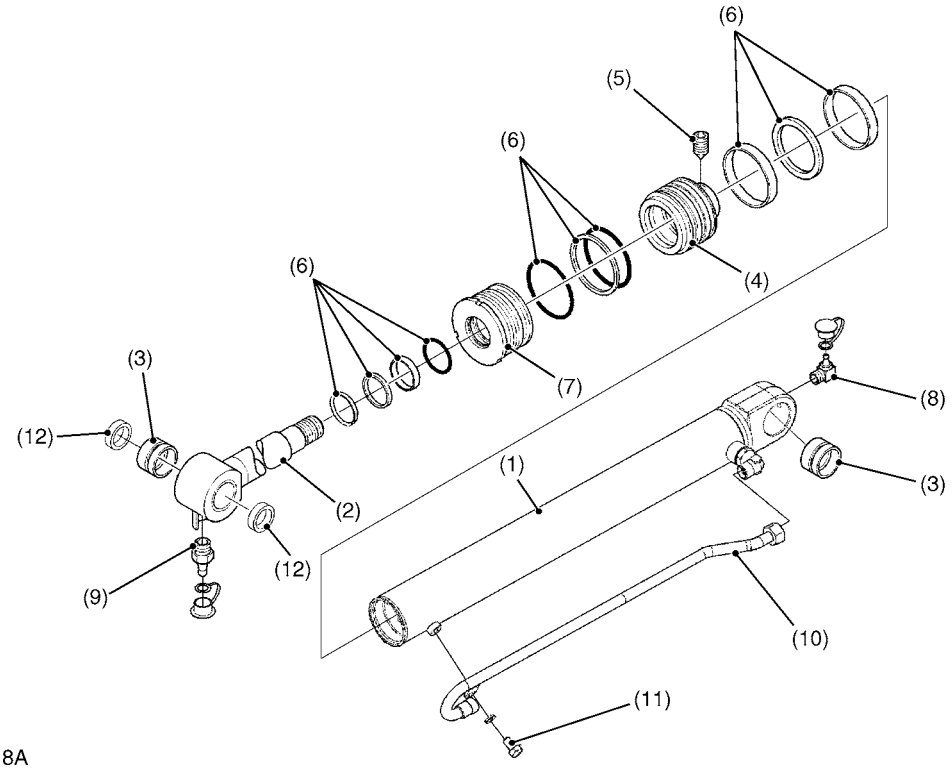
[C] Bucket Cylinder Components



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No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Cylinder Tube	1		(7)	Cylinder Head	1	
(2)	Piston Rod	1		(8)	Grease Nipple	1	
(3)	Bushing	2		(9)	Grease Nipple	1	
(4)	Piston	1		(10)	Pipe Assy	1	
(5)	Set Screw	1		(11)	Bolt	1	
(6)	Seal Kit	1		(12)	Dust Seal	2	

Tightening torque	Cylinder Head	250 to 300 N·m 25.5 to 30.5 kgf·m 184 to 221 lbf·ft
	Piston	380 to 570 N·m 38.7 to 58.1 kgf·m 280 to 420 lbf·ft
	Set Screw (Locked with loctite 243)	20 N·m 2.04 kgf·m 14.8 lbf·ft

RY9212119GEG0019US0

1 ENGINE

GENERAL

CONTENTS

1. ENGINE SPECIFICATIONS

		KX101-3α3, U35-3α3	Remarks
Model		D1803-M-E3-BH-EU1	
Number of cylinder		3	
Bore x Stroke		87 x 102.4 mm 3.43 x 4.03 in.	
Displacement		1826 cc 111.44 in^3	
Max. output/rpm		22.9 kW / 2300 rpm 31.1 PS / 2300 rpm 30.7 HP / 2300 rpm	ISO 9249 NET SAEJ 9249 NET
Compression ratio		24.3 : 1	
Max. torque/rpm		110.8 N·m / 1600 rpm 110.3 kgf·m / 1600 rpm 81.7 lbf·ft / 1600 rpm	
Dimensions: L x W x H		604 x 508 x 680 mm 23.8 x 20 x 26.8 in.	
Dry weight		158 kg 348.3 lbs	
Valve clearance		0.18 to 0.22 mm 0.0071 to 0.0087 in.	Cold condition
Firing sequence		1-2-3	
Combustion chamber		IDI	
Compression pressure		3.23 to 3.72 MPa 33 to 38 kgf/cm^2 468 to 539 psi	At 290 rpm
Fan belt		Mitsuboshi RE-MF6410	
Fuel consumption ratio		241.8 g/kWh 177.8 g/PSh 0.400 lbs/HPh	Gross value
Engine speed with idling		1150 to 1300 rpm	On the machine
Engine oil pressure with rated engine rpm		196 to 445 kPa 2.0 to 4.5 kgf/cm^2 28.4 to 64.5 psi	
Fuel injection pressure 1st stage/2nd stage		13.7 to 14.7 MPa 140 to 150 kgf/cm^2 1987 to 2132 psi	
Engine oil consumption ratio		Less than 0.95 g/kWh Less than 0.70 g/PSh Less than 0.00156 lbs/HPh	Gross
Alternator		12 V (360 W)	
Charging current		30 A	
Regulation voltage		14.2 to 14.8 V	
Battery	ETN	572 033 072	
	DIN	57233	
	JIS	80D26R	
Electrolyte gravity		More than 1.26	
Starter		12 V - 2.0 kW	
Glow plug		Approx. 0.9 Ω	

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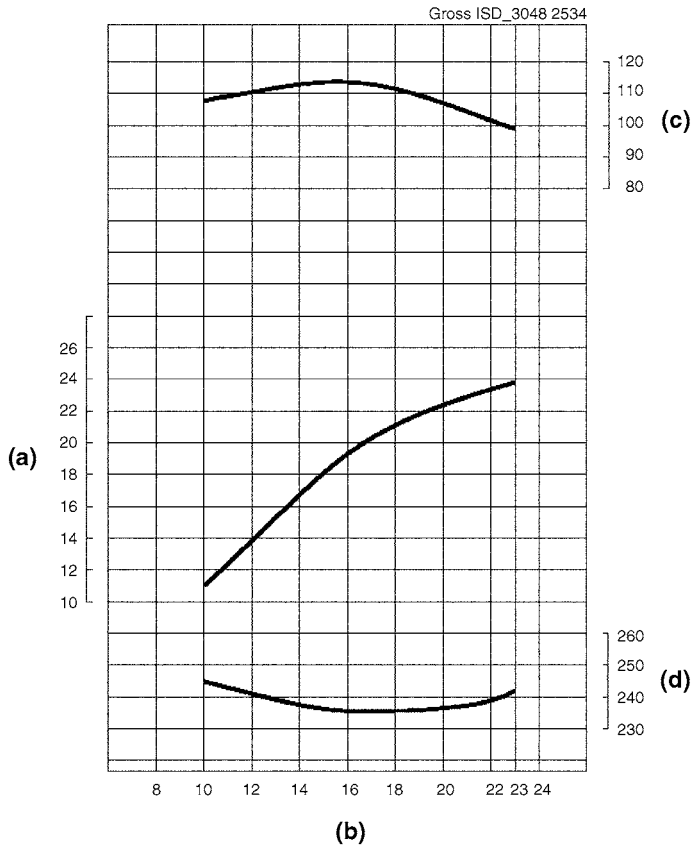
2. PERFORMANCE CURVE



RY9212119ENS001A

(a) Brake Horse Power (kW) **(b) Engine Speed (rpm x 100)** **(c) Torque (N·m)** **(d) BSFC (g/kW·h)**

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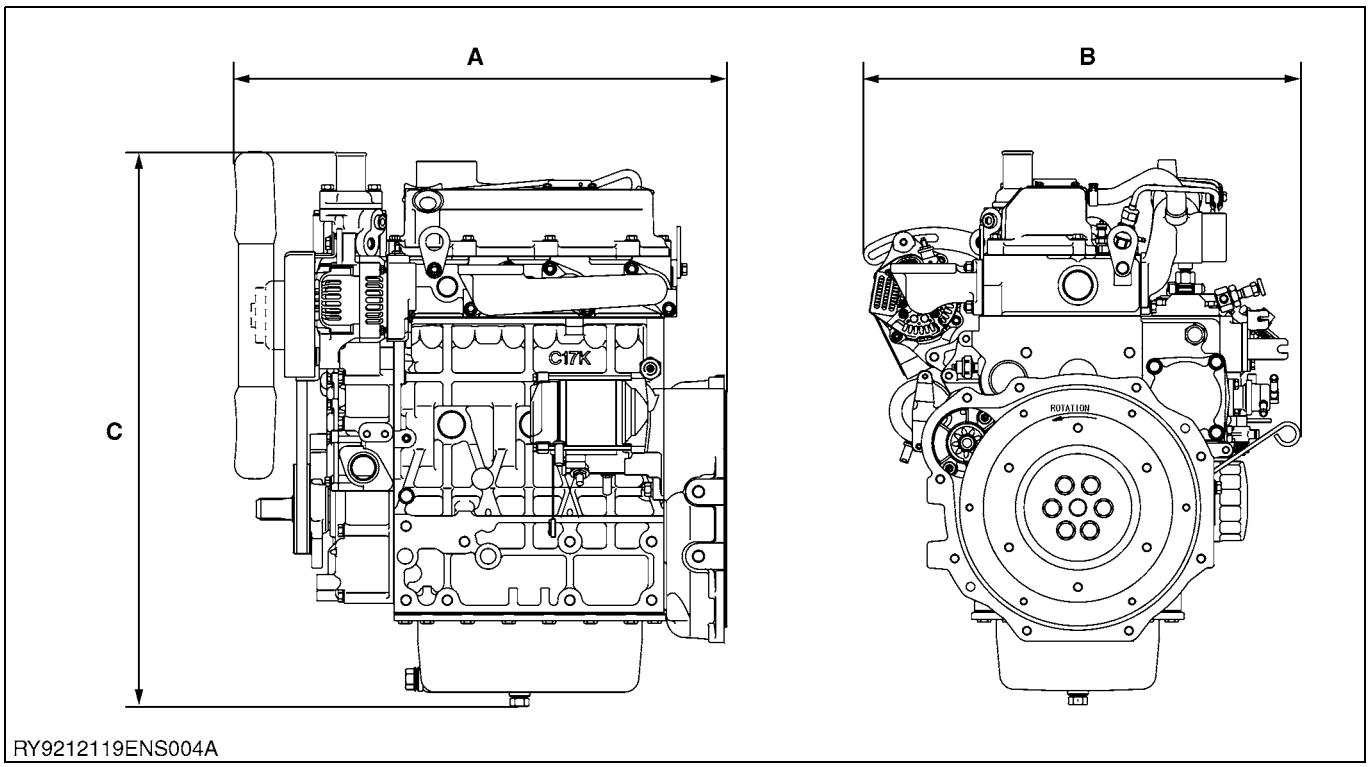
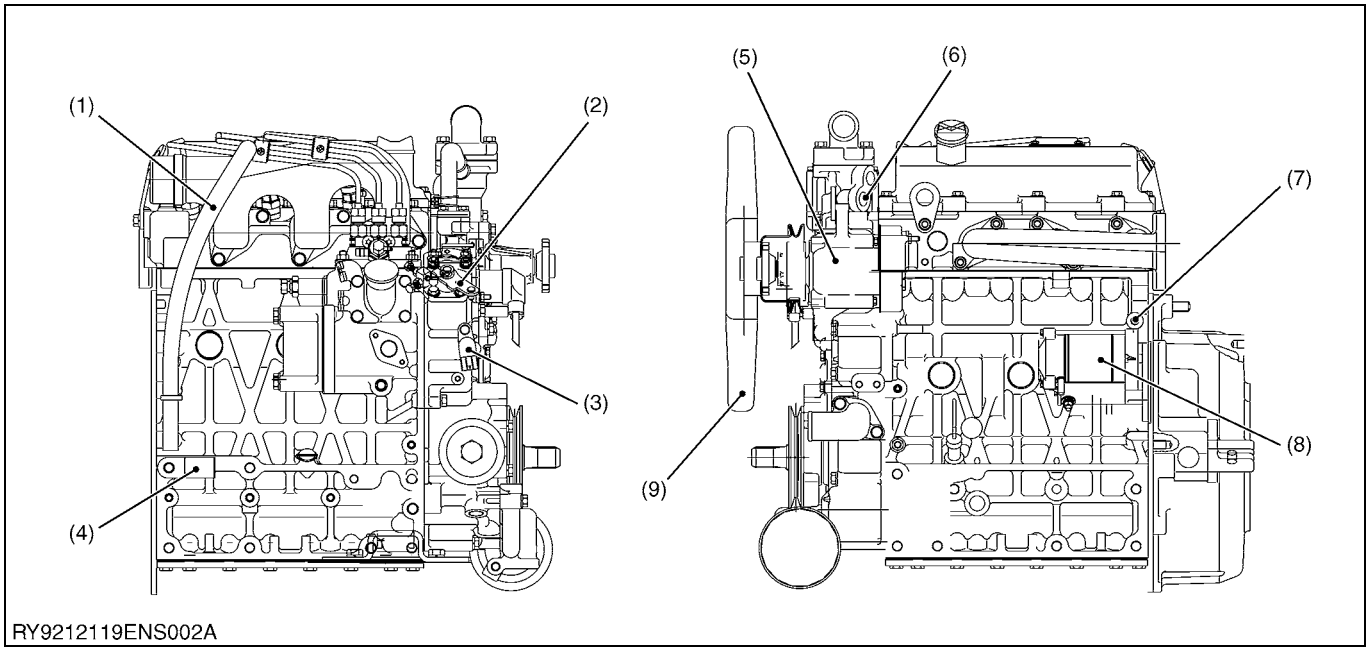
3. DIMENSIONS



RY9212119ENS004A

	D1503-M	D1803-M
A	567.0 mm (22.32 in.)	560.0 mm (22.05 in.)
B	512.0 mm (20.16 in.)	480.0 mm (18.90 in.)
C	643.0 mm (25.31 in.)	648.0 mm (25.51 in.)

Components layout



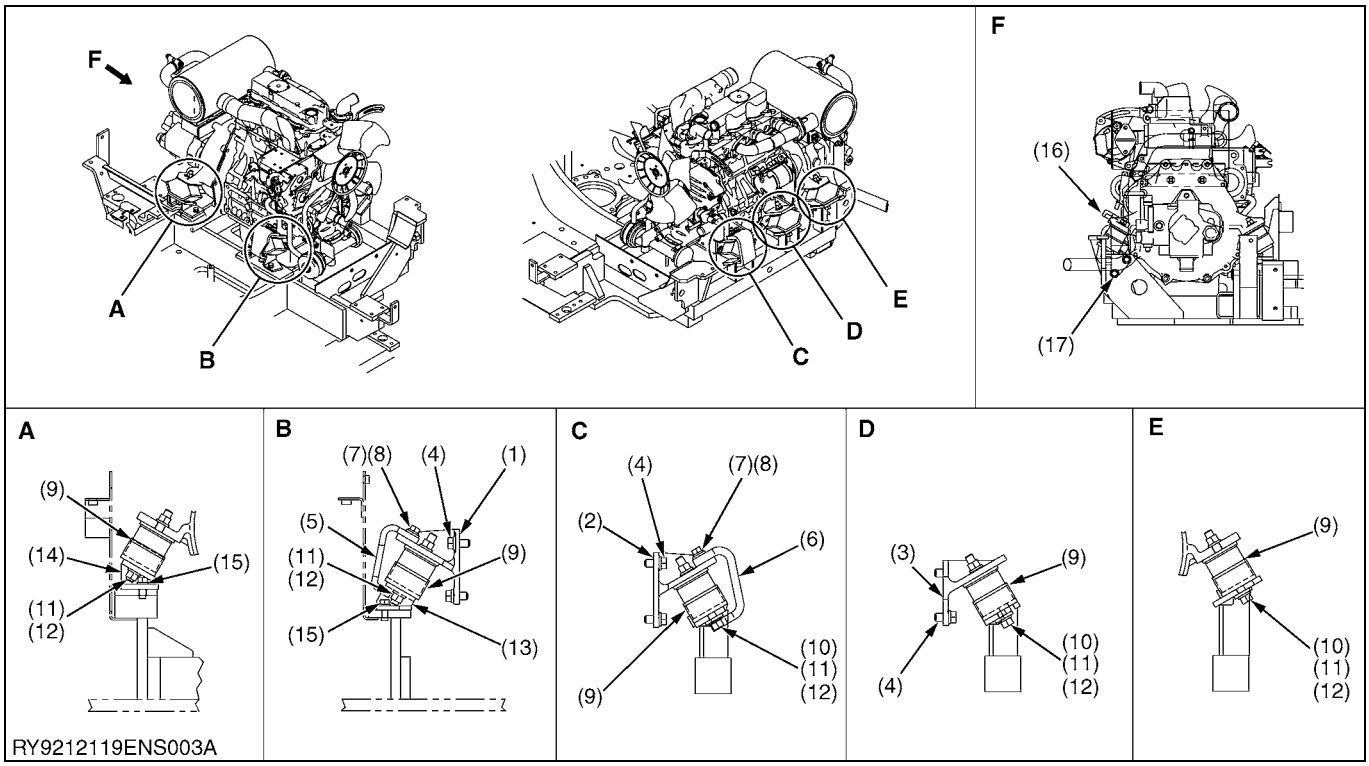
RY9212119ENS002A

(1) Breather Pipe
(2) Acceleration
(3) Rotation Sensor
(4) Hose Clamp
(5) Alternator
(6) Temperature Sensor
(7) Oil Switch
(8) Starter
(9) Fan

RY9212119END0003US0

4. ENGINE MOUNT

[1] ENGINE MOUNT STRUCTURAL COMPONENTS



(1) Bracket (1, Engine)
(2) Bracket (2, Engine)
(3) Bracket (5, Engine)
(4) Bolt, Sems
(5) Stopper (1, Engine)
(6) Stopper (2, Engine)
(7) Bolt, Sems
(8) Washer
(9) Cushion
(10) Washer, Plain
(11) Washer, Spring Lock
(12) Hex. Nut
(13) Support (1, Engine)
(14) Support (2, Engine)
(15) Bolt, Sems
(16) Stopper (3, Engine)
(17) Bolt, Sems

Tightening torque	Bolt (4) Nut (12)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft
	Bolts (15)	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

Apply thread locking compound (Loctite 302-71) onto part number (4), (12) and (15).

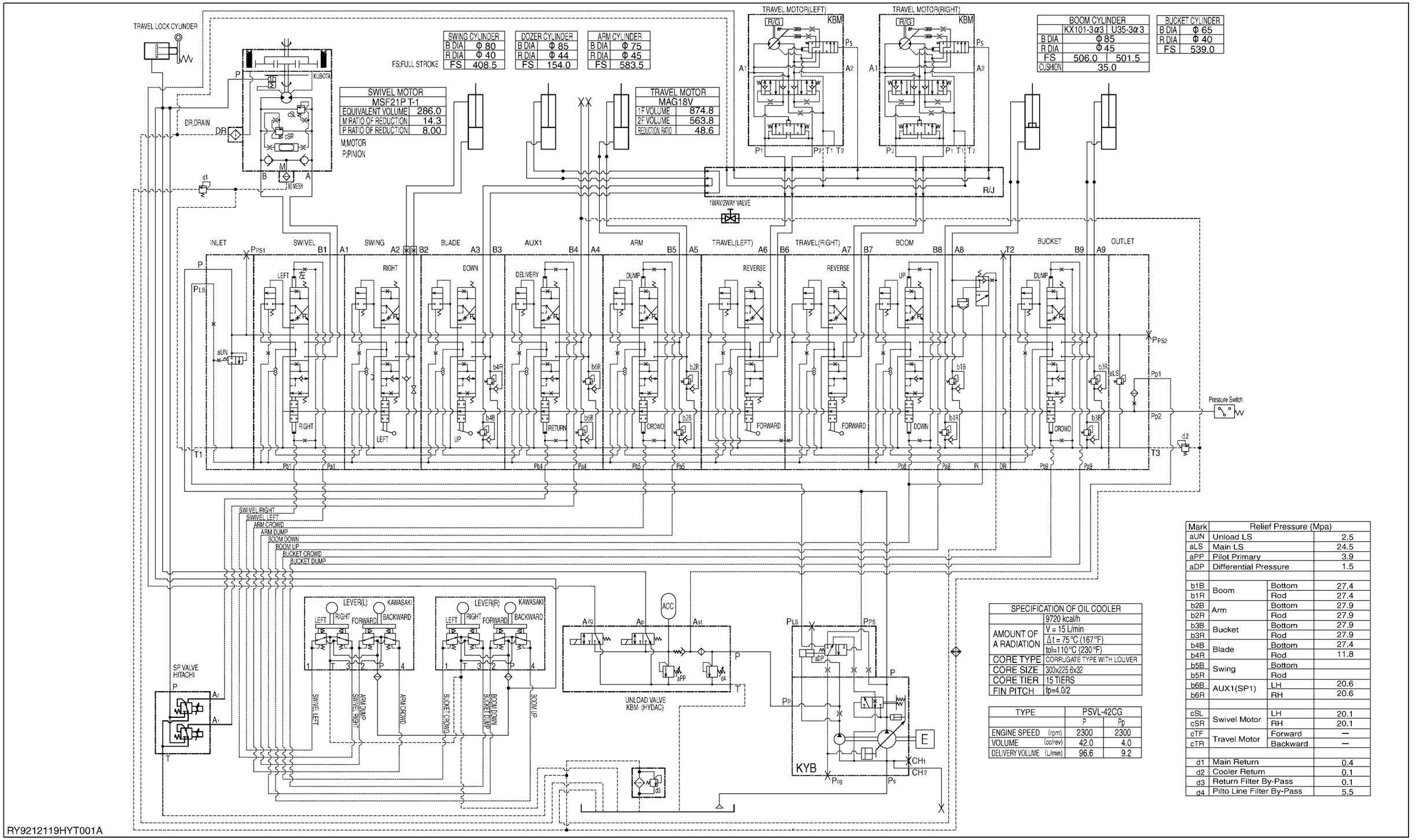
RY9212119END0004US0

2 HYDRAULIC SYSTEM

SERVICING

CONTENTS

1. DIAGRAM OF HYDRAULIC CIRCUIT



SPECIFICATION OF OIL COOLER	
AMOUNT OF A RADIATION	9720 kcal/h
	V = 15 L/min
	Δt = 75℃ (167℉)
	tol=110℃ (230℉)
CORE TYPE	CORRUGATE TYPE WITH LOUVER
CORE SIZE	300x225 6x32
CORE TIER	15 TIERS
FIN PITCH	fp=4.0/2

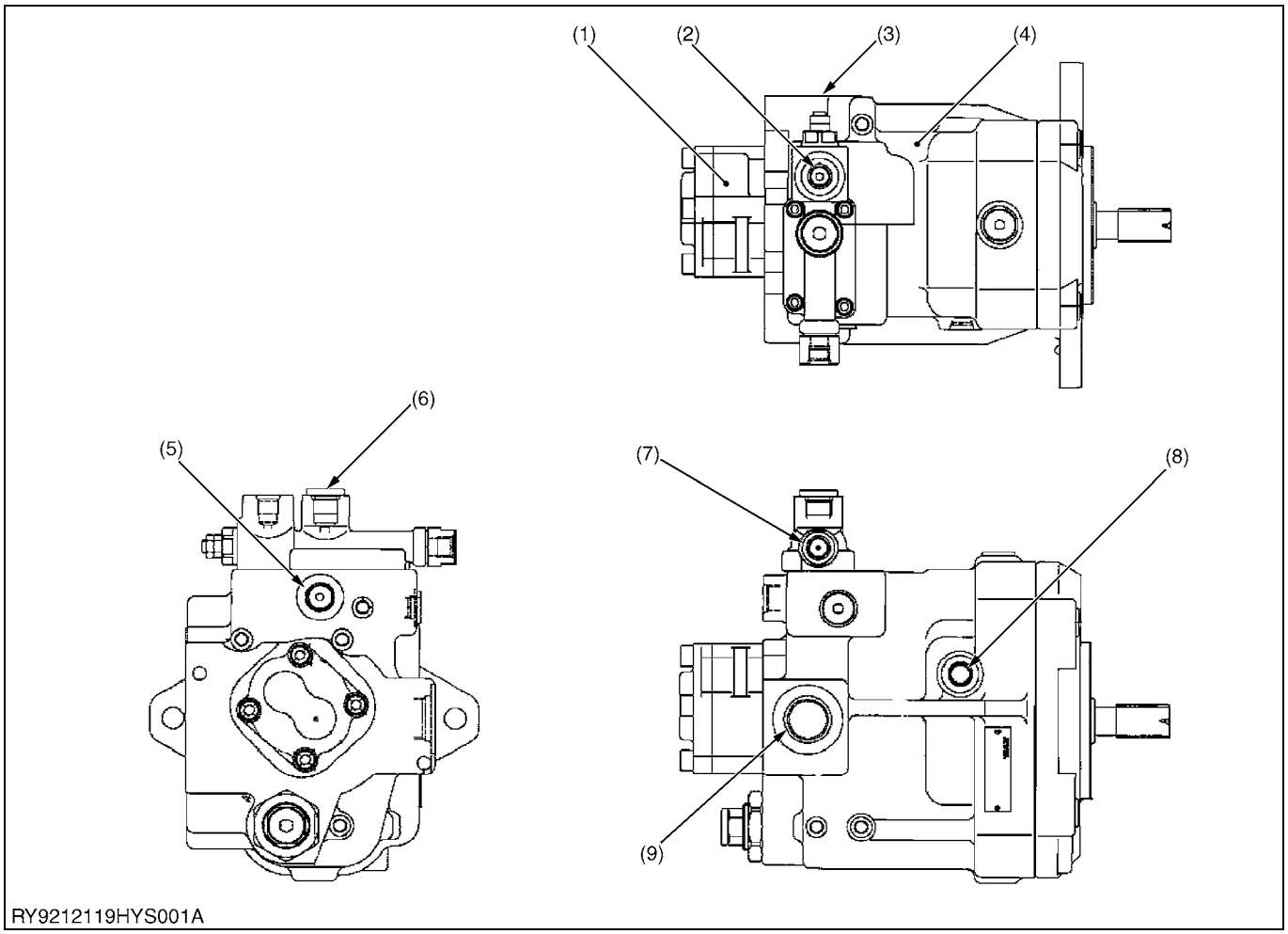
TYPE		PSVL-42CG	
		P	Pp
ENGINE SPEED	(rpm)	2300	2300
VOLUME	(cc/rev)	42.0	4.0
DELIVERY VOLUME	(L/min)	96.6	9.2

Mark	Relief Pressure (Mpa)		
aUN	Unload LS		2.5
aLS	Main LS		24.5
aPP	Pilot Primary		3.9
aDP	Differential Pressure		1.5
b1B	Boom	Bottom	27.4
b1R		Rod	27.4
b2B	Arm	Bottom	27.9
b2R		Rod	27.9
b3B	Bucket	Bottom	27.9
b3R		Rod	27.9
b4B	Blade	Bottom	27.4
b4R		Rod	11.8
b5B	Swing	Bottom	
b5R		Rod	
b6B	AUX1(SP1)	LH	20.6
b6R		RH	20.6
cSL	Swivel Motor	LH	20.1
cSR		RH	20.1
cTF	Travel Motor	Forward	—
cTR		Backward	—
d1	Main Return		0.4
d2	Cooler Return		0.1
d3	Return Filter By-Pass		0.1
d4	Pilto Line Filter By-Pass		5.5

RY9212119HYT001A

2. PUMP

[1] SPECIFICATIONS

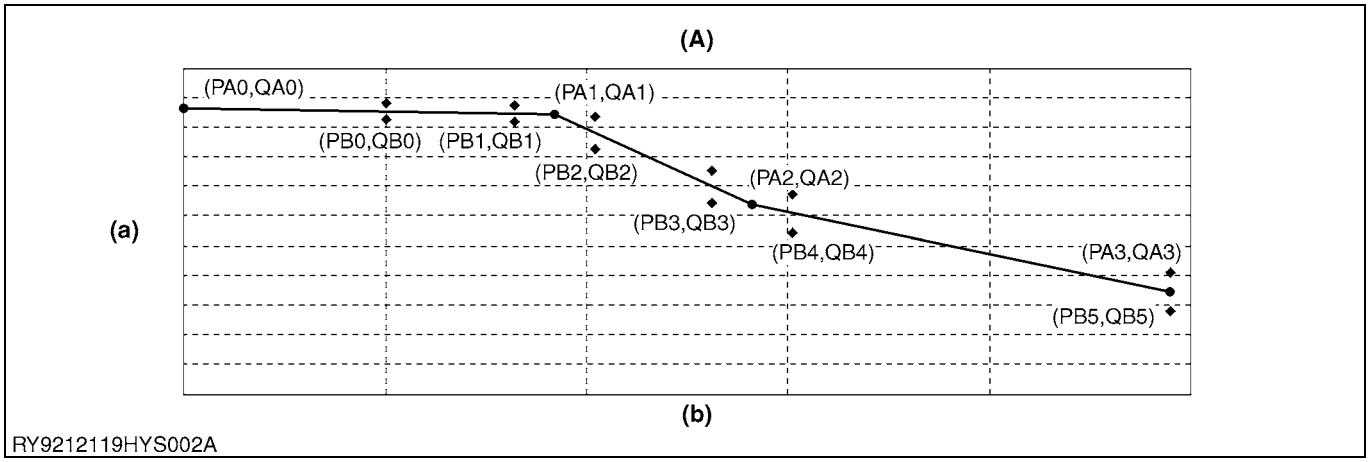


RY9212119HYS001A

(1) Gear Pump (Pilot Pump)
(2) Port PLS
(3) Port PS
(4) Variable Pump, Piston Pump (First Pump)
(5) Port PP
(6) L/S Regulator
(7) Port PPS
(8) Port T
(9) Port P

		KX101-3α3, U35-3α3
Maker		KYB
Model		PSVL-42CG
Rated RPM		2300 rpm
Piston Pump	Max. Displacement	42 cm^3/rev (2.56 cu.in./rev) (Min. 10 cm^3/rev (0.61 cu.in./rev) at 1000 rpm)
	Max. Discharge Capacity	96.6 L/min (5890 cu.in./min, 25.5 USGPM)
	Max. Pressure	24.5 MPa (250 kgf/cm^2, 3550 psi)
Pilot Pump (Gear Pump)	Max. Displacement	4.0 cm^3/rev (0.24 cu.in./rev)
	Max. Discharge Capacity	9.2 L/min (562 cu.in./min, 2.43 USGPM)
	Max. Pressure	4.9 MPa (50 kgf/cm^2, 711 psi)
Stand by Flow Rate		23 L/min (6.08 USGPM)

RY9212119HYS0001US0



(A) Piston Pump Power Constant Characteristics **(a) Delivery Flow : Q (L/min)** **(b) Pressure : P (MPa)**

(Bench Date)

Shaft speed : 2300 rpm		Total input torque : 84 N·m +0 , -3.0	
Pressure (MPa)	**Delivery flow (L/min)**	**Pressure (MPa)**	**Delivery flow (L/min)**
PAo = 0.0	QA0 = 96.6 ± 2.9	PB0 = 5.0	QB0 = 95.4 ± 2.9
PA1 = 9.2	QA1 = 94.3 (Target value)	PB1 = 8.2	QB1 = 94.6 ± 2.9
PA2 = 14.1	QA2 =63.7 (Target value)	PB2 = 10.2	QB2 = 88.1 ± 5.5
PA3 = 24.5	QA3 = 34.5 (Target value)	PB3 = 13.1	QB3 = 69.9 ± 5.5
		PB4 = 15.1	QB4 = 60.9 ± 6.5
		PB5 = 24.5	QB5 = 34.5 ± 6.5

RY9212119HYS0002US0

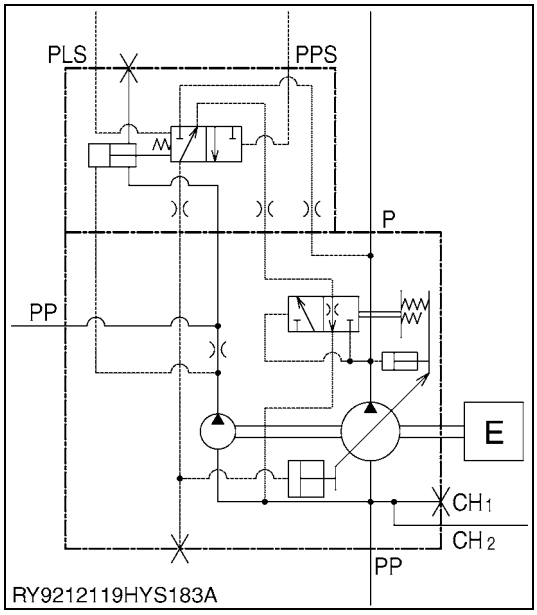
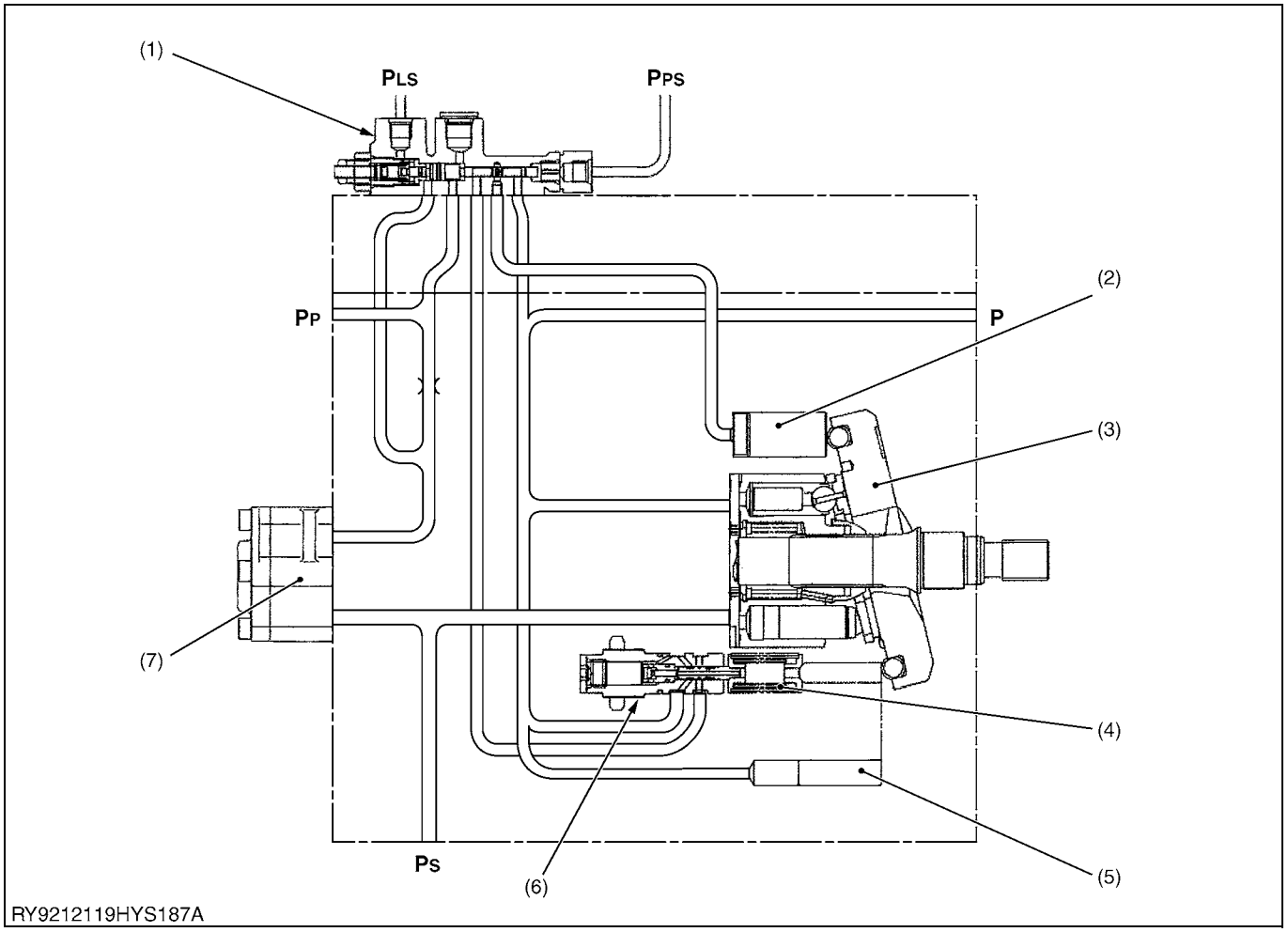


Diagram of Hydraulic Circuit

P: Piston Pump Discharge Pressure **PPS: Valve Inlet Pressure**
PP: Pilot Pump Discharge Pressure **PS: Suction Pressure**
PLS: Load Pressure **CH: Air Bleeds**

RY9212119HYS0191US0

Configuration Diagram



(1) L/S regulator
(2) Control pin B
(3) Swash plate
(4) Horsepower control spring
(5) Control pin A
(6) Horsepower control valve
(7) Gear Pump

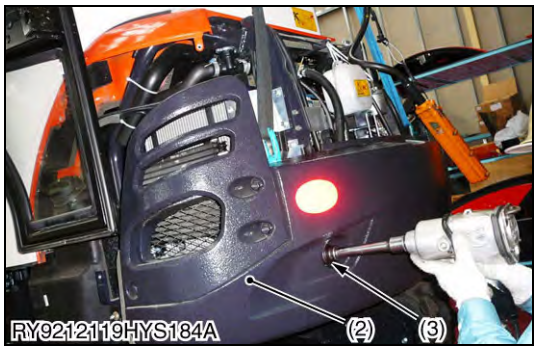
RY9212119HYS0192US0

[2] PUMP DISASSEMBLY/ASSEMBLY

CAUTION

- **When removing a hydraulic device after operating the mini-excavator, lower the bucket and blade to the ground and turn off the engine.**
- **Each of the devices and the hydraulic oil are hot and under high pressure immediately after operating the mini-excavator. If the hydraulic oil reached a high operating temperature, it may cause a burn.**
- **Oil gushing out under pressure has enough force to pierce your skin and may cause you injury. Always allow the temperature to drop and relieve any remaining pressure prior to working to remove any hydraulic equipment.**

RY9212001MBS0004US0



Removing the Rear Cover and Weight

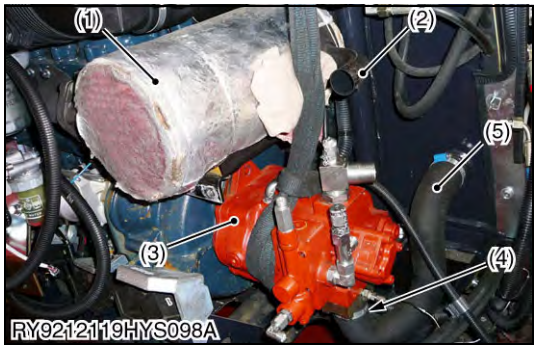
1. Open the rear bonnet, remove the snap rings and separate the gas damper and bonnet.
2. Slide the rear bonnet towards the right of the machine to remove.
3. Attach two eyebolts to the weight, connect a nylon sling to these and support the weight with a crane.
4. Remove the weight mounting bolts, lift slightly with the crane, slide the weight to the rear, and with the weight suspended, remove it from the frame.

Tightening torque	Weight	367.7 to 431.5 N·m 37.5 to 44 kgf·m 271.2 to 318.3 lbf·ft

Apply thread lock (Loctite AN302-71).

(1) Rear cover
(2) Weight
(3) Bolt

RY9212119HYS0055US0

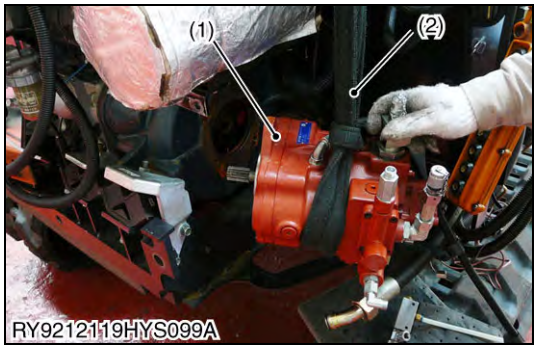


Removing the Mufflertail and Pump

1. Loosen the mufflertail clamp, then remove the mufflertail.
2. Remove all hoses from the pump and fit plugs to the adapter and disconnected hoses.
3. Loosen the suction hose tightening clamp and remove the suction hose from the pump.

(1) Muffler
(2) Mufflertail Joint
(3) Piston Pump Assy
(4) Hose Clamp
(5) Suction Hose

RY9212119HYS0004US0

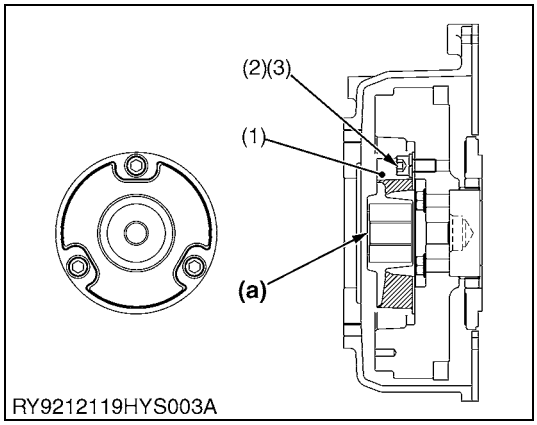


4. Suspend the pump by a nylon sling and support it with a crane. Remove the bolts in two locations, and pull the shaft of the pump suspended by the crane from the coupling.

Tightening torque	Pump	103 to 117.7 N·m 10.5 to 12 kgf·m 76 to 86.8 lbf·ft

(1) Piston Pump Assy
(2) Nylon Sling

RY9212119HYS0006US0



RY9212119HYS003A

Spline section grease application

Apply the correct amount of grease to the spline section.

■ **IMPORTANT**

- **Do not apply grease to the rubber section of the coupling.**

(1) Coupling
(2) Bolt (Socket Head)
(3) Washer (Spring Lock)
(a) Spline section grease application

RY9212119HYS0007US0

Tightening the coupling assembly bolts

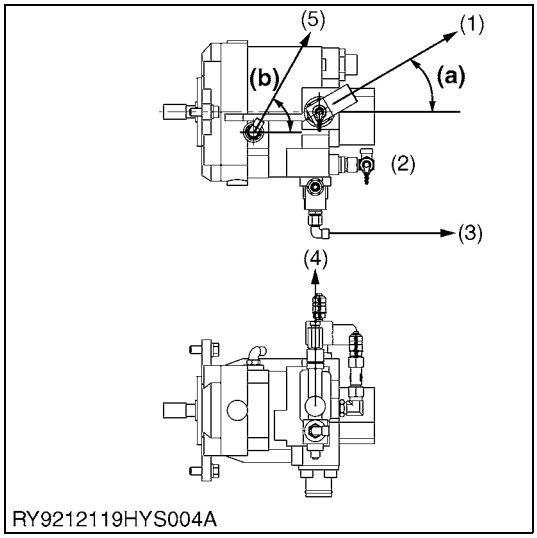
Apply an extremely thin layer of lubricating oil to the coupling seat surface, then tighten to the torque indicated in the following table.

Tightening torque	Bolt (Socket Head)	107 to 117 N·m 10.9 to 11.9 kgf·m 78.9 to 86.3 lbf·ft

■ **IMPORTANT**

- **Do not apply a threadlock.**

RY9212119HYS0008US0



RY9212119HYS004A

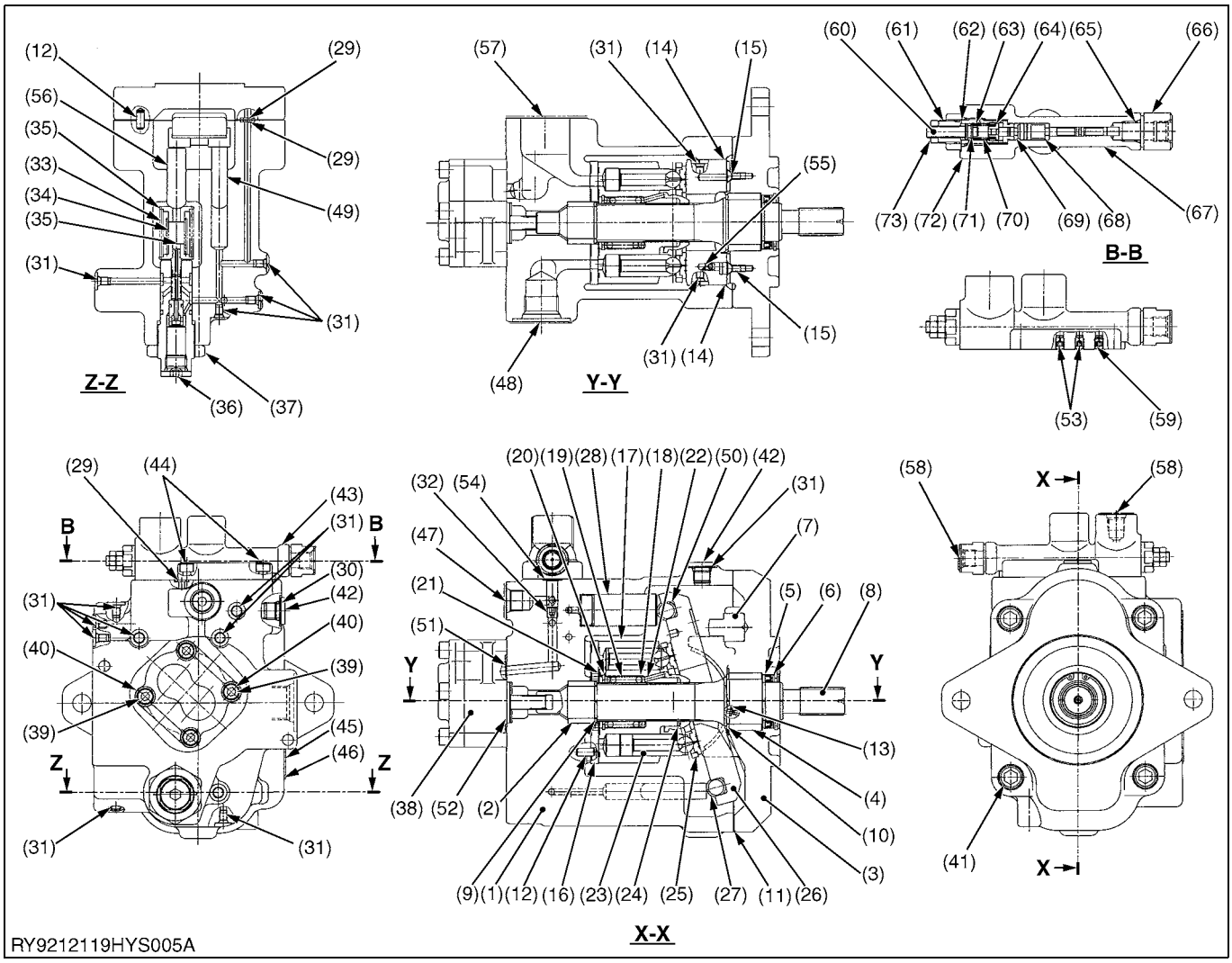
Pump Adapter Angles

(1) P
(2) PP
(3) PLS
(4) PPS
(5) Air Port
(a) 30 °
(b) 60 °

RY9212119HYS0009US0

[3] PUMP DISASSEMBLY PROCEDURES

Pump Components



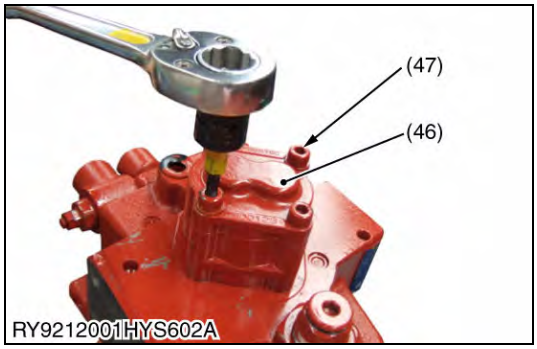
(To be continued)

(Continued)

No.	Parts Name	Q'ty	No.	Parts Name	Q'ty	No.	Parts Name	Q'ty
(1)	Case	1	(26)	Plate, Swash	1	(51)	O-ring	1
(2)	Bearing, Needle	1	(27)	Pin	1	(52)	O-ring	1
(3)	Flange	1	(28)	Pin	1	(53)	Orifice	2
(4)	Bearing, Needle	1	(29)	O-ring	6	(54)	O-ring	1
(5)	Seal, Oil	1	(30)	O-ring	2	(55)	Orifice	1
(6)	Ring, Snap	1	(31)	Plug	13	(56)	Pin	1
(7)	Stopper	1	(32)	Orifice	1	(57)	Plate, Shipping	1
(8)	Shaft	1	(33)	Spring	1	(58)	Plug, Shipping	3
(9)	Washer, Thrust	1	(34)	Spring	1	(59)	Orifice	1
(10)	Washer, Thrust	1	(35)	Seat, Spring	2	(60)	Screw, Set	1
(11)	Gasket	1	(36)	Valve Assy	1	(61)	Cap	1
(12)	Pin	3	(37)	Nut	1	(62)	O-ring	1
(13)	O-ring	1	(38)	Pump, Gear	1	(63)	Holder	1
(14)	Bushing	2	(39)	Bolt, SCH.	2	(64)	Seat, Spring	1
(15)	Screw	2	(40)	Washer	2	(65)	O-ring	1
(16)	Plate, Valve	1	(41)	Bolt, SCH.	4	(66)	Plug	1
(17)	Block, Cylinder	1	(42)	Plug	2	(67)	Body, Valve	1
(18)	Collar	1	(43)	Valve Assy	1	(68)	Spool	1
(19)	Spring	1	(44)	Bolt, SCH.	4	(69)	Bushing	1
(20)	Holder, Spring	1	(45)	Plate, Name	1	(70)	Spring	1
(21)	Ring, Snap	1	(46)	Screw, Drive	2	(71)	O-ring	1
(22)	Pin	3	(47)	Plug, Shipping	1	(72)	Nut	1
(23)	Piston Assy	10	(48)	Plug, Shipping	1	(73)	Nut	1
(24)	Holder, Retainer	1	(49)	Pin	1			
(25)	Plate, Retainer	1	(50)	Pin	1			

RY9212119HYS0010US0

(1) Disassembly Procedures

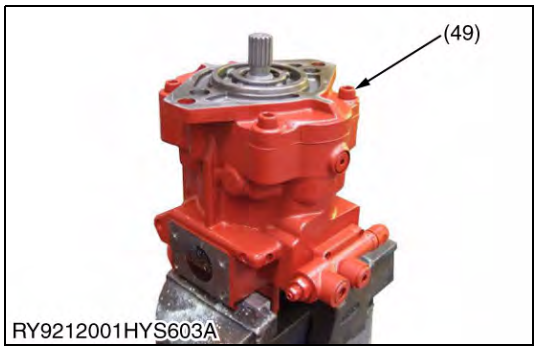


1. Remove the gear pump (46).

- Tool to use: M8 hex socket

(46) Gear Pump (47) Socket head bolt

RY9212001HYS0031US0

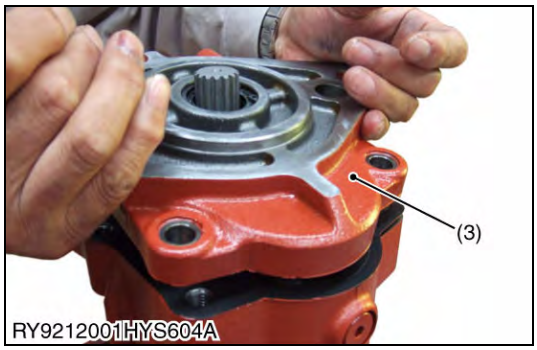


2. Lift the input axle up and clamp the pump in a vise.

■ **IMPORTANT**
- **Take care not to scratch the suction or discharge ports in the vise.**

(49) Socket head bolt

RY9212001HYS0032US0



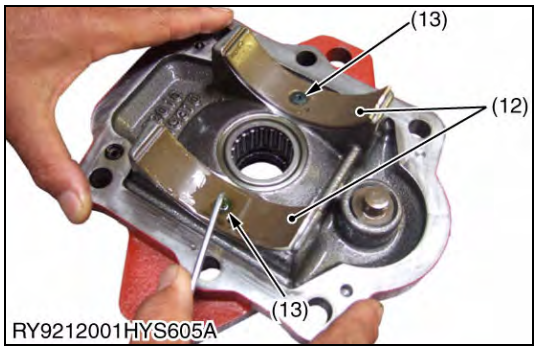
3. Loosen the bolt and remove flange (3).

CAUTION
- **If the flange is difficult to remove, tap lightly on it with a plastic hammer and take it apart.**
- **Don't pinch your fingers between the flange and the case.**

- Tool to use: M10 hex socket

(3) Flange

RY9212001HYS0033US0

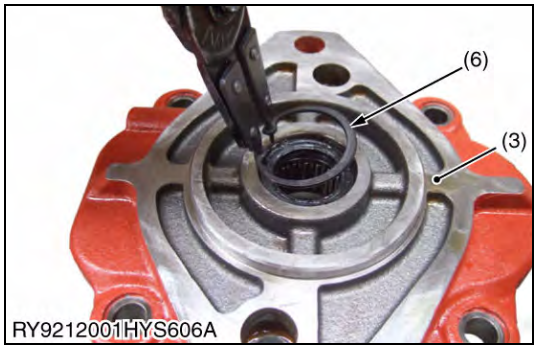


4. Remove the screw (13) and the bushing (12).

- Tool to use: M3 hex socket

(12) Bushing (13) Screw

RY9212001HYS0034US0



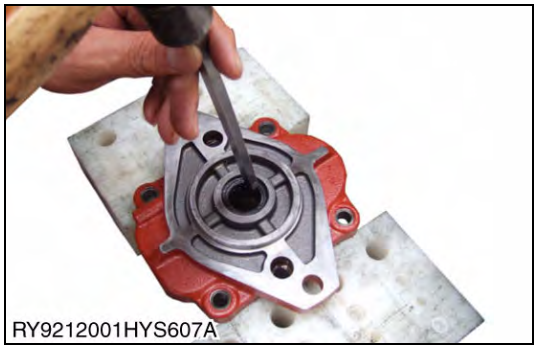
5. Remove the snap ring (6) from the flange (3).

CAUTION
- **Take care so the snap ring does not go flying.**

- Tool to use: Snap ring pliers

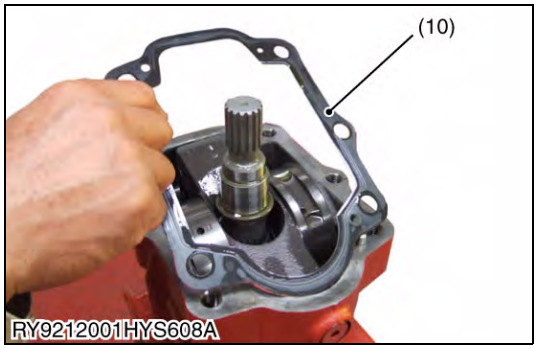
(3) Flange (6) Snap ring

RY9212001HYS0035US0


RY9212001HYS607A

6. Remove the oil seal and the needle bearing from the flange.

RY9212001HYS0036US0



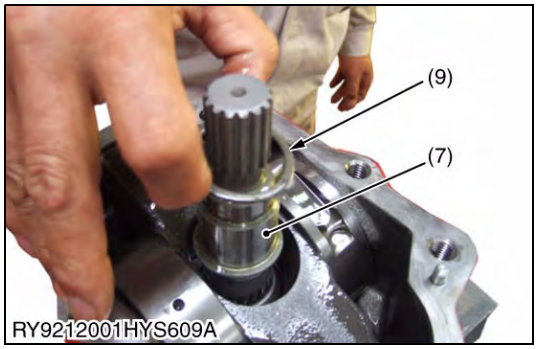
RY9212001HYS608A

7. Remove the gasket (10).

CAUTION
- **Be careful not to cut your fingers on the gasket.**

(10) Gasket

RY9212001HYS0037US0

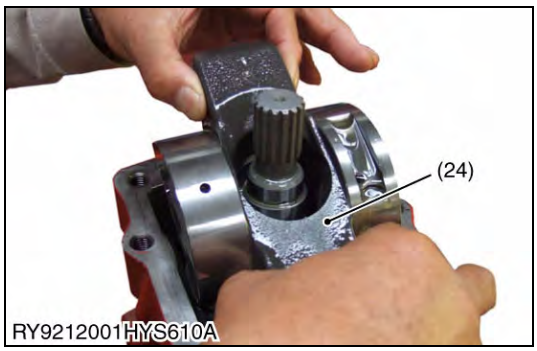


RY9212001HYS609A

8. Remove the thrust washer (9) from the shaft (7).

(7) Shaft (9) Thrust washer

RY9212001HYS0038US0

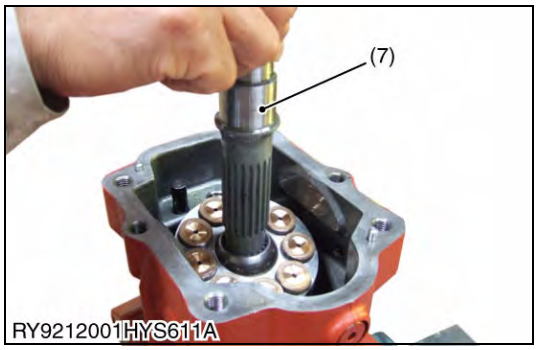


RY9212001HYS610A

9. Remove the swash-plate (24).

(24) Swash-plate

RY9212001HYS0039US0

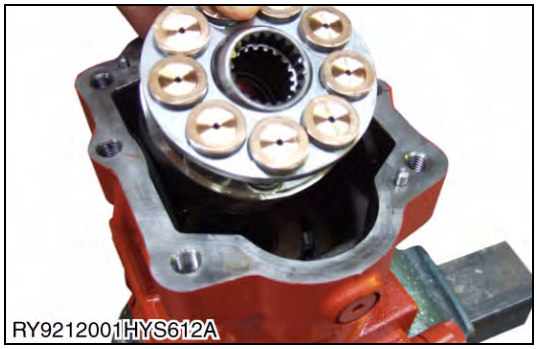


RY9212001HYS611A

10. Remove the shaft (7).

(7) Shaft

RY9212001HYS0040US0


RY9212001HYS612A

11. Remove the cylinder block ASSY.

- Cylinder Block ASSY Components
  Cylinder block, collar, spring, collar, snap ring, pin, piston ASSY, retainer holder, retainer plate

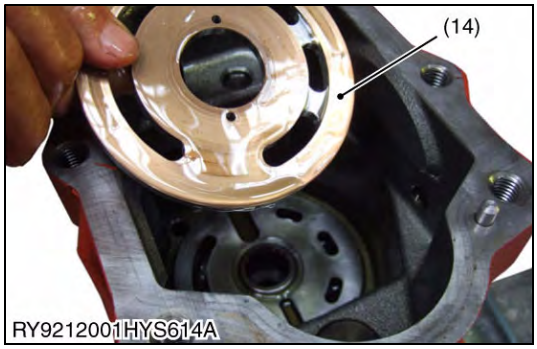
RY9212001HYS0041US0

RY9212001HYS613A

12. Remove the thrust washer (8).

(8) Thrust washer

RY9212001HYS0042US0



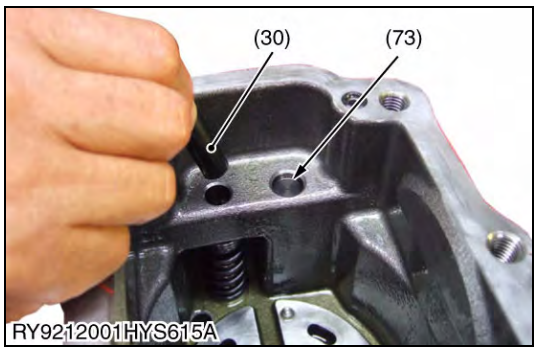
RY9212001HYS614A

13. Remove the valve plate (14).

■ **IMPORTANT**
- **Do not scratch the valve plate.**

(14) Valve plate

RY9212001HYS0043US0

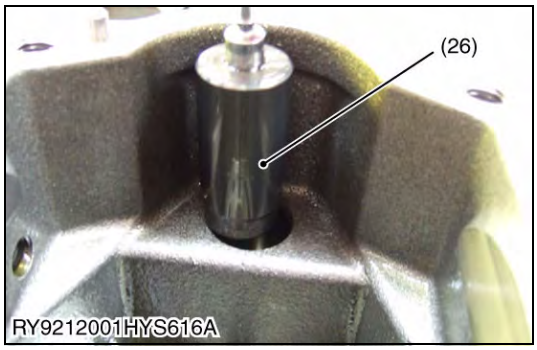


RY9212001HYS615A

14. Remove the pins (30) and (73).

(30) Pin (73) Pin

RY9212001HYS0044US0

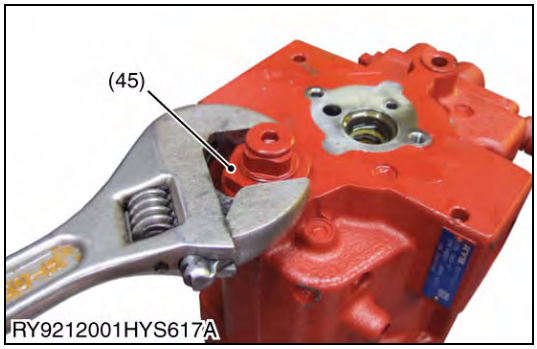


RY9212001HYS616A

15. Remove the pin(26).

(26) Pin

RY9212001HYS0045US0

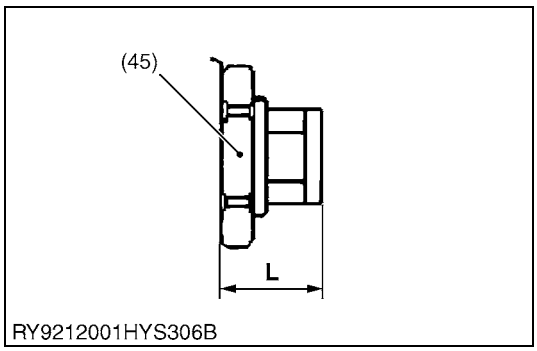


16. Remove the nut (45).

■ **IMPORTANT**
- **Measure the width of L before removing the nut.**
- Tool to use: Monkey wrench

(45) Nut

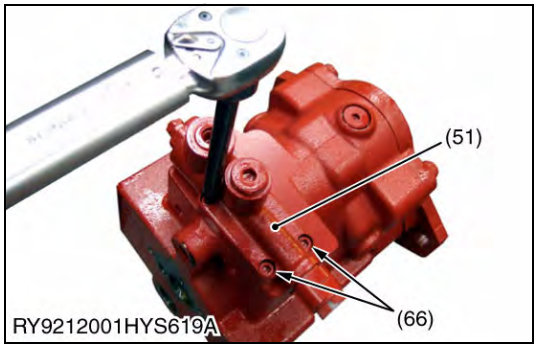
RY9212001HYS0046US0



17. Remove the valve ASSY (34).

(34) Valve ASSY

RY9212001HYS0047US0

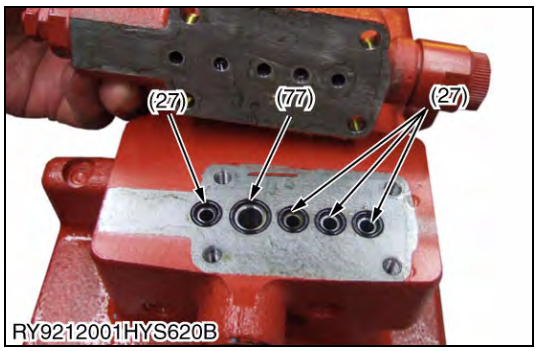


18. Remove the valve ASSY (51).

- Tool to use: M5 hex socket

(51) Valve ASSY
(66) Socket head bolt

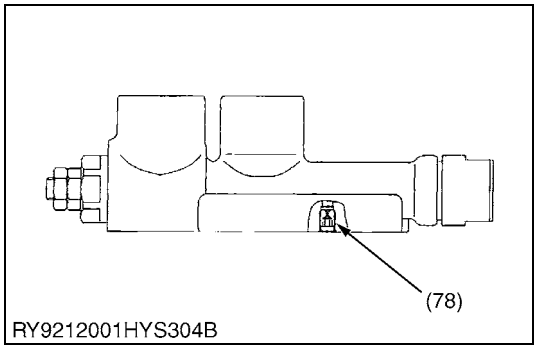
RY9212001HYS0048US0



19. Remove O-rings (27) and (77).

(27) O-Ring
(77) O-Ring

RY9212001HYS0049US0



RY9212001HYS304B

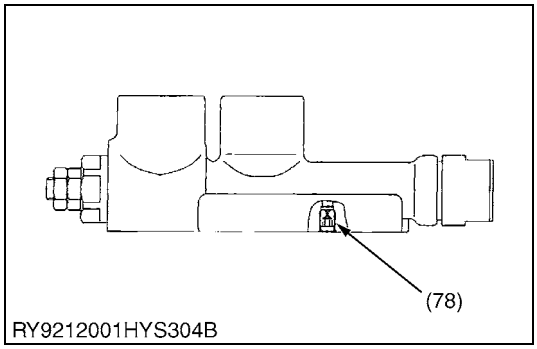
20. Remove the orifice (78) of the valve ASSY.

- Tool to use: M3 hex socket

(78) Orifice

RY9212001HYS0050US0

(2) Assembly Procedures



RY9212001HYS304B

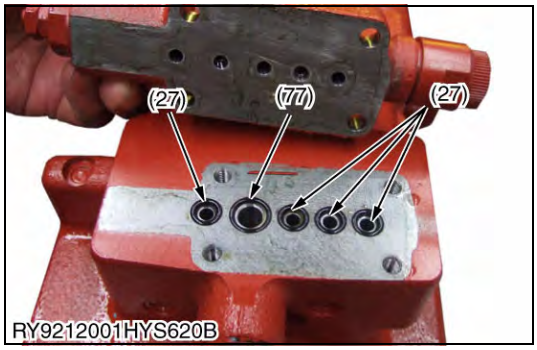
1. Install the orifice.

Tightening torque	Orifice (78)	2.5 N·m 0.25 kgf·m 1.8 lbf·ft

- Tool to use: M3 hex socket

(78) Orifice

RY9212001HYS0051US0

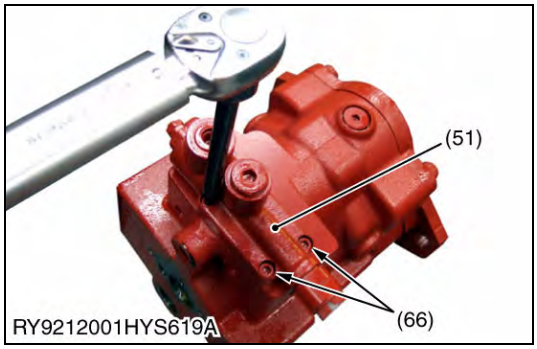


RY9212001HYS620B

2. Install O-rings (27) and (77).

(27) O-Ring (77) O-Ring

RY9212001HYS0052US0



RY9212001HYS619A

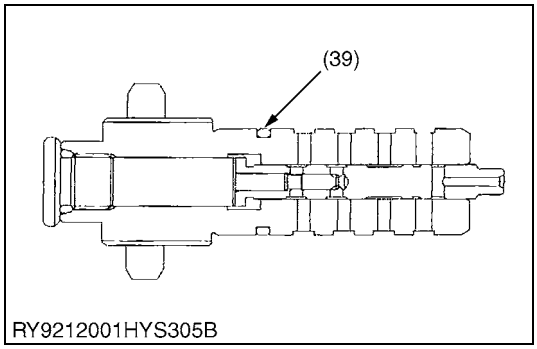
3. Attach the valve ASSY (51) to the case.

Tightening torque	Socket head bolt (66)	12.7 N·m 1.3 kgf·m 9.37 lbf·ft

- Tool to use: M5 hex socket

(51) Valve ASSY (66) Socket head bolt

RY9212001HYS0053US0

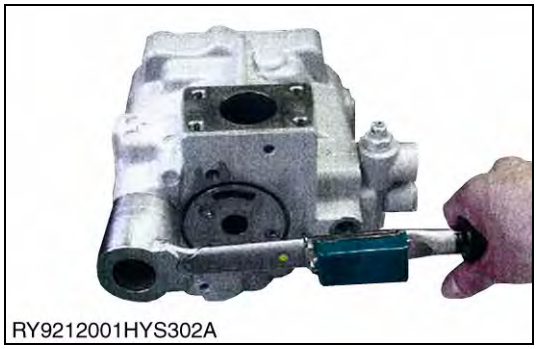


RY9212001HYS305B

4. Install the O-ring (39) on the valve ASSY sleeve.

(39) O-Ring

RY9212001HYS0054US0


RY9212001HYS302A

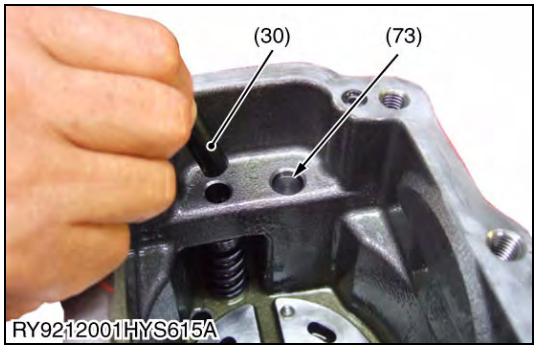
5. Attach the valve ASSY to the case.

■ **IMPORTANT**
- **Install the nut and adjust it to the width measured before disassembly.**

Tightening torque	Nut (45)	68.6 N·m 7.0 kgf·m 50.6 lbf·ft

- Tool to use: M41 socket

RY9212001HYS0055US0



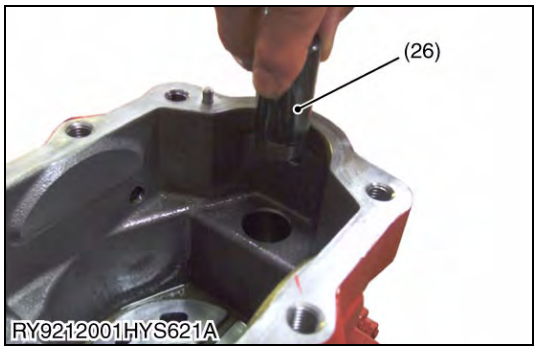
RY9212001HYS615A

6. Clamp the case in a vice and install pins (30), (73) and (26).

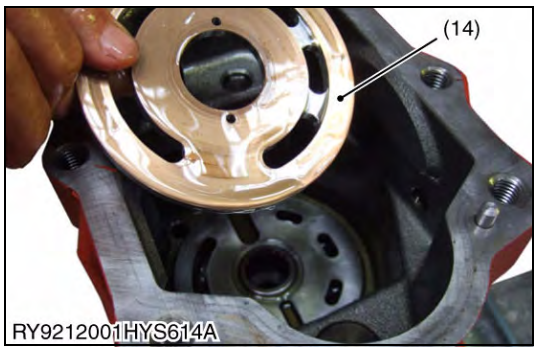
■ **IMPORTANT**
- **Take care not to scratch the suction or discharge ports in the vise.**

(26) Pin
(30) Pin
(73) Pin

RY9212001HYS0056US0



RY9212001HYS621A



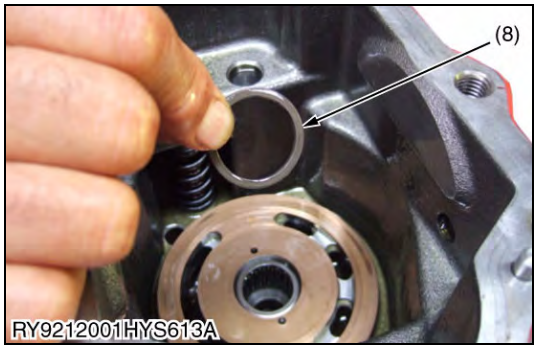
RY9212001HYS614A

7. Install the valve plate (14).

■ **IMPORTANT**
- **Apply hydraulic oil to both faces of the valve plate.**

(14) Valve plate

RY9212001HYS0057US0

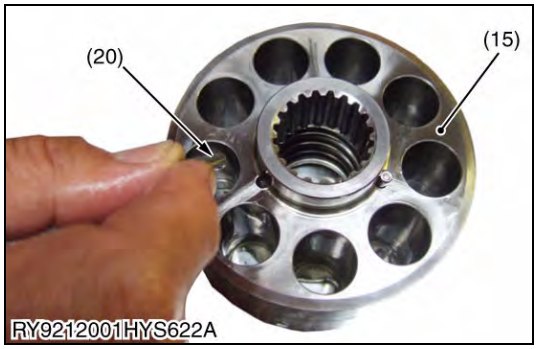


RY9212001HYS613A

8. Install the thrust washer (8).

(8) Thrust washer

RY9212001HYS0058US0

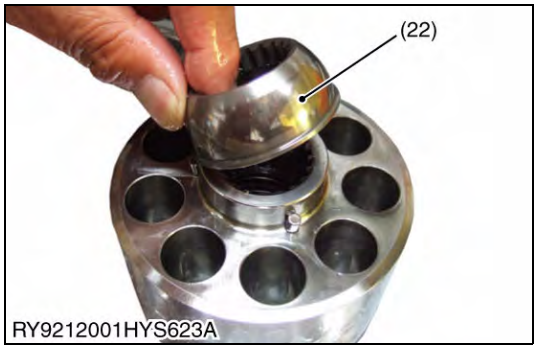


9. Insert the three pins (20) into the cylinder block (15).

■ **IMPORTANT**
- **Apply grease to the pins.**

(15) Cylinder block (20) Pin

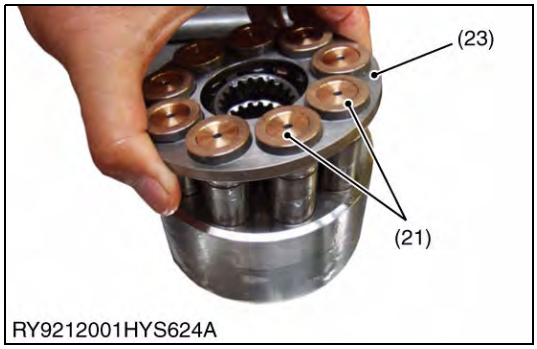
RY9212001HYS0059US0



10. Install the retainer holder (22) onto the cylinder block.

(22) Retainer holder

RY9212001HYS0060US0

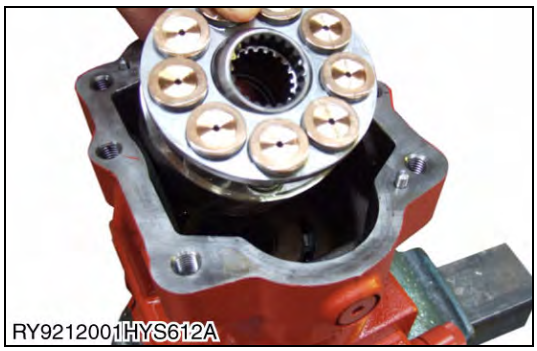


11. Install the piston ASSY (21) into the retainer plate (23) and then install it into the cylinder block.

■ **IMPORTANT**
- **Do not scratch the pistons.**
- **Do not use a hammer.**
- **Apply hydraulic oil to the body and shoe face of the pistons.**

(21) Piston ASSY (23) Retainer plate

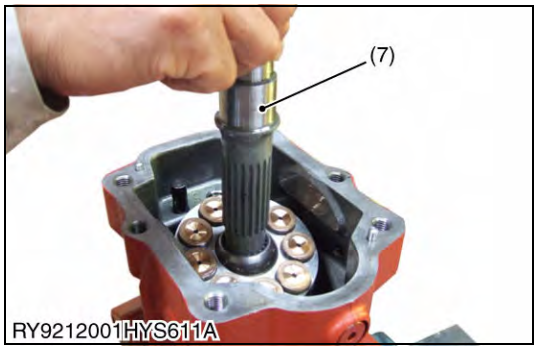
RY9212001HYS0061US0



12. Install the cylinder block ASSY.

■ **IMPORTANT**
- **Apply hydraulic oil to the sliding surfaces of the cylinder block.**
- **Assemble carefully to avoid scratching.**

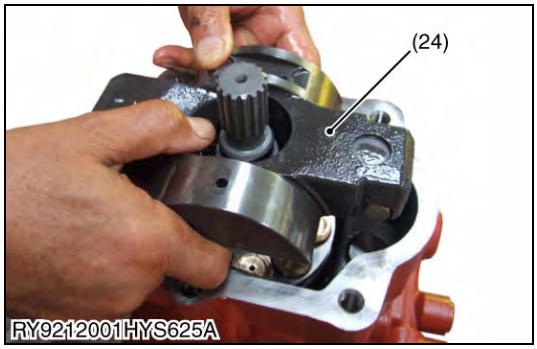
RY9212001HYS0062US0



13. Install the shaft (7).

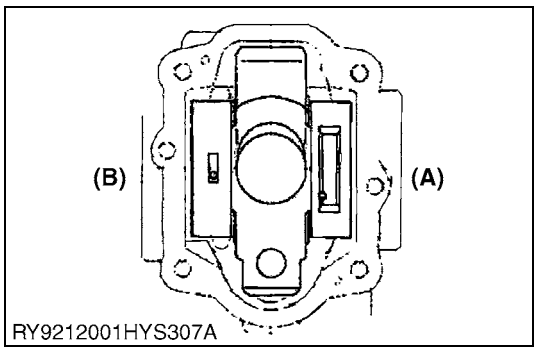
(7) Shaft

RY9212001HYS0063US0



14. Install the swash-plate (24).

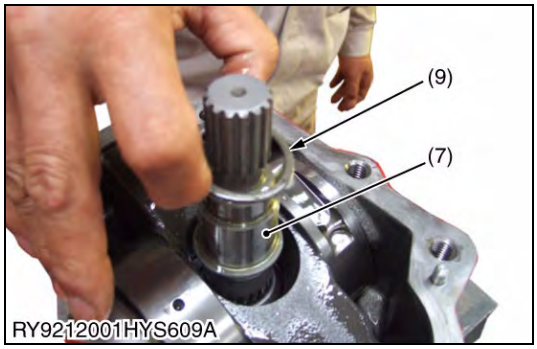
■ **IMPORTANT**
- **Install so the sliding surfaces of the piston shoes are not scratched.**
- **Double-check that the swash-plate is facing the right direction.**



(24) Swash-plate

(A) Discharge port side
(B) Suction port side

RY9212001HYS0064US0

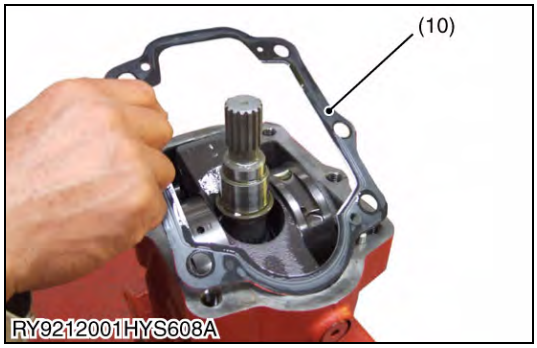


15. Install the thrust washer (9) on the shaft (7).

(7) Shaft

(9) Thrust washer

RY9212001HYS0065US0

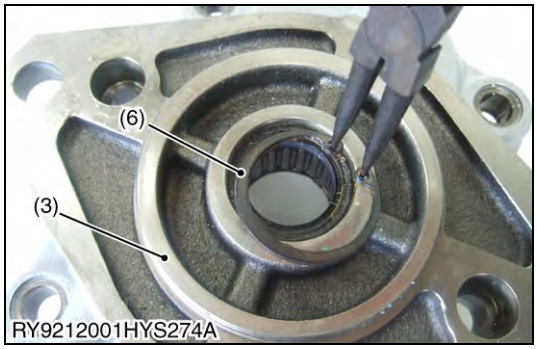


16. Install the gasket (10).

CAUTION
- **Be careful not to cut your fingers on the gasket.**

(10) Gasket

RY9212001HYS0066US0



17. Install the snap ring (6) onto the flange (3).

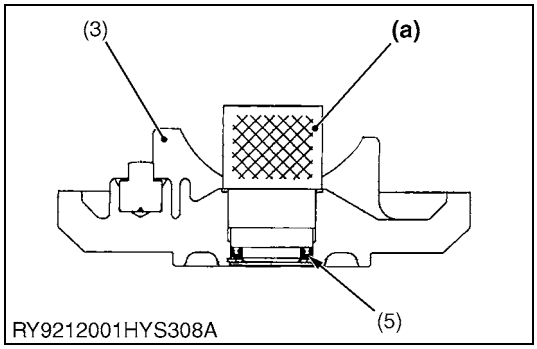
■ **IMPORTANT**
- **Install the snap ring so its angled surface faces the outside of the housing.**

- Tool to use: Snap ring pliers

(3) Flange

(6) Snap ring

RY9212001HYS0067US0

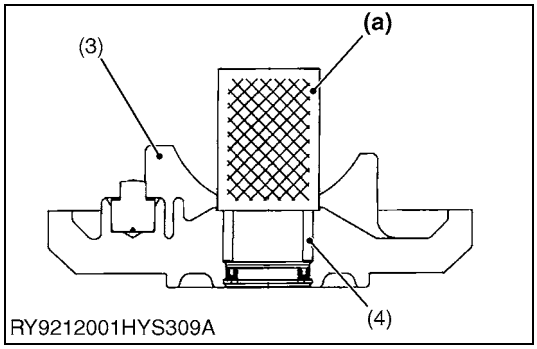


18. Use the jig **(a)** to insert the oil seal (5) into the flange (3).

■ **IMPORTANT**
- **Apply grease to the lip of the oil seal.**

(3) Flange
(5) Oil Seal
(a) Tool

RY9212001HYS0068US0

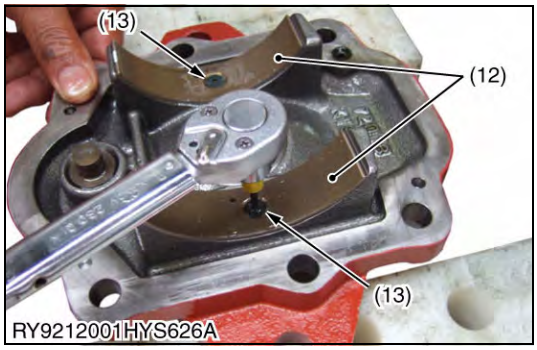


19. Use the jig **(a)** to install the needle bearing (4) into the flange (3).

■ **IMPORTANT**
- **Press the bearing in so its stamped side is facing up.**

(3) Flange
(4) Needle bearing
(a) Tool

RY9212001HYS0069US0



20. Fasten the bushing (12) with the screws (13).

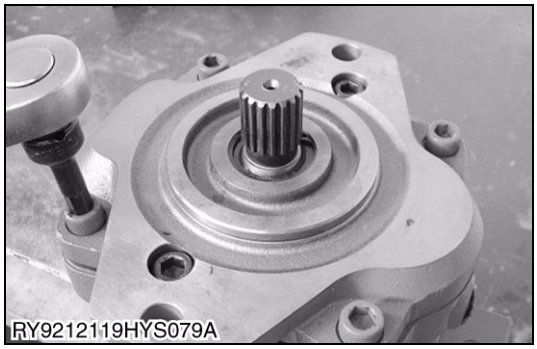
■ **IMPORTANT**
- **Be careful that the bushing faces the right direction.**

Tightening torque	Screw (13)	5.9 N·m 0.6 kgf·m 4.4 lbf·ft

- Tool to use: M3 hex socket

(12) Bushing
(13) Screw

RY9212001HYS0070US0



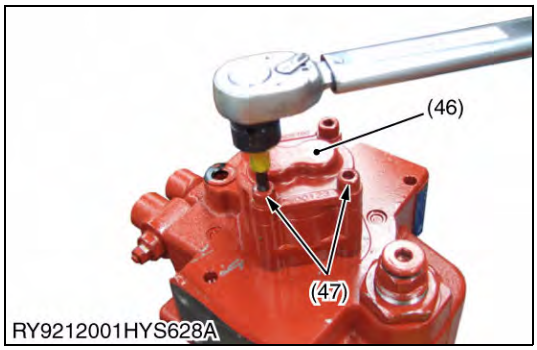
21. Attach the valve ASSY to the case.

■ **IMPORTANT**
- **Don't scratch the lip of the oil seal.**

Tightening torque	Socket head bolt	106.9 N·m 10.9 kgf·m 78.9 lbf·ft

- Tool to use: M10 hex socket

RY9212119HYS0183US0



22. Install the gear pump (46).

Tightening torque	Socket head bolt (47)	28.9 N·m 2.95 kgf·m 21.3 lbf·ft

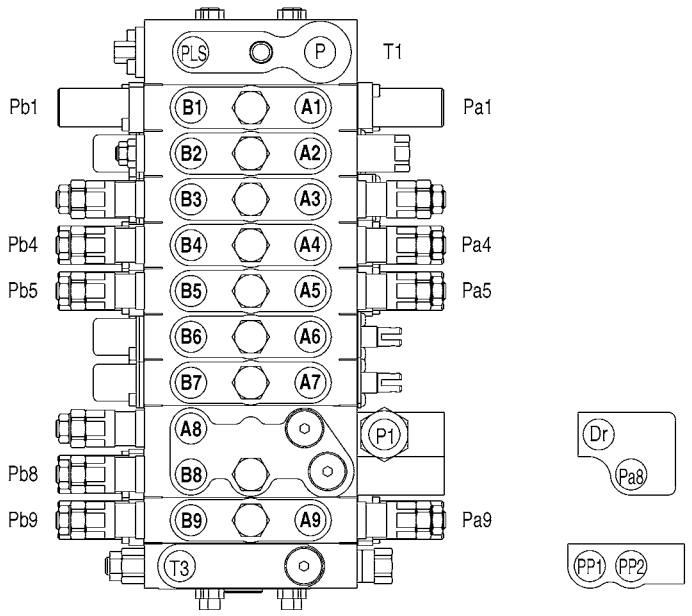
- Tool to use: M6 hex socket

(46) Gear Pump
(47) Socket head bolt

RY9212001HYS0072US0

3. CONTROL VALVE

[1] SPECIFICATIONS



RY9212119HYS080A

A1: Swivel Left (Pb1)
B1: Swivel Right (Pb1)
A2: Swing Rod
B2: Swing Bottom
A3: Blade Bottom
B3: Blade Rod
A4: AUX1 (Pb4)
B4: AUX1 (Pb4)
A5: Arm Rod (Pb5)
B5: Arm Bottom (Pb5)
A6: Travel Left Reverse
B6: Travel Left Forward
A7: Travel Right Reverse
B7: Travel Right Forward
A8: Boom Bottom (Pb8)
B8: Boom Rod (Pb8)
A9: Bucket Rod (Pb9)
B9: Bucket Bottom (Pb9)

RY9212119HYS0020US0

Item		KX101-3α3, U35-3α3	Notes
Maker		KYB	
Model		KVSX-14C-12B	
Main LS valve pressure setting (aLS)		24.5 MPa 250 kgf/cm^2 3550 psi	at 37 L/min (2300 cu.in./min, 9.8 USGPM)
Unload LS valve pressure setting (aUN)		2.5 MPa 25.5 kgf/cm^2 363 psi	at 22 L/min (1400 cu.in./min, 6.1 USGPM)
Overload relief valve pressure setting	AUX1 (b6B), (b6R)	20.6 MPa 210 kgf/cm^2 2990 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)
	Bucket (b3B), (b3R)	27.9 MPa 284 kgf/cm^2 4050 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)
	Arm (b2B), (b2R)	27.9 MPa 284 kgf/cm^2 4050 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)
	Boom (b1B), (b1R)	27.4 MPa 280 kgf/cm^2 3980 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)
	Blade (b4B)	27.4 MPa 280 kgf/cm^2 3980 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)
	Blade (b4R)	11.8 MPa 120 kgf/cm^2 1710 psi	at 5 L/min (300 cu.in./min, 1.3 USGPM)

RY9212119HYS0011US0

[2] CONTROL VALVE REMOVAL AND INSTALLATION

CAUTION

- **When removing a hydraulic device after operating the mini-excavator, lower the bucket and blade to the ground and turn off the engine.**
- **Each of the devices and the hydraulic oil are hot and under high pressure immediately after operating the mini-excavator. If the hydraulic oil reached a high operating temperature, it may cause a burn.**
- **Oil gushing out under pressure has enough force to pierce your skin and may cause you injury. Always allow the temperature to drop and relieve any remaining pressure prior to working to remove any hydraulic equipment.**

RY9212001MBS0004US0

1. Open the right bonnet, remove the snap ring, pin and bonnet.
2. Remove the mounting bolts and remove the swivel cover.
3. Attach the breather hose of the hydraulic fluid tank to the vacuum pump, and apply vacuum pressure to the hydraulic fluid tank.
4. Disconnect all hydraulic hoses and electrical wiring from the control valve.

CAUTION

- **Plug all disconnected hydraulic hoses, and affix identification labels on each for reassembly.**

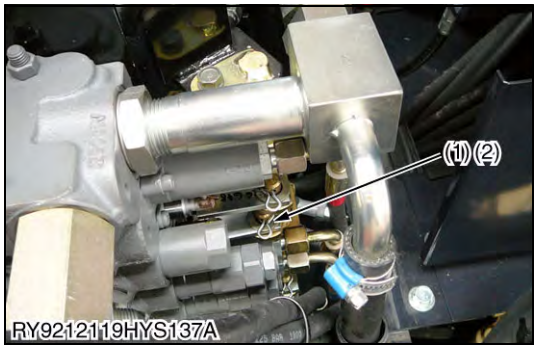
(1) Right Bonnet (2) Swivel Cover

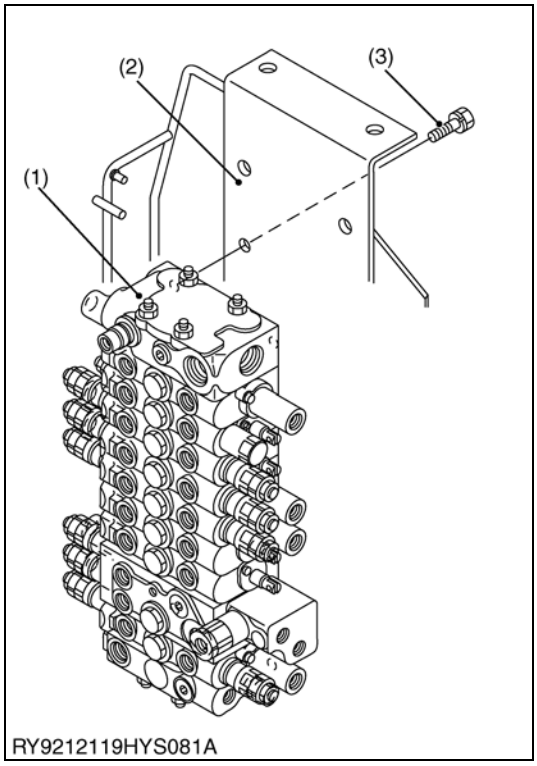
RY9212119HYS0012US0

5. Disconnect all snap pins and joint pins from the control valve.

(1) Snap pin (2) Joint pin

RY9212119HYS0015US0





RY9212119HYS081A

Removing the control valve assembly

1. Remove the control valve assembly mounting bolts, and remove the control valve assembly from the bracket (control valve).

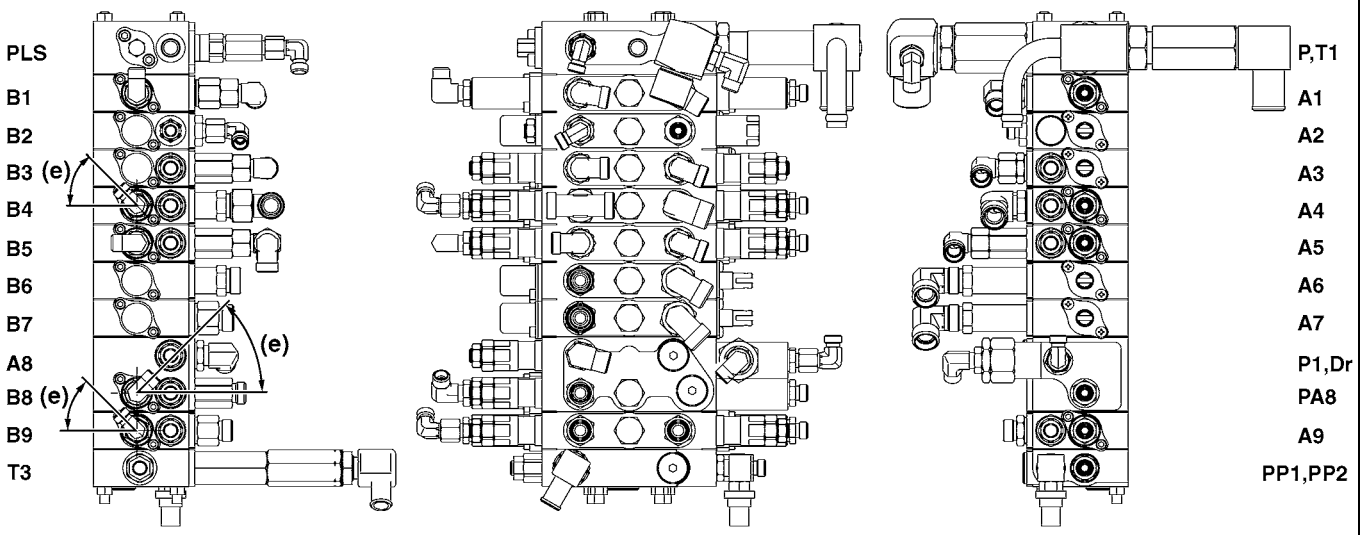
Tightening torque	Control valve assembly	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

■ **IMPORTANT**
- **Apply a threadlock (Loctite #271).**

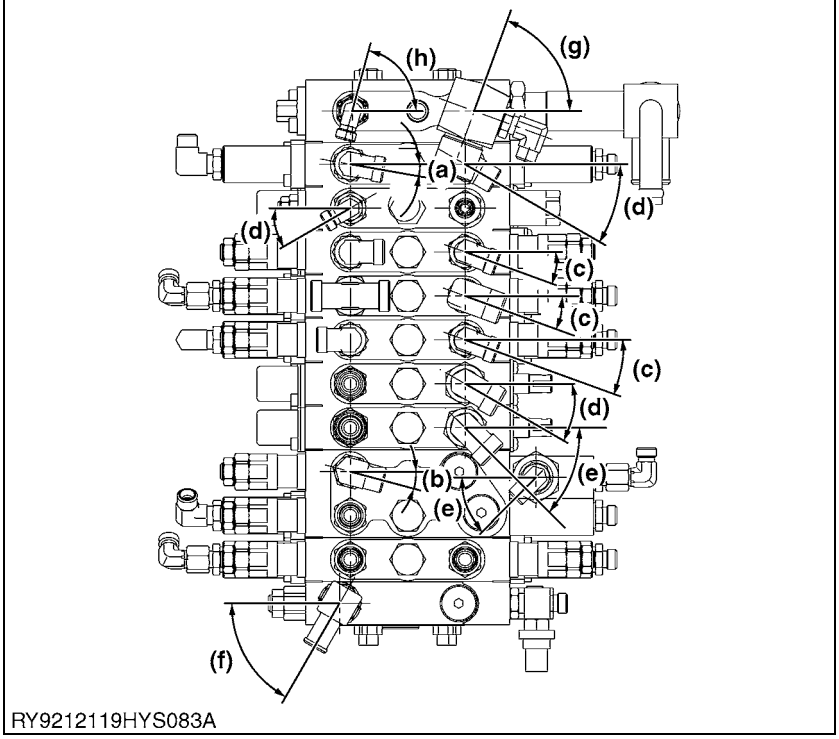
(1) Control Valve Assembly
(2) Bracket (Control Valve)
(3) Flange Bolt (M10 × 18)

RY9212119HYS0019US0

Control Valve Adapter Installation Angle [KX101-3α3]



RY9212119HYS082A



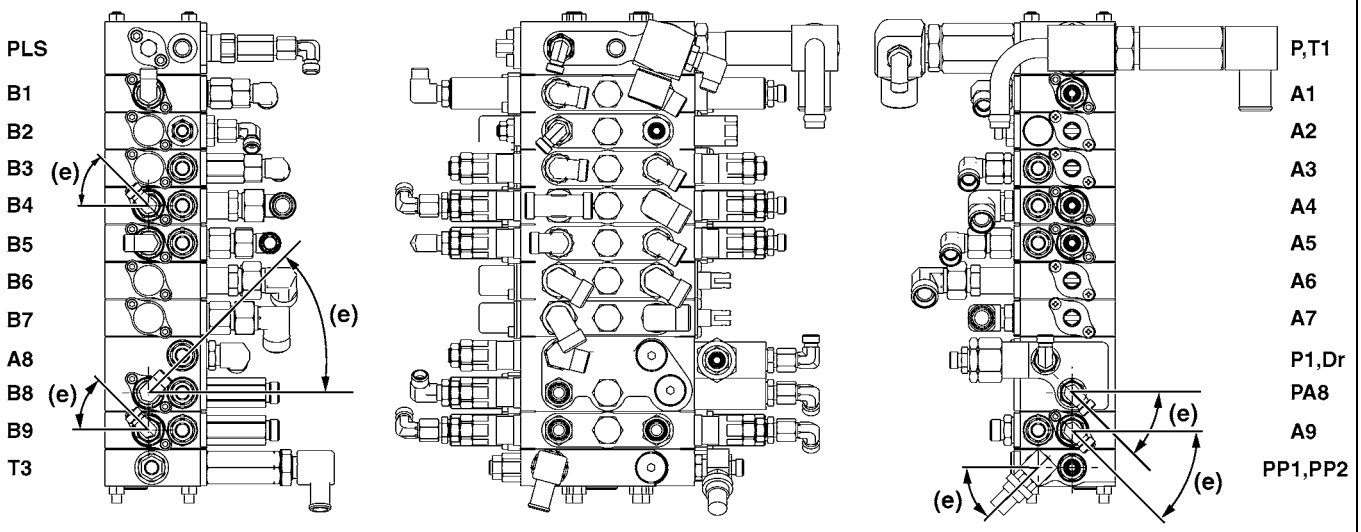
RY9212119HYS083A

A1: Swivel Left (Pa1)
B1: Swivel Right (Pb1)
A2: Swing Rod
B2: Swing Bottom
A3: Blade Bottom
B3: Blade Rod
A4: AUX1 (Pa4)
B4: AUX1 (Pb4)
A5: Arm Rod (Pa5)
B5: Arm Bottom (Pb5)
A6: Travel Left Reverse
B6: Travel Left Forward
A7: Travel Right Reverse
B7: Travel Right Forward
A8: Boom Bottom
B8: Boom Rod (Pb8)
A9: Bucket Rod (Pa9)
B9: Bucket Bottom (Pb9)

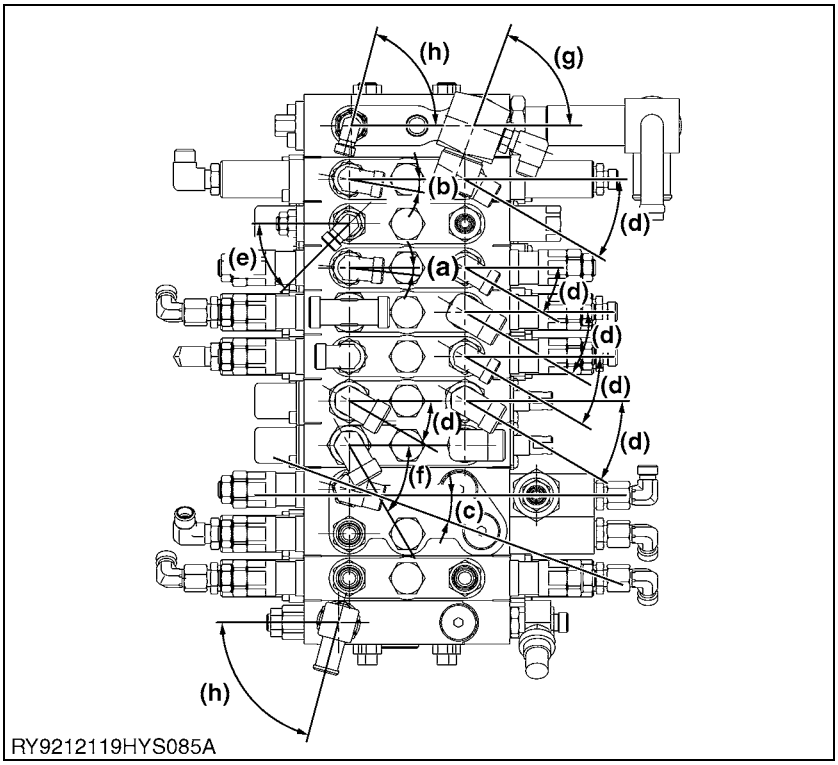
(a) 10°
(b) 15 °
(c) 20 °
(d) 30 °
(e) 45 °
(f) 60 °
(g) 70 °
(h) 75 °

RY9212119HYS0021US0

Control Valve Adapter Installation Angle [U35-3α3]



RY9212119HYS084A



RY9212119HYS085A

A1: Swivel Left (Pa1)
B1: Swivel Right (Pb1)
A2: Swing Rod
B2: Swing Bottom
A3: Blade Bottom
B3: Blade Rod
A4: AUX1 (Pa4)
B4: AUX1 (Pb4)
A5: Arm Rod (Pa5)
B5: Arm Bottom (Pb5)
A6: Travel Left Reverse
B6: Travel Left Forward
A7: Travel Right Reverse
B7: Travel Right Forward
A8: Boom Bottom
B8: Boom Rod (Pb8)
A9: Bucket Rod (Pa9)
B9: Bucket Bottom (Pb9)

(a) 10°
(b) 15 °
(c) 20 °
(d) 30 °
(e) 45 °
(f) 60 °
(g) 70 °
(g) 75 °

RY9212119HYS0022US0

[3] CONTROL VALVE DISASSEMBLY/ASSEMBLY PROCEDURES

Precautions during Disassembly / Assembly

Precautions during Disassembly

1. Generally, hydraulic devices are precision machined, and disassembly should therefore be conducted in a clean environment to prevent entry of debris into the narrow interstices formed in the device structure.
2. Always use clean tools and cleaning oil.
3. After removing from the machine, first wash the outside of the assembly.
4. Before starting work, prepare the necessary parts for the aims and extent of disassembly. Before reassembling, as a rule you should replace all seals and O-rings, etc. Also, since a subassembly is available with the required parts if parts cannot be supplied as single items, refer to the parts catalog beforehand in preparation.

Precautions on Assembly

1. Apply clean grease or hydraulic fluid to O-rings and their countersunk parts for mounting.
2. There should be no flaws in O-rings due to forming, and no marks or heat deformation incurred when handling.
3. If permanently deformed, O-rings will not straighten out. (Make sure that no flaws are incurred by an O-ring when passing it through sharp angled sections of a spool.)
4. Do not turn over O-rings on installation. (Fouled O-rings are difficult to re-install and can easily result in oil leakage.)

Before assembling, at the mating surface of each section, make sure no cleaning oil, hydraulic fluid, etc., is adhered to the outer surface of the O-ring groove. (If you assemble with oil adhered to a mating surface, this may be mistakenly recognized as oil leakage from that location when the machine is running.)

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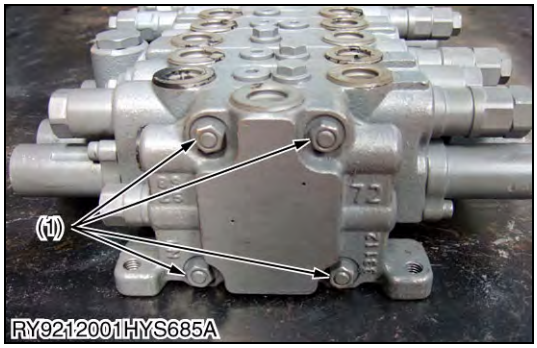

Control Valve Disassembly / Assembly Procedures

1. Loosen the nuts on one side with a ring spanner.

Tightening torque	Nut (four locations)	27 to 30 N·m 2.8 to 3.1 kgf·m 19.9 to 22.1 lbf·ft

2. Pull out each section with a tie rod, and arrange in order on a workbench.

CAUTION

- **When removing each section, take care not to lose the load check valve and spring of the mating surface.**
- **Identify the load check valve and spring of each section so that they are not mismatched.**
- **Apply a location mark for each section.**
- **Excess torque on threads will cause defective spool operation. Therefore, be sure to use the specified torque.**
- **Take care over the direction of installation of each spool, align with the holes and insert slowly.**

(1) Nut

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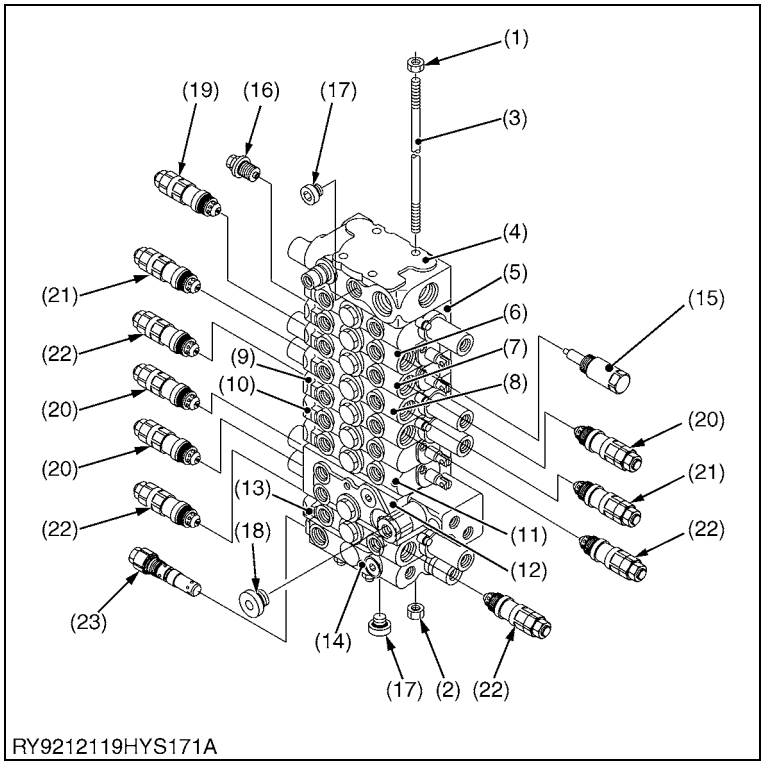

RY9212119HYS171A

Control Valve Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Nut	4	
(2)	Nut with Seal	4	
(3)	Tie Rod	4	
(4)	Spool Section Assy (Inlet)	1	
(5)	Spool Section Assy (Swivel)	1	
(6)	Spool Section Assy (Swing)	1	
(7)	Spool Section Assy (Blade)	1	
(8)	Spool Section Assy (AUX1)	1	
(9)	Spool Section Assy (Arm)	1	
(10)	Spool Section Assy (Travel Left)	1	
(11)	Spool Section Assy (Travel Right)	1	
(12)	Spool Section Assy (Boom)	1	
(13)	Spool Section Assy (Bucket)	1	
(14)	Spool Section Assy (Outlet)	1	
(15)	Valve Assy (Anti-Void)	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(16)	Valve Assy (Shut Off)	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(17)	Plug Assy	2	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 20.9 to 22.4 lbf·ft
(18)	Plug Assy	1	88.3 to 96.1 N·m 9.0 to 9.8 kgf·m 65.1 to 70.9 lbf·ft

No.	Valve Assy (Relief) Pressure Setting	Q'ty	Tightening torque
(19)	11.8 MPa 120 kgf/cm^2 1711 psi	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(20)	27.4 MPa 279 kgf/cm^2 3973 psi	3	
(21)	20.6 MPa 210 kgf/cm^2 2987 psi	2	
(22)	27.9 MPa 285 kgf/cm^2 4046 psi	4	
(23)	24.5 MPa 250 kgf/cm^2 3553 psi	1	49 to 54 N·m 5.0 to 5.5 kgf·m 36.1 to 39.8 lbf·ft

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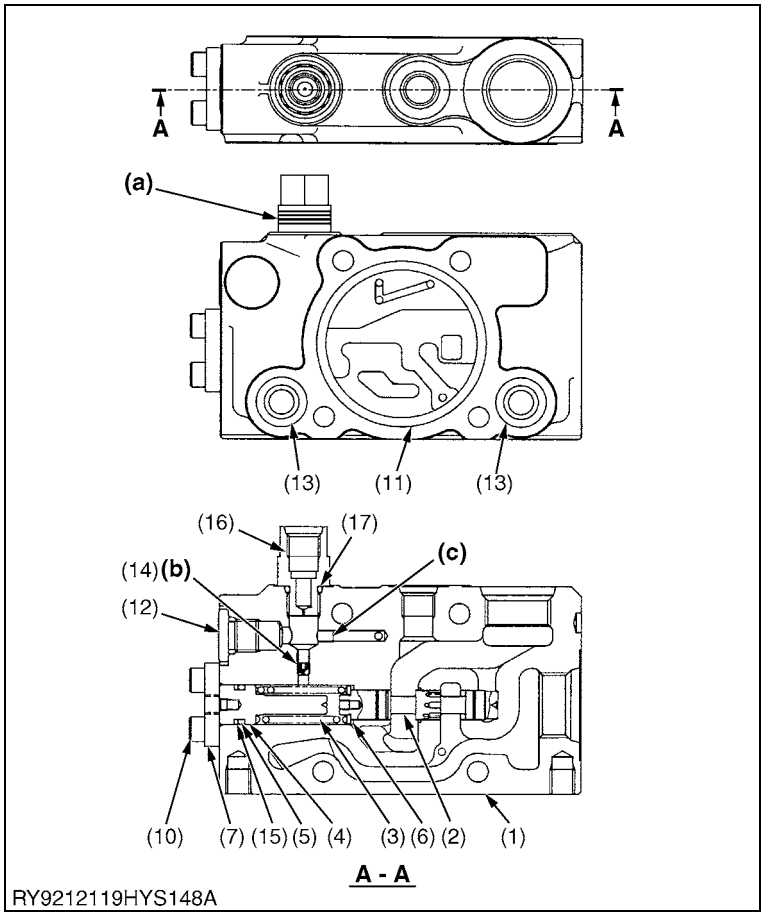

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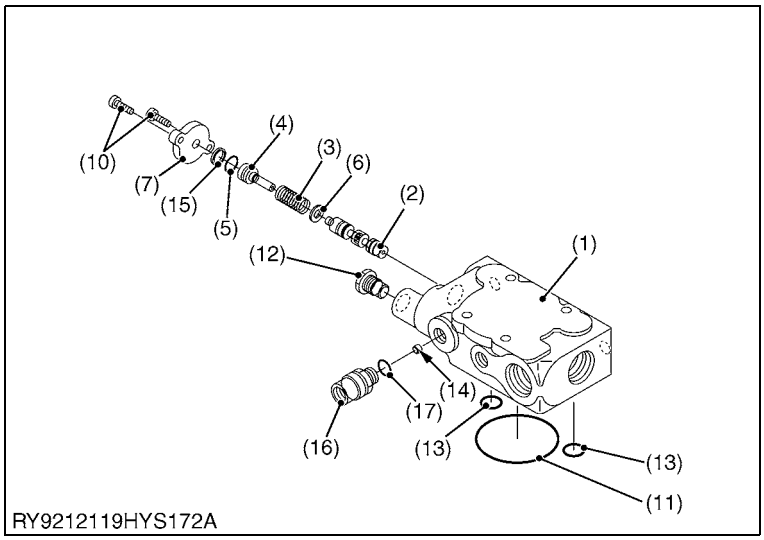


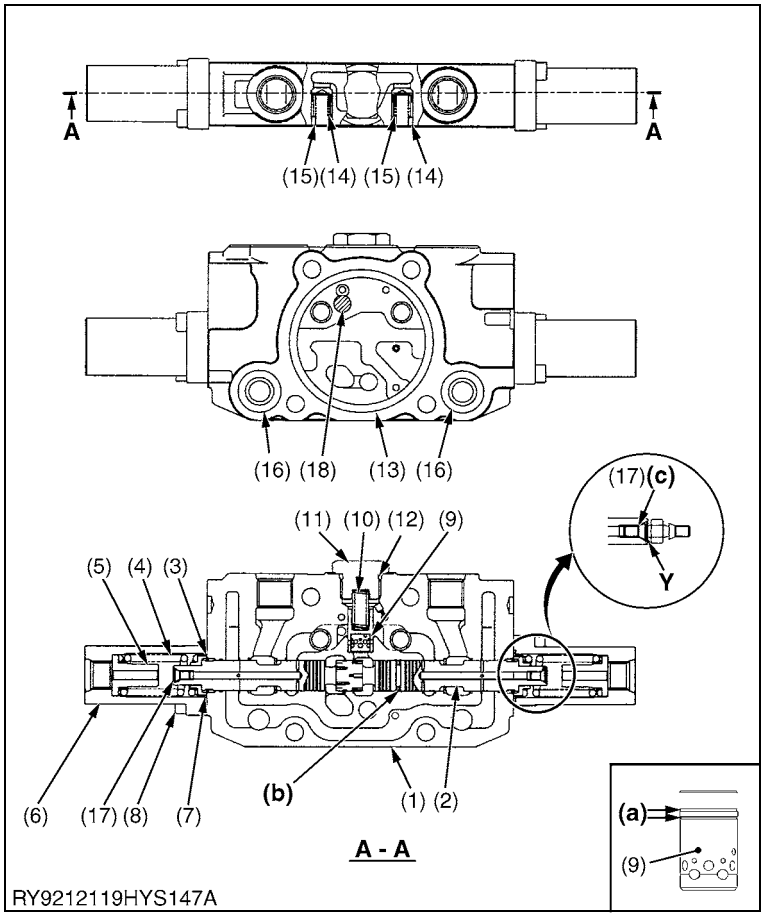
RY9212119HYS172A

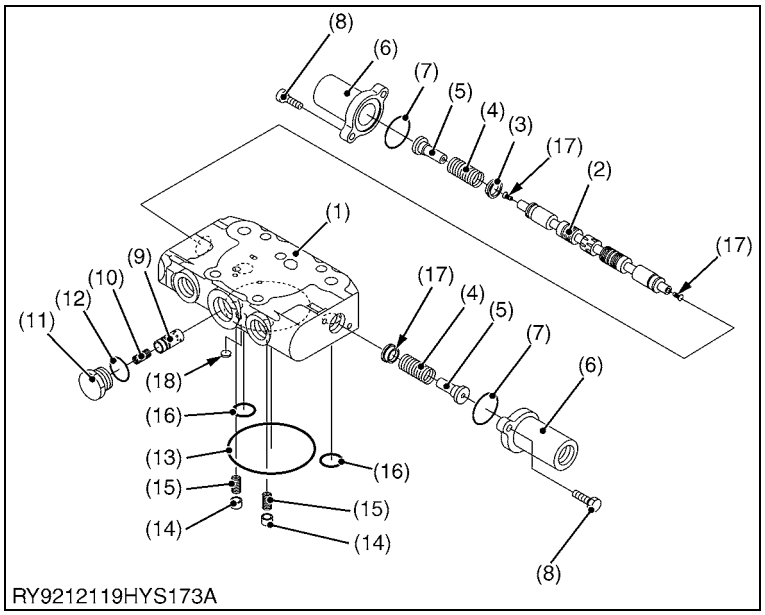
(A) Spool Section (Inlet) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Inlet Housing	1	
(2)	Spool	1	
(3)	Spring	2	
(4)	Spacer	1	
(5)	O-ring	1	
(6)	Washer	1	
(7)	Flange	1	
(8)	–		
(9)	–		
(10)	Socket Head Bolt	4	8.8 to 11 N·m 0.9 to 1.1 kgf·m 6.5 to 8.1 lbf·ft
(11)	O-ring	1	
(12)	Plug Assy	1	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 21 to 22.4 lbf·ft
(13)	O-ring	1	
(14)	Orifice Plug	1	
(15)	Backup Ring	1	
(16)	Plug	1	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 21 to 22.4 lbf·ft
(17)	O-ring	1	

(a) Identification Groove (x 4)
(b) Identification mark in yellow
(c) No orifice plug

RY9212119HYS0054US0





(B) Spool Section (Swivel) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	Spring Seat	2	
(4)	Spring	2	
(5)	Spring Seat	2	
(6)	Cap	2	
(7)	O-ring (S24, 1A)	2	
(8)	Socket Head Bolt	4	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(9)	Spool	1	
(10)	Spring	1	
(11)	Plug	2	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(12)	O-ring	1	
(13)	O-ring	1	
(14)	Load Check Valve	2	
(15)	Spring	2	
(16)	O-ring	1	
(17)	Plug	2	
(18)	Plate	1	

(a) Identification Groove (x 2)
(b) Assembly Direction Identification Groove
(c) Tighten until Y breaks. (Both Ends)
[Tightening torque approximately 6.9 N·m (0.7 kgf·m, 5.1 lbf·ft)]

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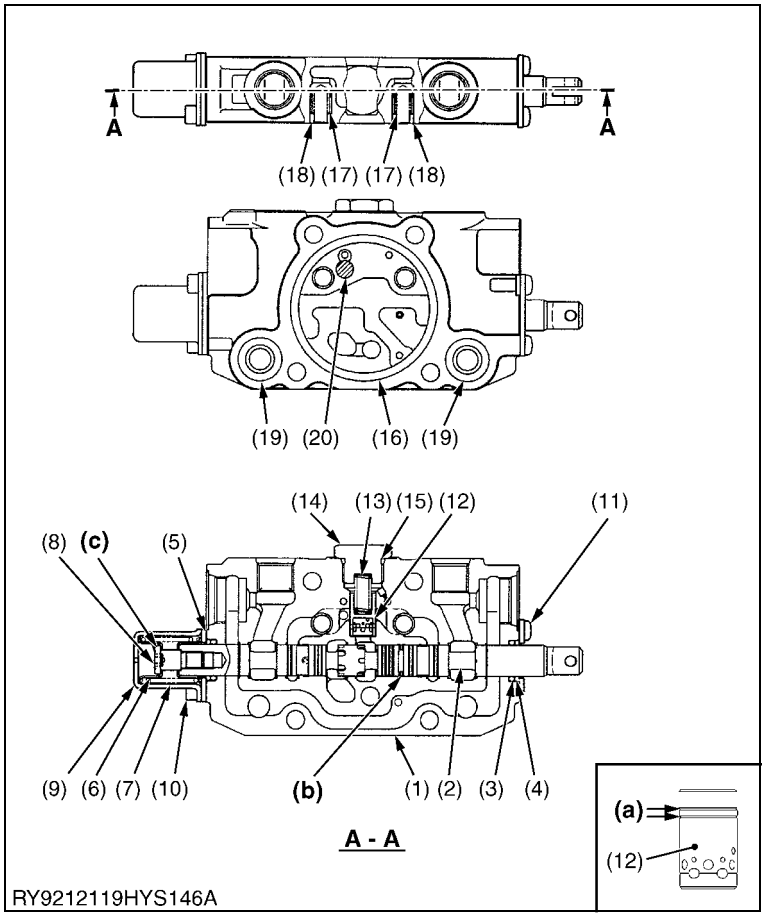

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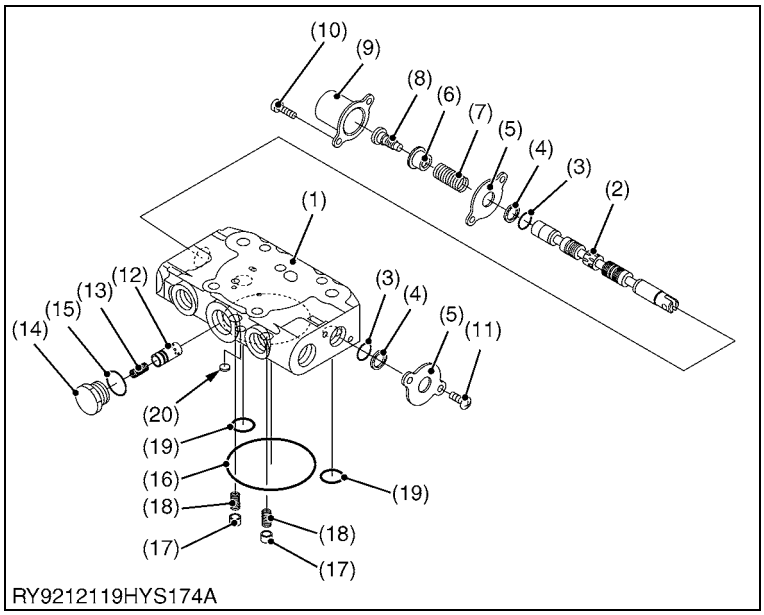

RY9212119HYS174A

(C) Spool Section (Swing) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	O-ring	2	
(4)	Wiper	2	
(5)	Seal Plate	2	
(6)	Spring Seat	2	
(7)	Spring	1	
(8)	Cap Screw	1	
(9)	Cap	1	
(10)	Socket Head Bolt	2	7.3 to 10 N·m 0.74 to 1.02 kgf·m 5.38 to 7.38 lbf·ft
(11)	Screw	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(12)	Spool	1	
(13)	Spring	1	
(14)	Plug	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(15)	O-ring	1	
(16)	O-ring	1	
(17)	Load Check Valve	2	
(18)	Spring	2	
(19)	O-ring	2	
(20)	Plate	1	

(a) Identification Groove (x 2)
(b) Assembly Direction Identification Groove
(c) Identification groove on the end

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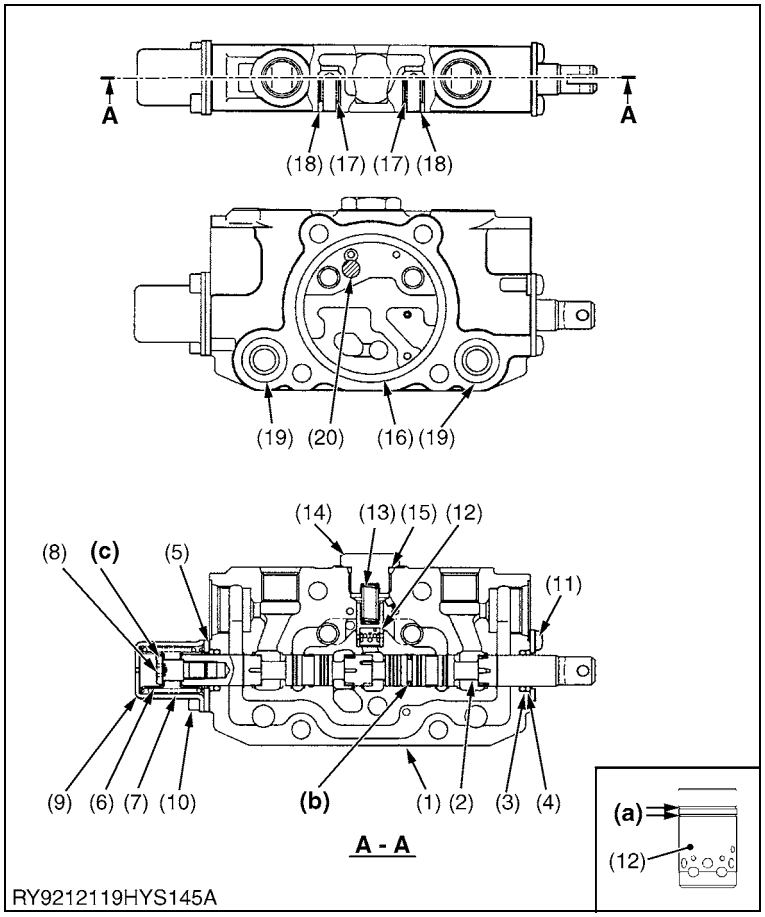

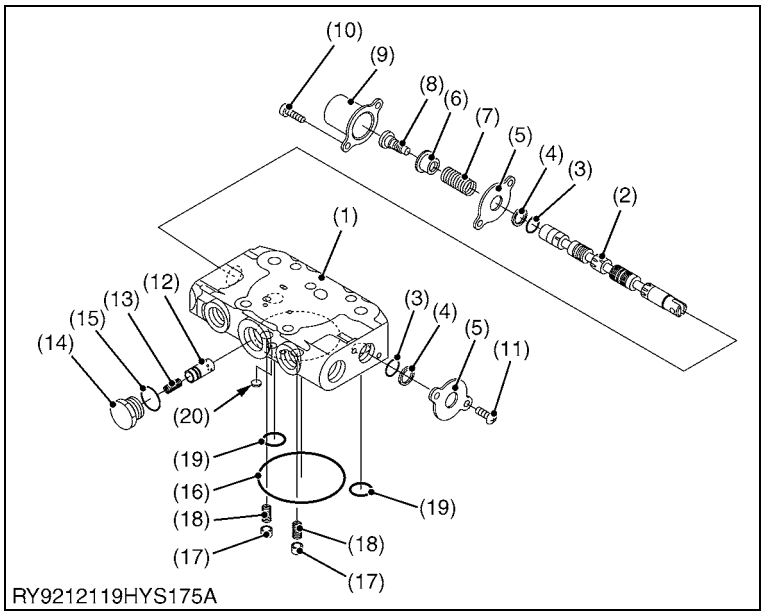

(D) Spool Section (Blade) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	O-ring	1	
(4)	Wiper	2	
(5)	Seal Plate	2	
(6)	Spring Seat	2	
(7)	Spring	2	
(8)	Cap Screw	1	
(9)	Cap	1	
(10)	Socket Head Bolt	2	7.3 to 10 N·m 0.74 to 1.02 kgf·m 5.38 to 7.38 lbf·ft
(11)	Screw	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(12)	Spool	1	
(13)	Spring	1	
(14)	Plug	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(15)	O-ring	1	
(16)	O-ring	1	
(17)	Load Check Valve	2	
(18)	Spring	2	
(19)	O-ring	1	
(20)	Plate	1	

(a) Identification Groove (x 2)
(b) Assembly Direction Identification Groove
(c) Identification groove on the end

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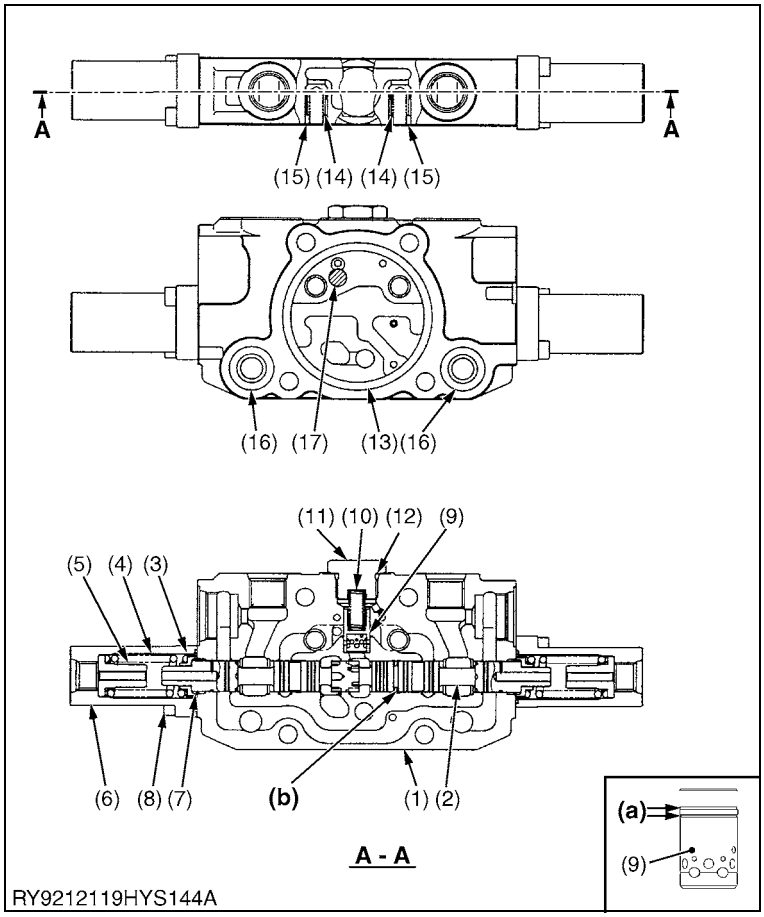

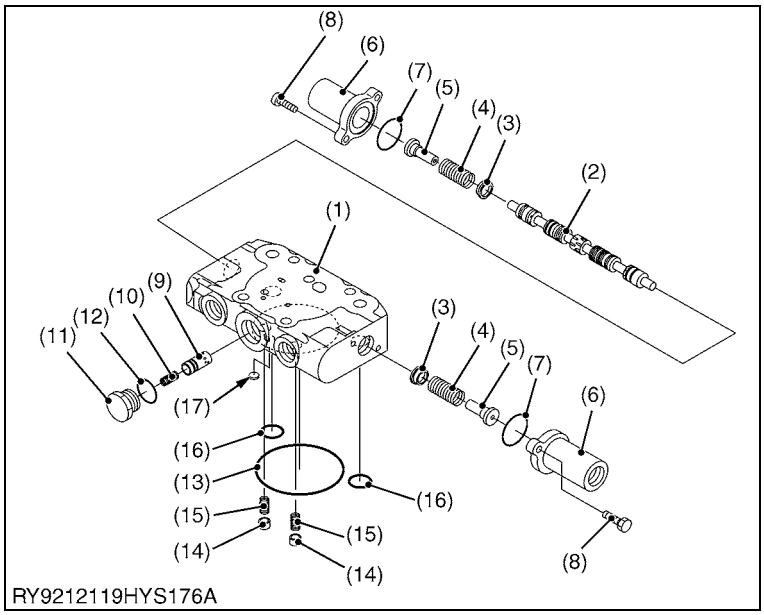

(E) Spool Section (AUX1) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	Spring Seat	2	
(4)	Spring	2	
(5)	Spring Seat	2	
(6)	Cap	2	
(7)	O-ring (S24, 1A)	2	
(8)	Socket Head Bolt	4	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(9)	Spool	1	
(10)	Spring	1	
(11)	Plug	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(12)	O-ring	1	
(13)	O-ring	1	
(14)	Load Check Valve	2	
(15)	Spring	2	
(16)	O-ring	1	
(17)	Plate	1	

(a) Identification Groove (x 2)
(b) Assembly Direction Identification Groove

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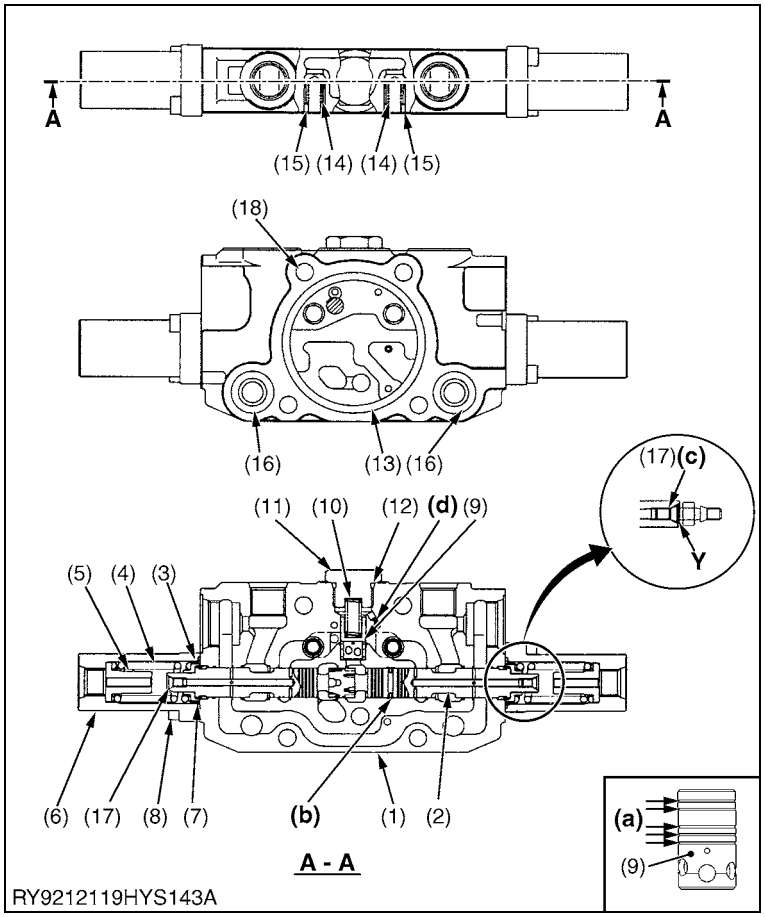

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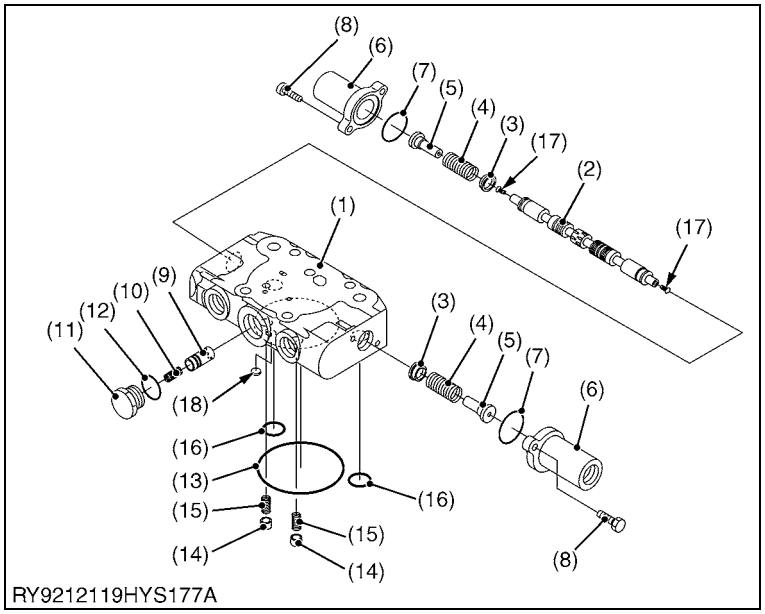


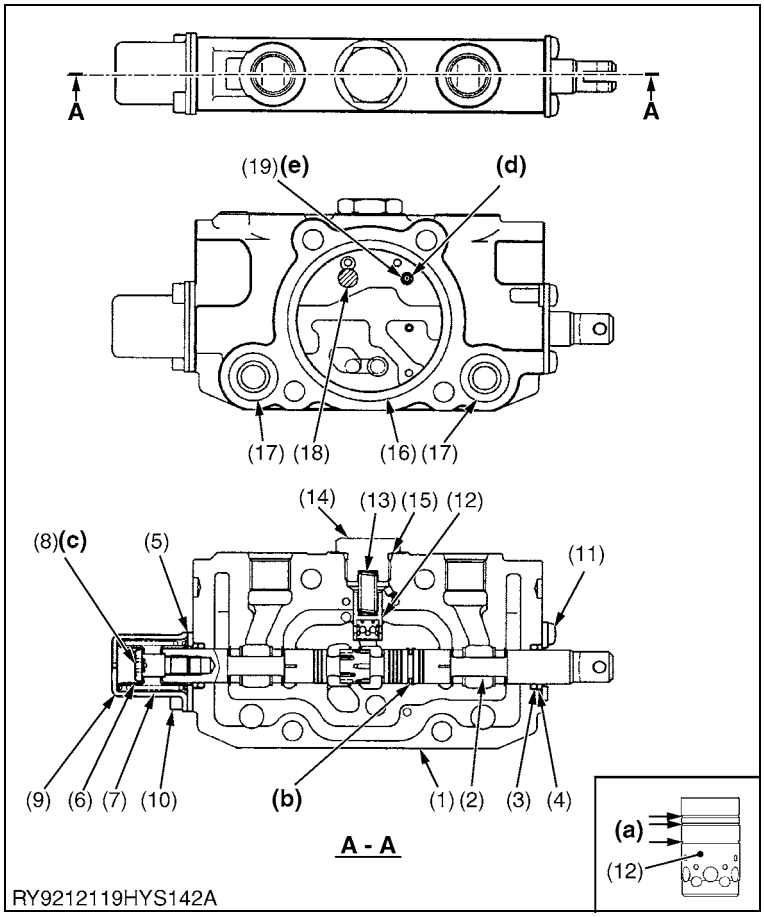
RY9212119HYS177A

(F) Spool Section (Arm) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	Spring Seat	2	
(4)	Spring	2	
(5)	Spring Seat	2	
(6)	Cap	2	
(7)	O-ring	2	
(8)	Socket Head Bolt	4	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(9)	Spool	1	
(10)	Spring	1	
(11)	Plug	2	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(12)	O-ring	1	
(13)	O-ring	1	
(14)	Load Check Valve	2	
(15)	Spring	2	
(16)	O-ring	2	
(17)	Plug	2	
(18)	Plate	1	

(a) Identification Groove (x 5)
(b) Assembly Direction Identification Groove
(c) Tighten until Y breaks. (Both Ends) [Tightening torque approximately 6.9 N·m (0.7 kgf·m, 5.1 lbf·ft)]
(d) ϕ0.6 drill thru

RY9212119HYS0049US0



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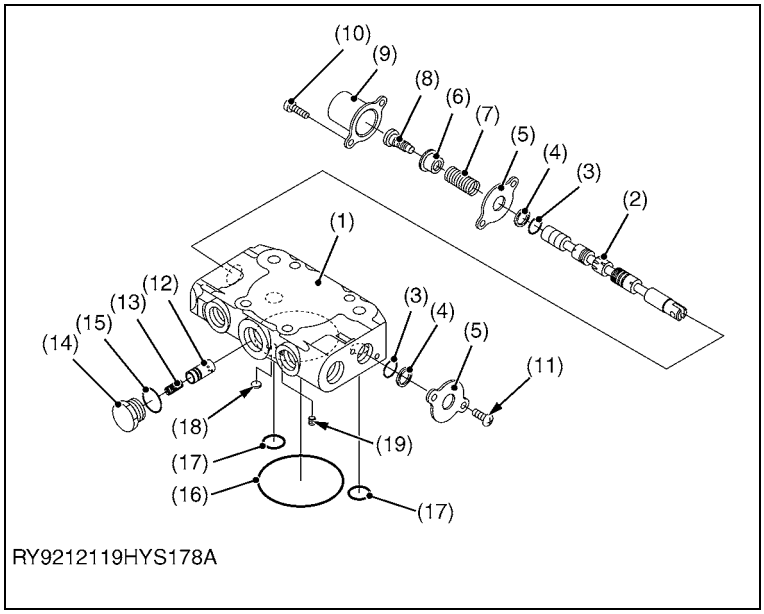


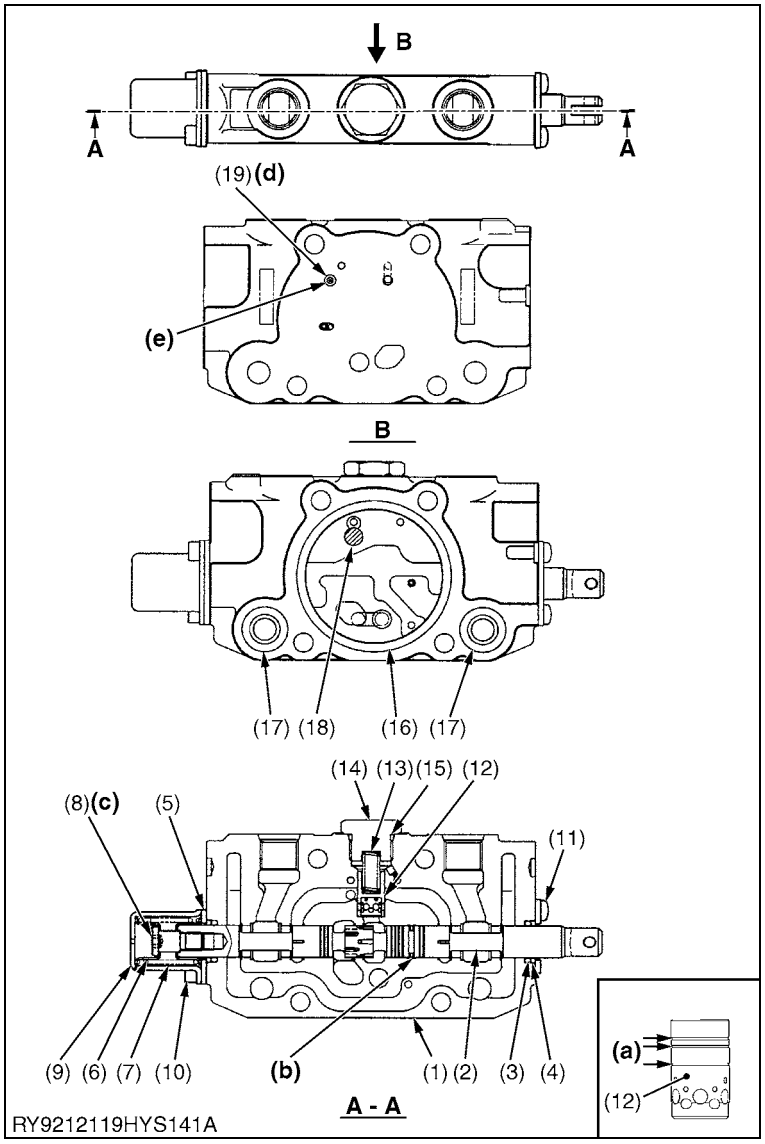
RY9212119HYS178A

(G) Spool Section (Travel Left) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	O-ring	2	
(4)	Wiper	2	
(5)	Seal Plate	2	
(6)	Spring Seat	2	
(7)	Spring	1	
(8)	Cap Screw	1	19 to 22 N·m 1.94 to 2.24 kgf·m 14 to 16.2 lbf·ft
(9)	Cap	2	
(10)	Socket Head Bolt	2	7.3 to 10 N·m 0.74 to 1.02 kgf·m 5.38 to 7.38 lbf·ft
(11)	Screw	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(12)	Spool	1	
(13)	Spring	1	
(14)	Plug	2	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(15)	O-ring	1	
(16)	O-ring	1	
(17)	O-ring	2	
(18)	Plate	1	
(19)	Orifice Plug	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft

(a) Identification Groove (x 3)
(b) Assembly Direction Identification Groove
(c) Identification groove on the end
(d) Identification mark in red
(e) Communication orifice ϕ0.6

RY9212119HYS0048US0



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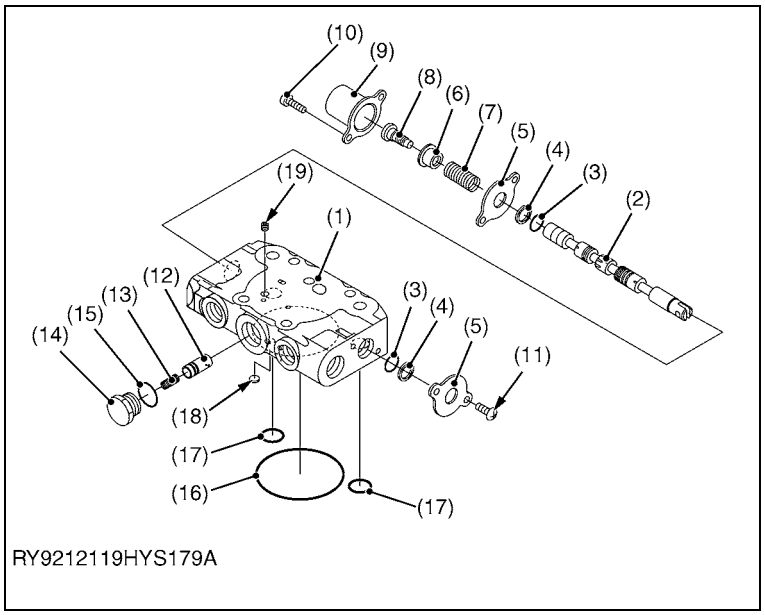


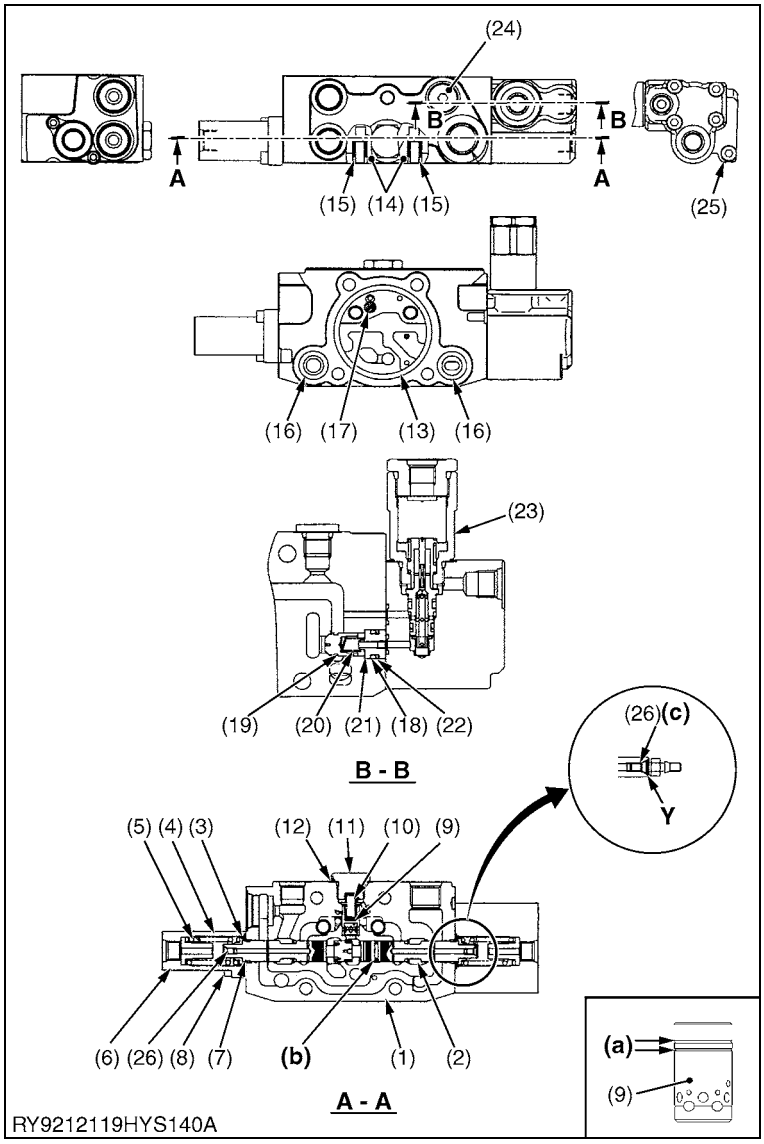
RY9212119HYS179A

(H) Spool Section (Travel Right) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	O-ring	2	
(4)	Wiper	2	
(5)	Seal Plate	2	
(6)	Spring Seat	2	
(7)	Spring	1	
(8)	Cap Screw	1	19 to 22 N·m 1.94 to 2.24 kgf·m 14 to 16.2 lbf·ft
(9)	Cap	2	
(10)	Socket Head Bolt	2	7.3 to 10 N·m 0.74 to 1.02 kgf·m 5.38 to 7.38 lbf·ft
(11)	Screw	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(12)	Spool	1	
(13)	Spring	1	
(14)	Plug	2	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(15)	O-ring	1	
(16)	O-ring	1	
(17)	O-ring	2	
(18)	Plate	1	
(19)	Orifice Plug	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft

(a) Identification Groove (x 3)
(b) Assembly Direction Identification Groove
(c) Identification groove on the end
(d) Identification mark in red
(e) Communication orifice ϕ0.6

RY9212119HYS0047US0



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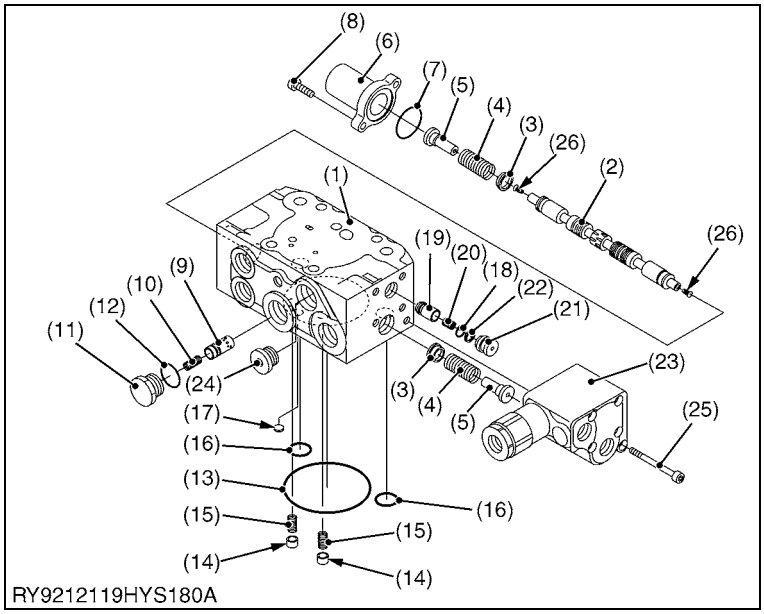

RY9212119HYS180A

(I) Spool Section (Boom) Components

No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	Spring Seat	2	
(4)	Spring	2	
(5)	Spring Seat	2	
(6)	Cap	1	
(7)	O-ring (S24, 1A)	2	
(8)	Socket Head Bolt	2	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(9)	Spool	1	
(10)	Spring	2	
(11)	Plug	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(12)	O-ring	1	
(13)	O-ring	1	
(14)	Load Check Valve	1	
(15)	Spring	2	
(16)	O-ring	1	
(17)	Plate	1	
(18)	O-ring	1	
(19)	Poppet	2	
(20)	Spring	1	
(21)	Spacer	1	
(22)	Backup Ring	1	
(23)	Anti-Drift Assembly	1	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(24)	Plug Assy	1	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 20.9 to 22.4 lbf·ft
(25)	Socket Head Bolt	5	8.8 to 11 N·m 0.9 to 1.12 kgf·m 6.49 to 8.11 lbf·ft
(26)	Plug	2	

(a) Identification Groove (x 2)
(b) Assembly Direction Identification Groove
(c) Tighten until Y breaks. (Both Ends)
[Tightening torque approximately 6.9 N·m (0.7 kgf·m, 5.1 lbf·ft)]

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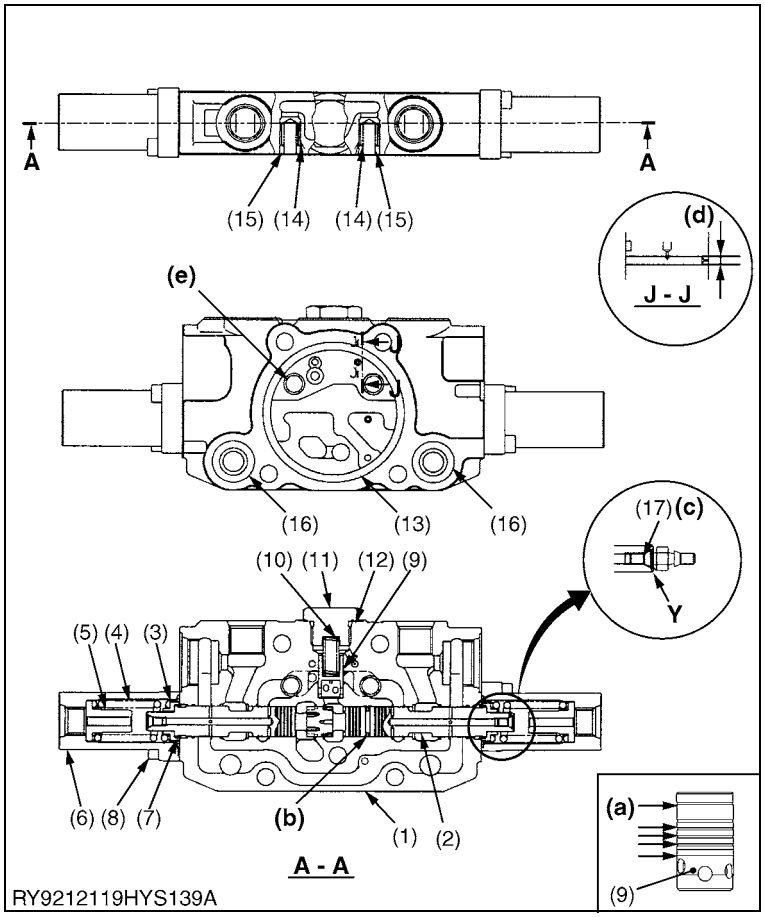

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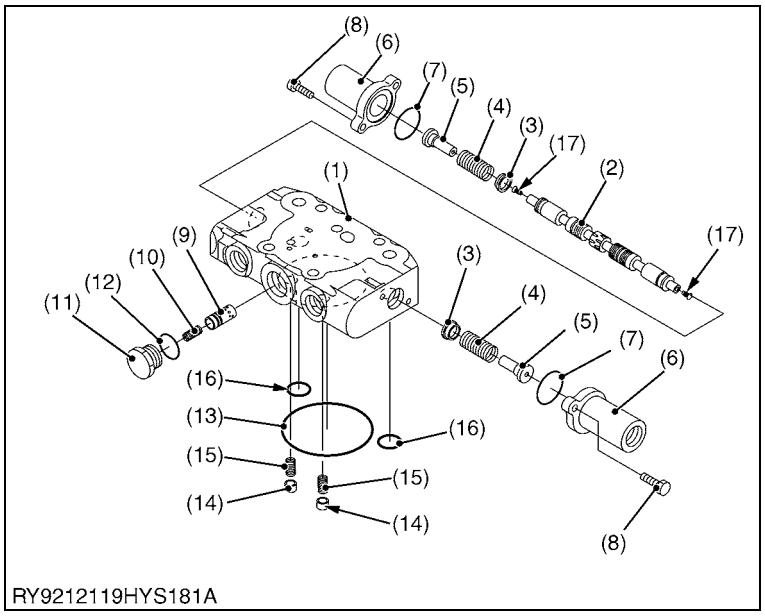


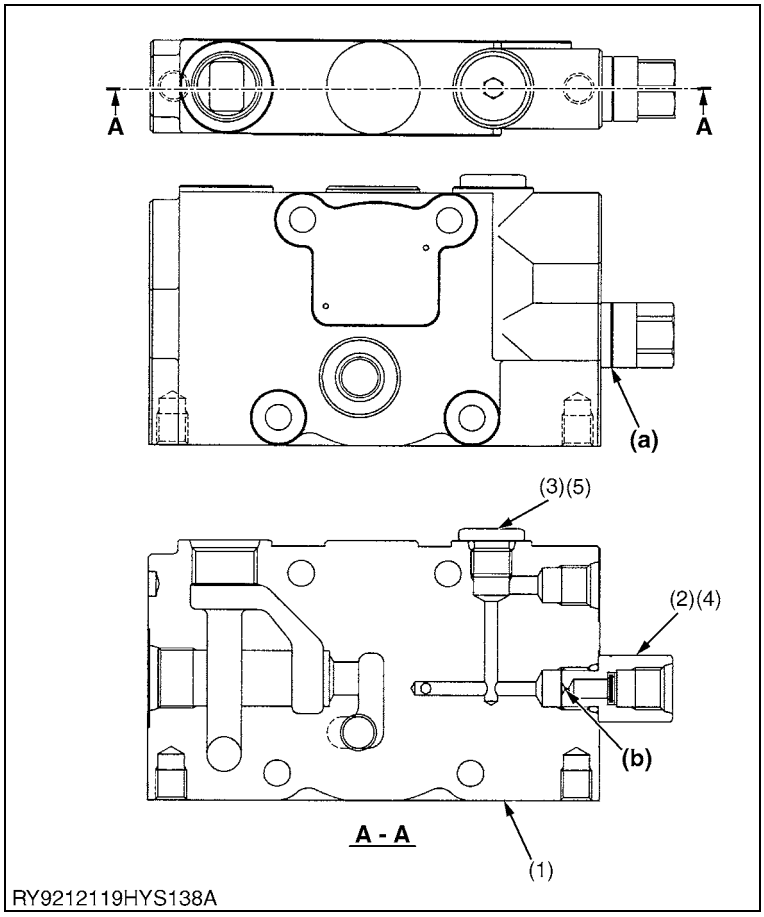
RY9212119HYS181A

(J) Spool Section (Bucket) Components

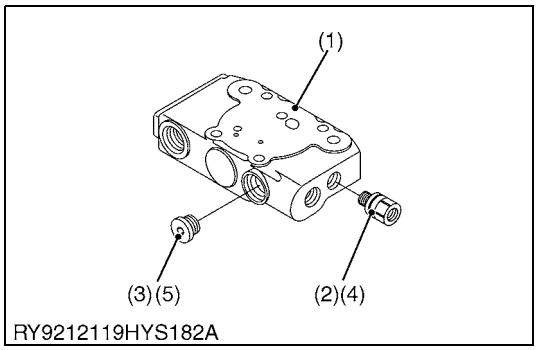
No.	Parts Name	Q'ty	Tightening torque
(1)	Valve Housing	1	
(2)	Spool	1	
(3)	Spring Seat	2	
(4)	Spring	2	
(5)	Spring Seat	2	
(6)	Cap	2	
(7)	O-ring (S24, 1A)	2	
(8)	Socket Head Bolt	4	7.5 N·m 0.77 kgf·m 5.53 lbf·ft
(9)	Spool	1	
(10)	Spring	1	
(11)	Plug	2	69 to 78 N·m 7.0 to 8.0 kgf·m 50.9 to 57.5 lbf·ft
(12)	O-ring	1	
(13)	O-ring	1	
(14)	Load Check Valve	1	
(15)	Spring	1	
(16)	O-ring	2	
(17)	Plug	2	

(a) Identification Groove (x 5)
(b) Assembly Direction Identification Groove
(c) Tighten until Y breaks. (Both Ends)
[Tightening torque approximately 6.9 N·m (0.7 kgf·m, 5.1 lbf·ft)]
(d) (ϕ 0.6)
(e) No plate

RY9212119HYS0045US0



RY9212119HYS138A



RY9212119HYS182A

(K) Spool Section (Outlet) Components

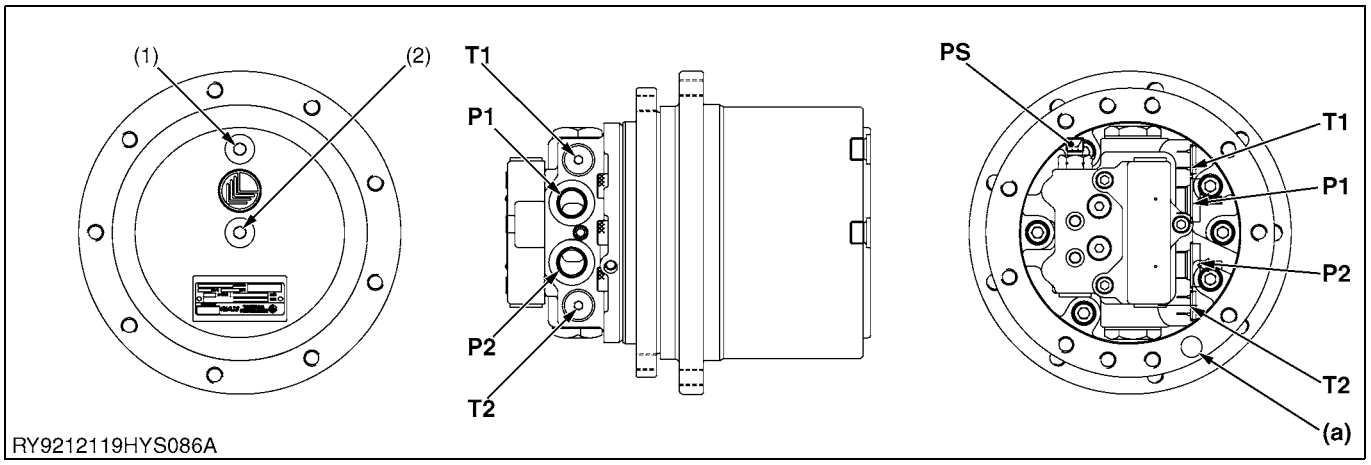
No.	Parts Name	Q'ty	Tightening torque
(1)	Outlet Housing	1	
(2)	Plug Assembly	1	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 21 to 22.4 lbf·ft
(3)	Plug Assembly	1	28.4 to 30.4 N·m 2.9 to 3.1 kgf·m 21 to 22.4 lbf·ft
(4)	O-ring	1	
(5)	O-ring	1	

(a) Identification Groove (x 1)
(b) 100 mesh, ϕ 0.4

RY9212119HYS0044US0

4. TRAVEL MOTOR

[1] SPECIFICATIONS



RY9212119HYS086A

(1) Oil Filling and Draining Plug
(2) Oil Level Plug

A1, A2: Gauge Ports
P1, P2: Motor Ports

T1, T2: Motor Drain Ports
P3: Pilot Ports for 2 Speed Control

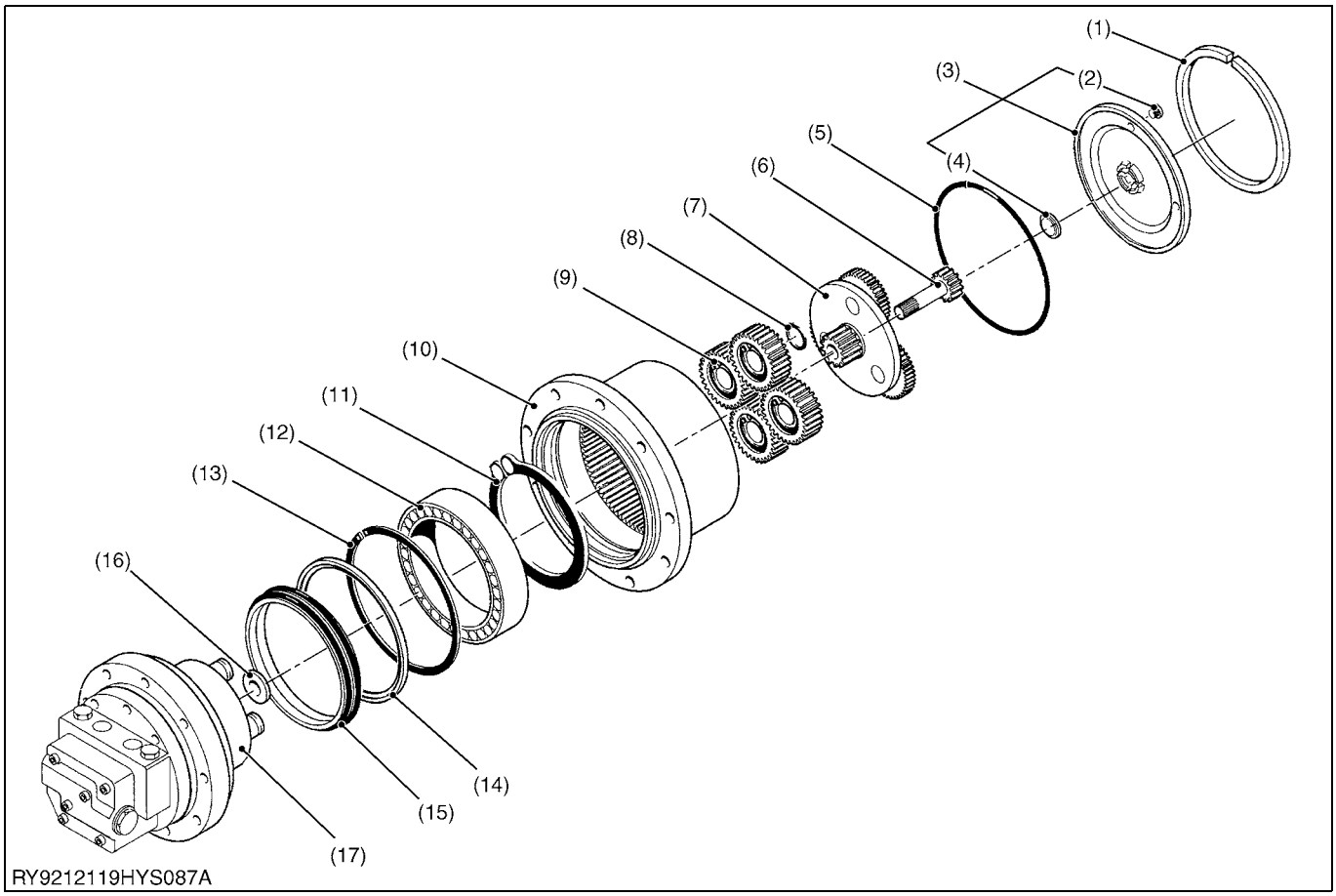
(a) Red mark to identify gearbox

		KX101-3α3, U35-3α3
Maker		BONFIGLIOLI TRASMITAL
Model		2T702C2K049005
Motor Displacement	High Speed	10.6 cc/rev (0.65 cu.in./rev)
	Low Speed	18.4 cc/rev (1.12 cu.in./rev)
Reduction Ratio		1 : 48.6
Max. Pressure		24.5 MPa (250 kgf/cm^2, 3550 psi)
Max. Flow		38 L/min (10 USGPM)
Max. Motor Output Torque (Theoretical)	High Speed (at Max. Pressure)	41.33 N·m (4.21 kgf·m, 30.5 lbf·ft)
	Low Speed (at Max. Pressure)	71.75 N·m (7.32 kgf·m, 52.9 lbf·ft)
Max. Motor Output Speed (Theoretical)	High Speed	3585 rpm
	Low Speed	2065 rpm
Max. Gearbox Output Torque (Theoretical)	High Speed	2010 N·m (205 kgf·m, 1482 lbf·ft)
	Low Speed	3490 N·m (356 kgf·m, 2574 lbf·ft)
Max. Gearbox Output Speed (Theoretical)	High Speed	73.7 rpm
	Low Speed	42.5 rpm
Displacement Control Pressure	Low to High Speed	15.7 to 18.5 MPa 160 to 189 kgf/cm^2 2277 to 2683 psi
	High to Low Speed	16.4 to 19.2 MPa 167 to 196 kgf/cm^2 2379 to 2785 psi
2 Speed Control Min. Pressure		3.4 to 3.7 MPa 34.7 to 37.7 kgf/cm^2 493 to 537 psi

RY9212119HYS0023US0

[2] TRAVEL MOTOR DISASSEMBLY/ASSEMBLY PROCEDURES

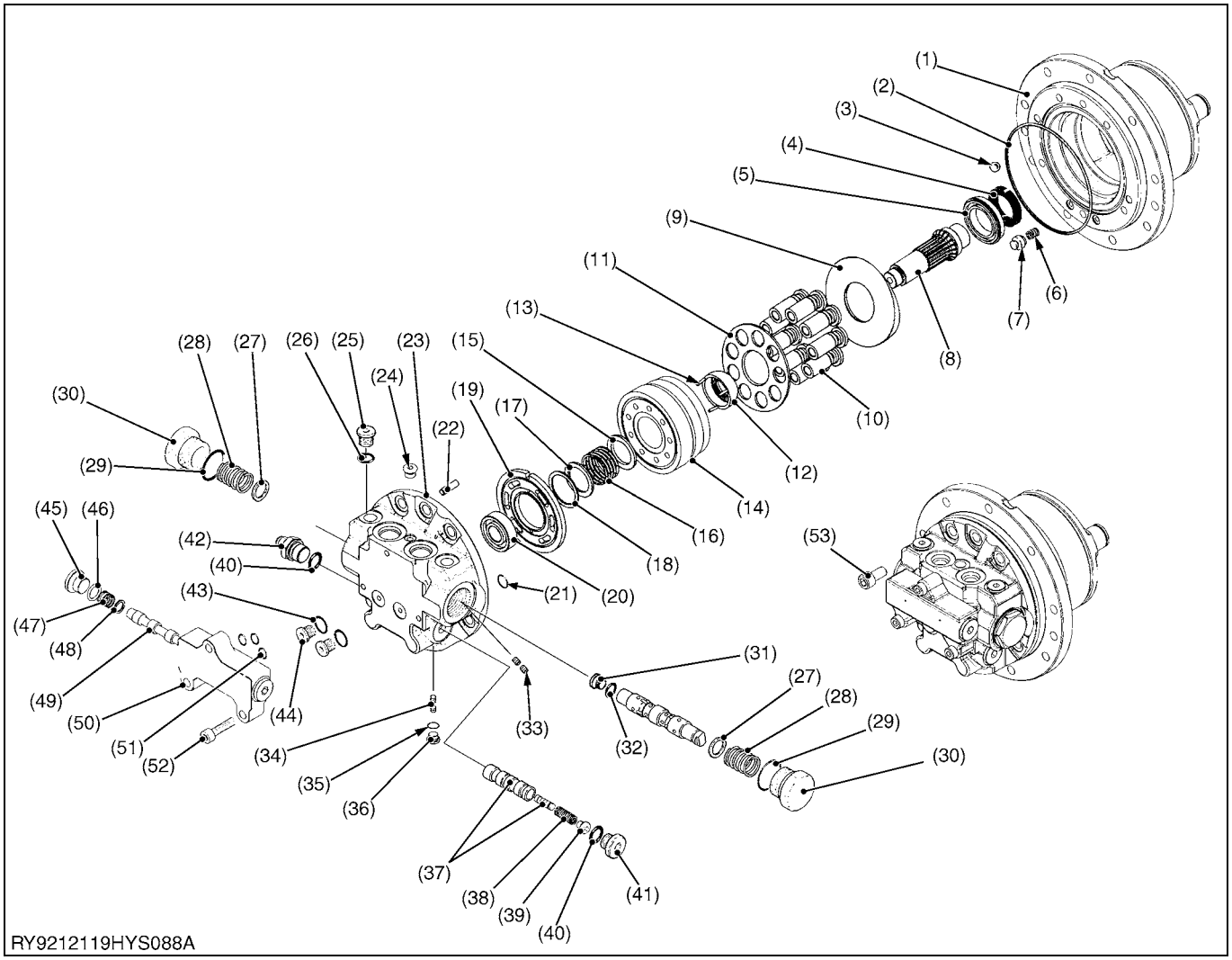
Gear Case Components



No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Circlip	1	BR 180	(10)	Gearbox Housing	1	
(2)	Plug	2	3/8"	(11)	Circlip	1	UNI 7435-130
(3)	Cover Assembly	1		(12)	Bearing	1	ϕi 130
(4)	Pad	1		(13)	Circlip	1	UNI7437-170
(5)	O-ring	1	2.62 x 177.47	(14)	Disc	1	
(6)	Sun Gear	1	1 : 8.27 z11 m2.00	(15)	Lifetime Seal	1	ϕi 154
(7)	1st Red. Assembly	1	1 : 8.27	(16)	Centering Ring	1	
(8)	Circlip	4	UNI 7435-25	(17)	Hydraulic Motor	1	MAG-18V-TRF4
(9)	Reduction Assembly	4	1:6.00				

RY9212119HYS0166US0

Motor Components



(To be continued)

(Continued)

No.	Parts Name	Q'ty	Notes	No.	Parts Name	Q'ty	Notes
(1)	Hub	1		(28)	Spring	2	
(2)	O-ring	1		(29)	O-ring	2	
(3)	Ball	2		(30)	Plug	2	
(4)	Motor Seal Ring	1		(31)	Plunger Assy	1	
(5)	Bearing	1		(32)	O-ring	2	
(6)	Spring	2		(33)	Orifice	2	ϕ0.6
(7)	Piston	2		(34)	Orifice	4	ϕ0.5
(8)	Motor Shaft Assy	1		(35)	O-ring	2	
(9)	Swash Plate	1		(36)	Plug	4	SAE2
(10)	Piston	9		(37)	Spool	2	
(11)	Retainer Plate	1		(38)	Spring	1	
(12)	Spherical Bush	1		(39)	Spring Seat	1	
(13)	Pin	3		(40)	O-ring	2	
(14)	Cylinder Block	1		(41)	Plug	1	JIS PF 3/8
(15)	Spring Holder	1		(42)	Plug	1	M14
(16)	Spring	1		(43)	O-ring	2	
(17)	Collar Washer	1		(44)	Plug	2	JIS PF 1/8
(18)	Circlip	1		(45)	Plug	2	JIS PF 3/8
(19)	Valve Plate	1		(46)	O-ring	2	
(20)	Bearing	1		(47)	Spring	2	
(21)	O-ring	2		(48)	Spring Seat	2	
(22)	Pin	2		(49)	Spool Valve	1	
(23)	Base Plate	1		(50)	Valve Housing	1	
(24)	Plug	1	M10 x 1.5	(51)	O-ring	3	
(25)	Plug	1		(52)	Screw	3	M8 x 30
(26)	O-ring	1		(53)	Screw	6	M10 x 20-12.9
(27)	Spring Seat	2					

RY9212119HYS0167US0

(1) Disassembly Procedures

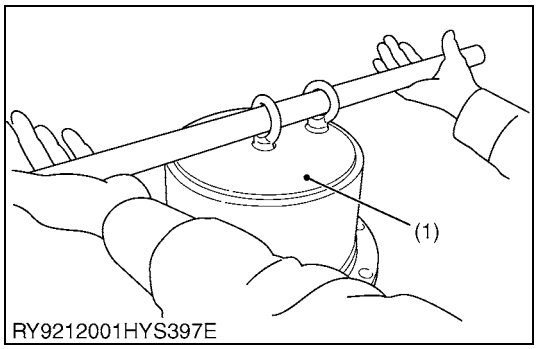
[A] Gear Case Disassembly

1. Attach the travel motor to the special disassembly platform.
2. Remove the circlip.

- Tool to use: Slotted screwdriver

(1) Circlip

RY9212119HYS0056US0



3. Remove the cover.
- Remove the plugs and attach eye-bolts.
- Put the rod through the eyebolt holes.
- Knock upwards on both sides of the rod and remove the cover.

- Tool to use: Eyebolts and round rod

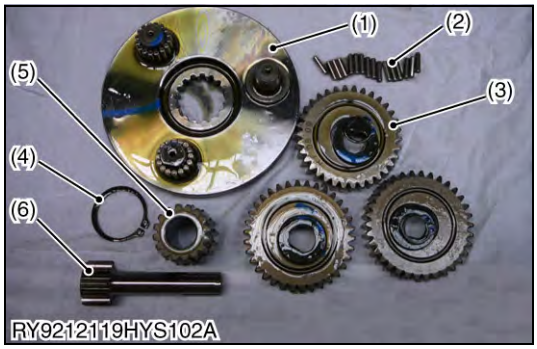
(1) Cover

RY9212091HYS0116US0

4. Remove the holder and sub-assembly.

(1) Holder, Sub-Assy

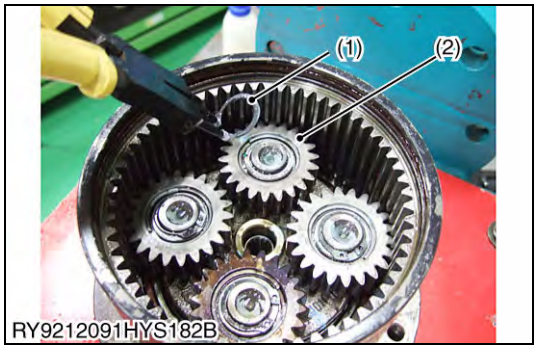
RY9212119HYS0057US0



Components of the holder and sub-assy

(1) Holder
(2) Needle Bearing
(3) Gear (Planetary)
(4) External Circlip
(5) Gear (Sun)
(6) Gear (Drive)

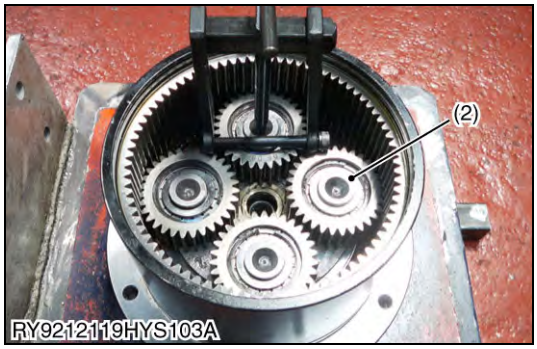
RY9212119HYS0091US0



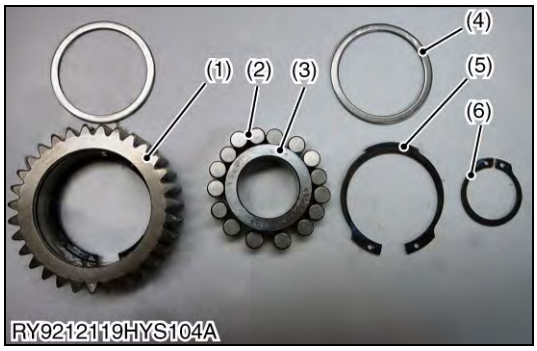
5. Remove the external circlip and planetary gear assy.

(1) External Circlip
(2) Planetary Gear Assy

RY9212119HYS0058US0



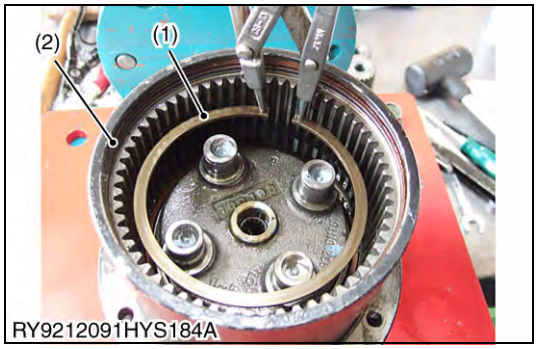
Components of the planetary gear assy



(1) Gear (Planetary)
(2) Needle Bearing
(3) Coller
(4) Plate
(5) Internal Circlip
(6) External Circlip

RY9212119HYS0092US0

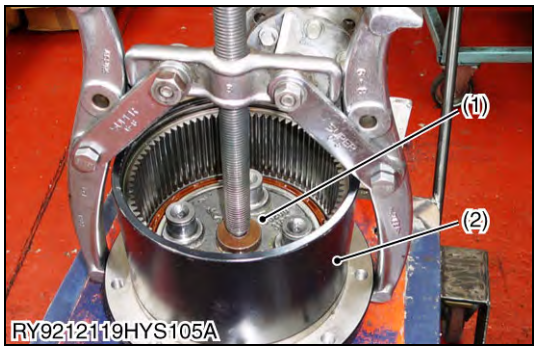
6. Remove the circlip and O-ring.



(1) Circlip
(2) O-ring

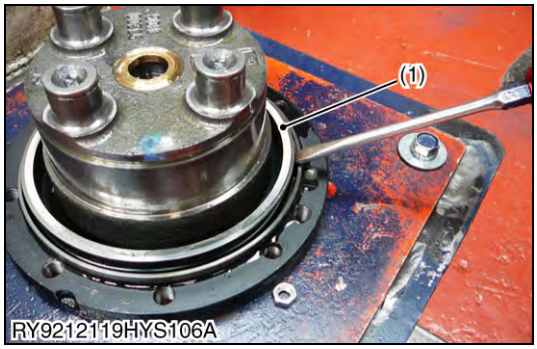
RY9212091HYS0183US0

7. Remove the gear case from the flange holder.



(1) Gear Case
(2) Flange Holder

RY9212119HYS0060US0



8. Remove the seal from the flange holder side.

- Tool to use: Slotted screwdriver

(1) Seal

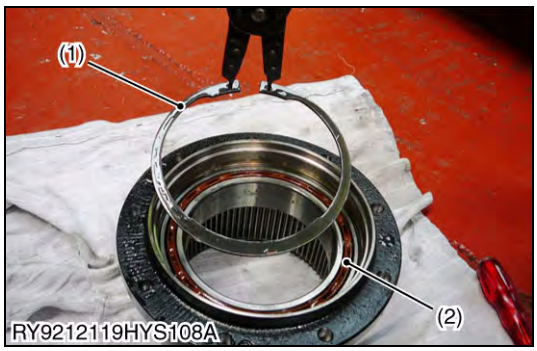
RY9212119HYS0061US0

9. Remove the seal from the gear case side.

- Tool to use: Slotted screwdriver

(1) Seal

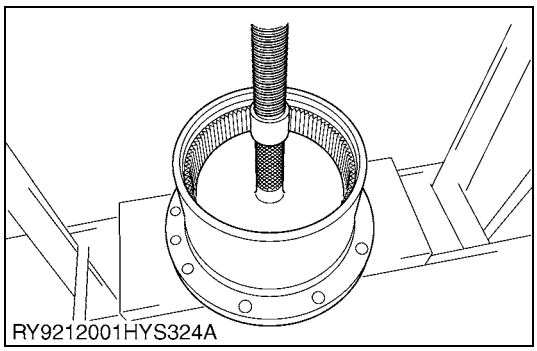
RY9212119HYS0062US0



10. Remove the circlip.
11. Remove the bearing (angular) with a press.

(1) Circlip (2) Bearing (Angular)

RY9212119HYS0063US0



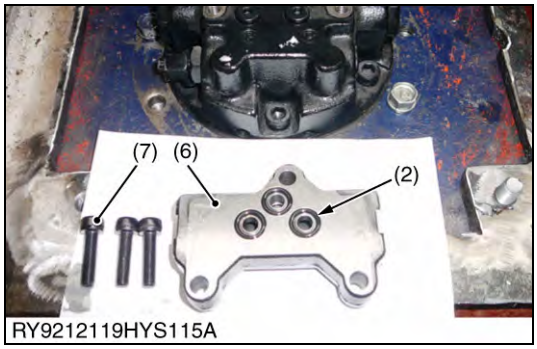
[B] Motor Disassembly

1. Remove the plug.

- Tool to use: M8 hex socket

(1) Plug

RY9212119HYS0064US0

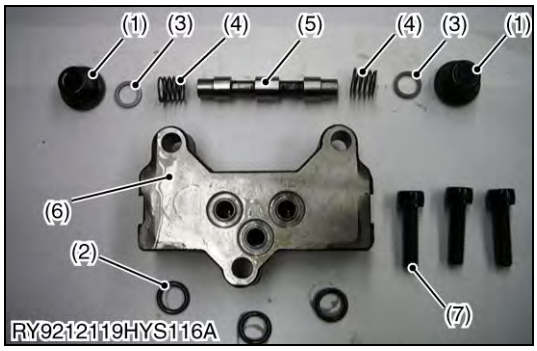


2. Remove the body (anti-cavitation).

■ **IMPORTANT**

- **Replace O-rings with new ones during reassembly.**

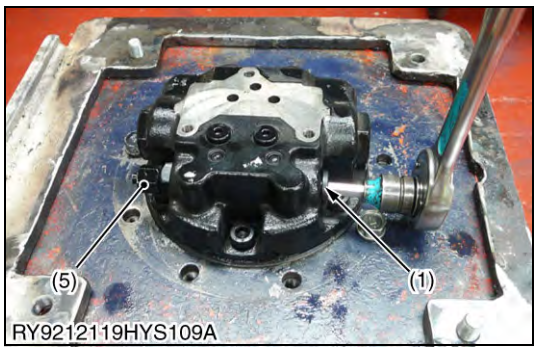
- Tool to use: M6 hex socket



Body (anti-cavitation), Assy Components

(1) Plug
(2) O-Ring
(3) Spring Washer
(4) Spring (Anti-Cavitation)
(5) Spool (Anti-Cavitation)
(6) Body (Anti-Cavitation)
(7) Hex Socket Bolt

RY9212119HYS0065US0

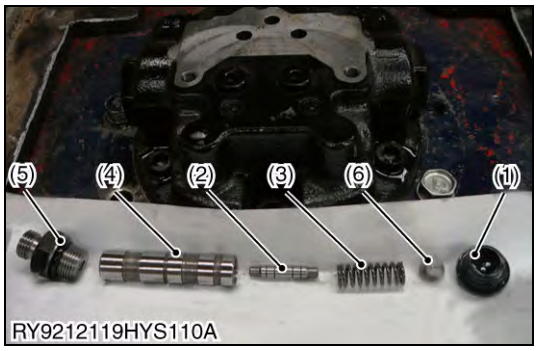


3. Remove the 2-speed parts.

■ **IMPORTANT**

- **Check to make sure there are not any scratches around the circumference of the spools.**

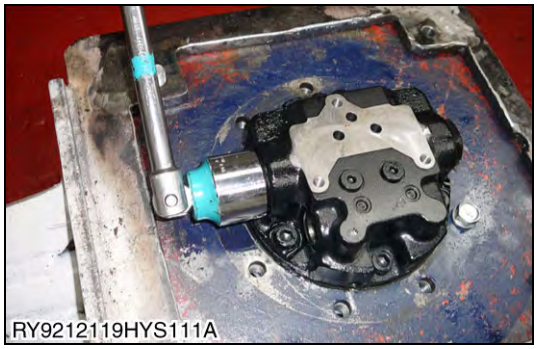
- Tool to use: M8 hex socket, M22 socket wrench



Components of the 2-speed Assy

(1) Plug
(2) Spool (2-Speed, S)
(3) Spring (2-Speed, S)
(4) Spool (2-Speed Switch)
(5) Pipe connector (2-Speed)
(6) Spring Seat

RY9212119HYS0066US0

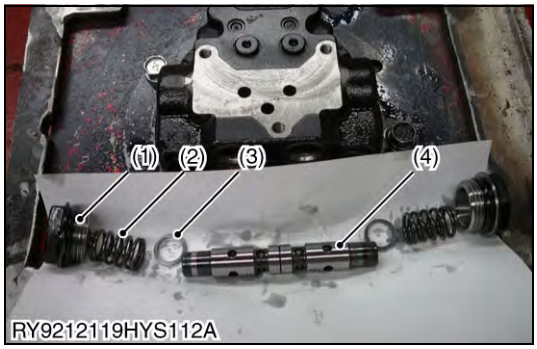

RY9212119HYS111A

4. Remove the plug.

CAUTION
- **There is little room for the wrench (or socket), so be careful not to let it slip.**

- Tool to use: M36 wrench (socket)

RY9212119HYS0067US0



RY9212119HYS112A

5. Remove the compression spring, metal washer (spring) and plunger (counterbalance) in order.

IMPORTANT
- **Check to make sure there are not any scratches around the circumference of the spools.**

(1) Plug
(2) Compression Spring
(3) Metal Washer (Spring)
(4) Plunger (Counterbalance)

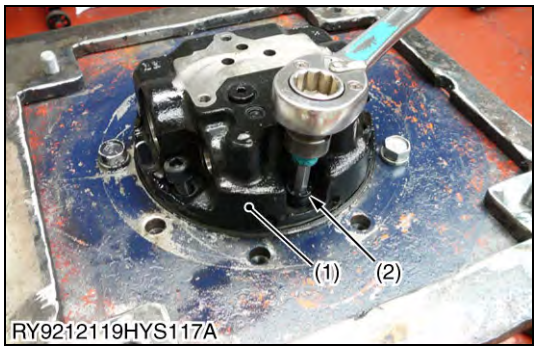
RY9212119HYS0068US0

RY9212119HYS113A

6. Remove the orifice.

(1) Orifice

RY9212119HYS0069US0



RY9212119HYS117A

7. Remove the hex socket bolt.

(1) Body (Counterbalance)
(2) Hex Socket Bolt

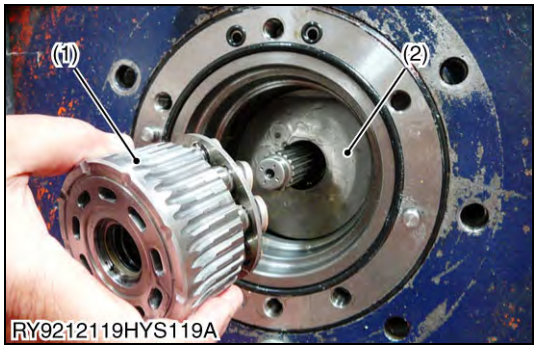
RY9212119HYS0070US0


RY9212119HYS118A

8. Tap the body (counterbalance) with a plastic hammer to raise it. Insert a slotted screwdriver into the gap and tap the body (counterbalance) from the opposite side with the hammer to remove it.

IMPORTANT
- **Be very careful because using force to insert a slotted screwdriver may scratch the body (counterbalance).**

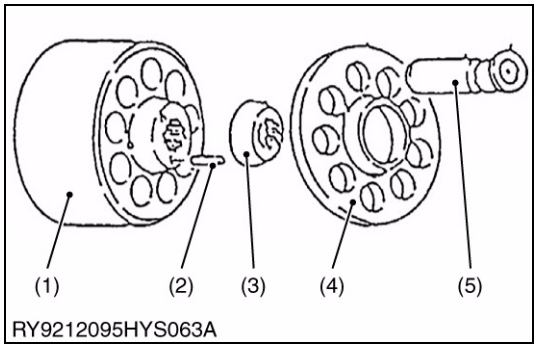
RY9212119HYS0071US0



9. Rotate the assembly platform 90° and remove the cylinder block, sub-assembly and swash-plate (variable).

(1) Cylinder Block and Sub-Assembly (2) Swash-Plate

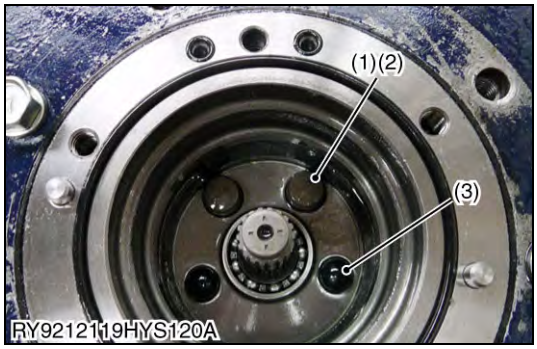
RY9212119HYS0093US0

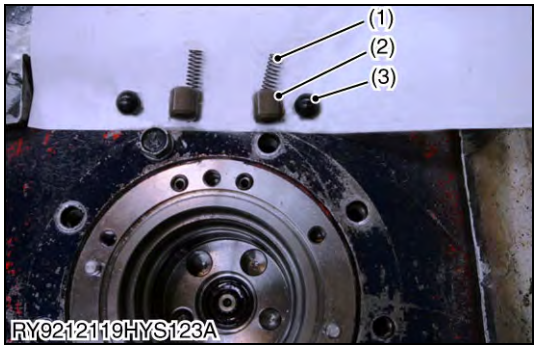


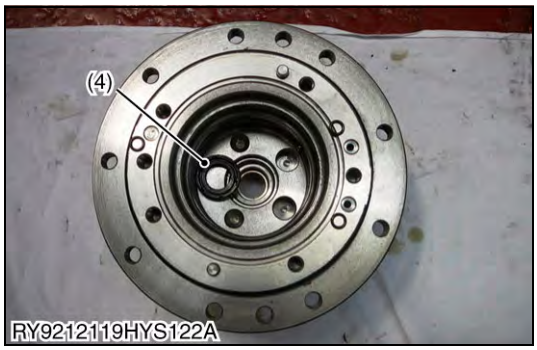
10. Remove the nine piston-shoe assemblies, shoe holder, retainer holder and three pins.

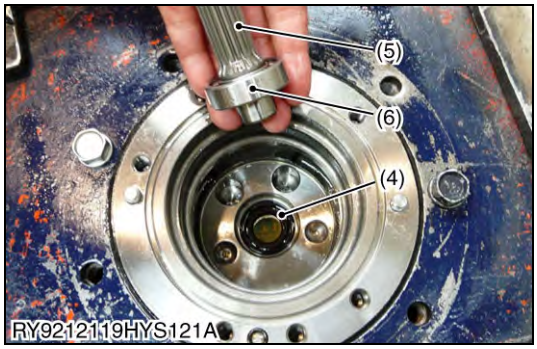
(1) Cylinder Barrel
(2) Pin
(3) Retainer Holder
(4) Shoe Holder
(5) Piston

RY9212095HYS0032US0









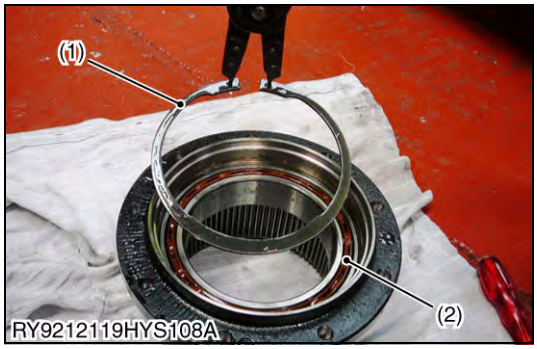
11. Turn the assembly platform back to its original position and remove the piston Assy and spring.
12. Remove the two steel balls.
13. Remove the shaft and bearing, turn the assembly platform over and remove the oil seal.

(1) Spring
(2) Piston Assy
(3) Steel Ball
(4) Oil Seal
(5) Shaft
(6) Bearing

RY9212119HYS0072US0

(2) Assembly Procedures

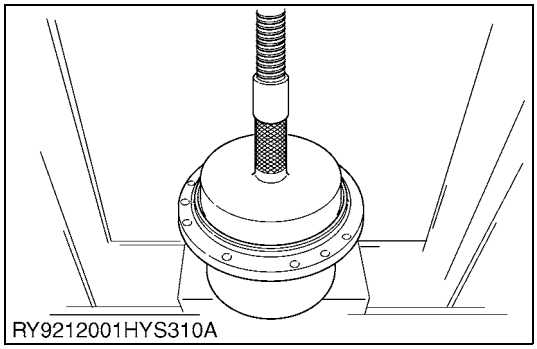
[A] Gear Case Assembly

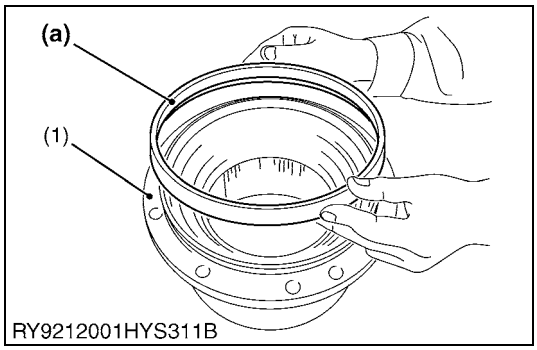


1. Install the circlip.
2. Set the angular bearing in the gear case and install it with a press.

(1) Circlip

RY9212119HYS0073US0





3. Set the floating seal installation tool **(a)** on the gear case.

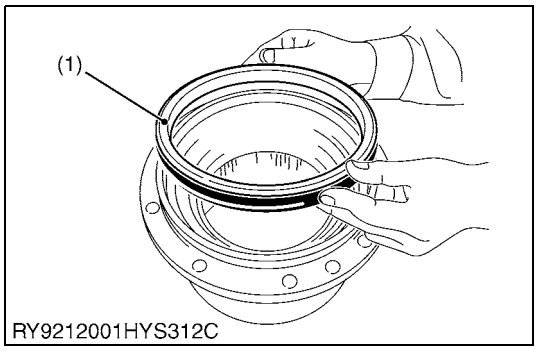
(1) Gear Case

(a) Floating seal installation tool guide (for housing)

RY9212119HYS0074US0

4. Apply grease to the O-ring of the seal and install the seal.

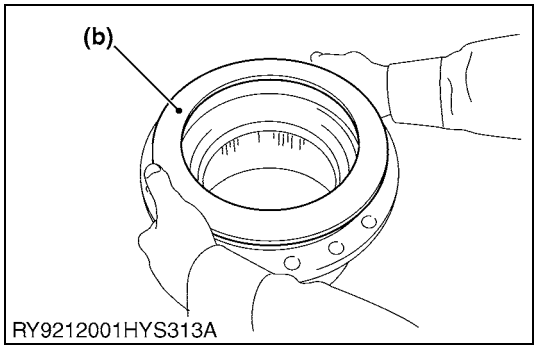
RY9212001HYS0007US0



5. Set the seal in the gear case.

(1) Seal

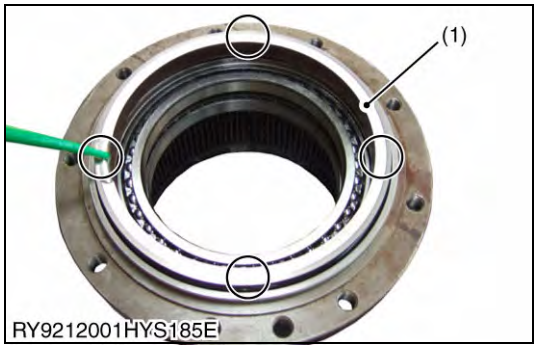
RY9212119HYS0194US0



6. Install the seal in the gear case with the floating seal installation tool **(b)**.

(b) Floating seal installation tool (pusher)

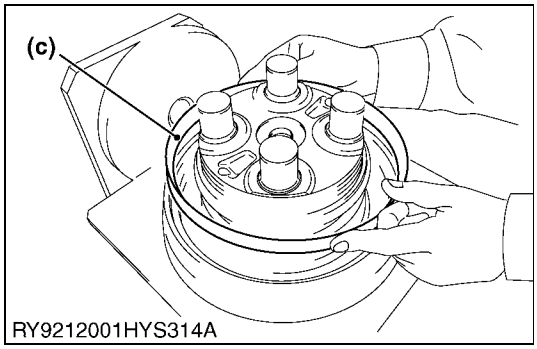
RY9212001HYS0008US0



7. Apply a little gear oil to the sliding surface of the seal. (4 places, every 90º)

(1) Floating Seal

RY9212119HYS0075US0



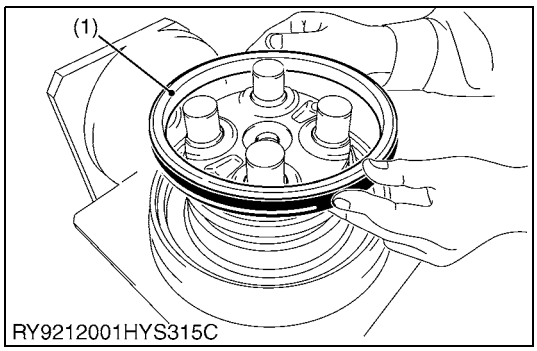
8. Set the holder (flange) on the assembly platform.
Set the floating seal installation tool on the holder (flange).

(c) Floating seal installation tool guide (for flange holder)

RY9212001HYS0009US0

9. Apply grease to the O-ring of the seal and install the seal.

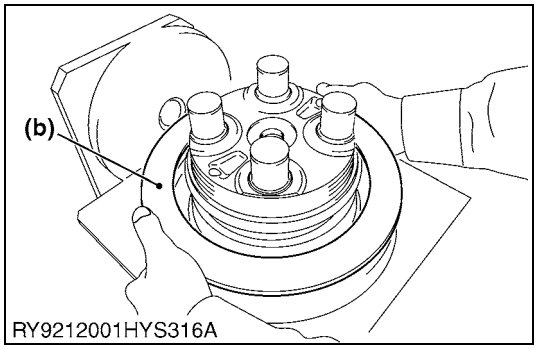
RY9212001HYS0010US0



10. Set the seal in the holder (flange).

(1) Seal

RY9212119HYS0195US0



11. Install the seal on the holder (flange) with the floating seal installation tool.

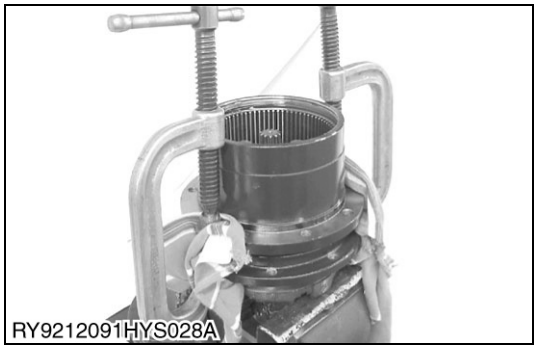
(b) Floating seal installation tool (pusher)

RY9212001HYS0011US0

12. Apply a little gear oil to the sliding surface of the floating seal. (4 places, every 90 °)

(1) Floating Seal

RY9212091HYS0198US0

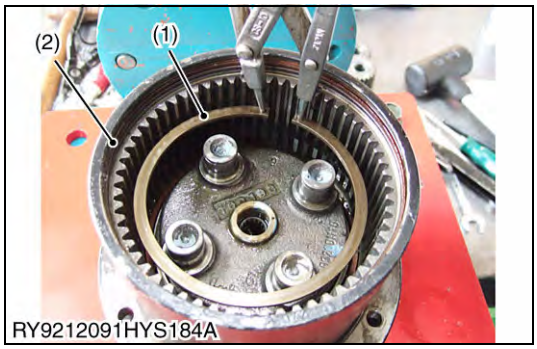


13. Use a vice or hydraulic press to press the flange holder and gear case together.

■ **IMPORTANT**

- **Rotate the gear case by hand to seat the angular bearing.**

RY9212091HYS0199US0



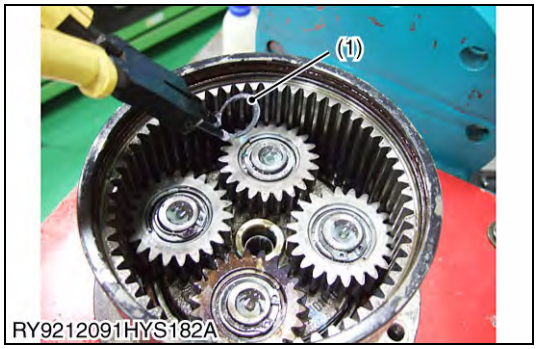
14. Install the circlip.

(1) Circlip (2) Gear Case

RY9212091HYS0200US0

15. Gently tap the planetary gear into place with a plastic hammer.

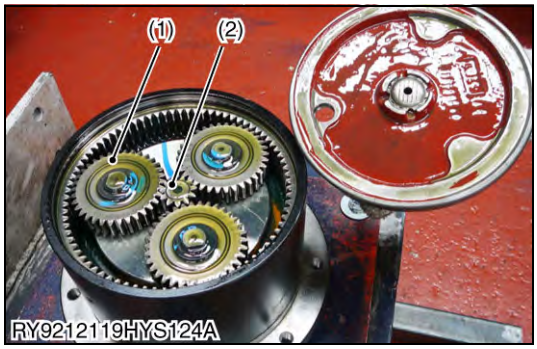
RY9212091HYS0201US0



16. Install the external circlip.

(1) External Circlip

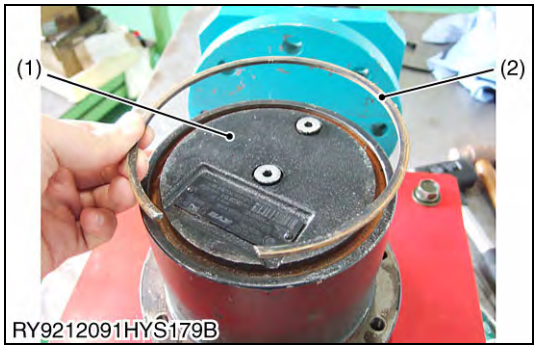
RY9212091HYS0202US0



17. Install the holder, sub-assembly and sun gear.

(1) Holder, Sub-Assy (2) Sun Gear

RY9212119HYS0076US0



18. After installing the O-ring, install the cover and the circlip.

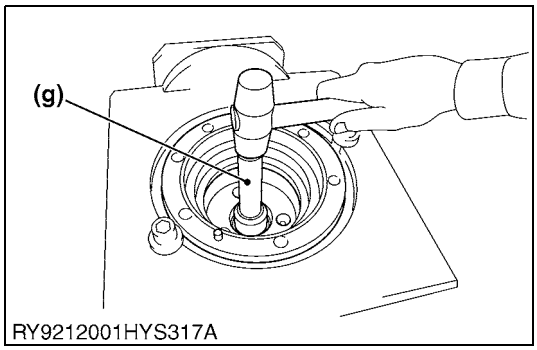
■ **IMPORTANT**

- **Apply grease to the O-ring.**

(1) Cover (2) Circlip

RY9212091HYS0205US0

[B] Motor Assembly



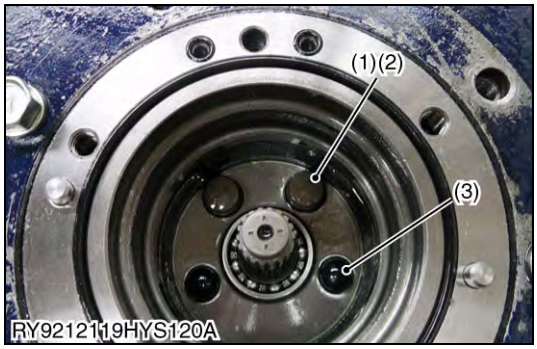
RY9212001HYS317A

1. Tap the oil seal in with the oil seal installation tool **(g)**.

■ **IMPORTANT**
- **Take care to face the oil seal the right direction.**
- **Apply grease to its lip and circumference.**

(g) Oil Seal Installation Tool

RY9212119HYS0077US0



RY9212119HYS120A

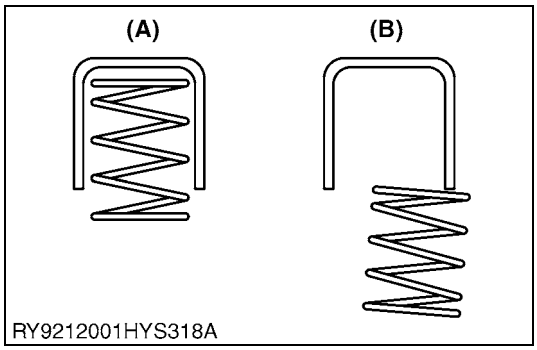
2. Install the pistons and Assy.
3. Apply grease to the two balls and install them.

■ **IMPORTANT**
- **The spring comes out easily, so apply some grease to it.**
- **Press the piston Assy down and make sure it moves smoothly.**

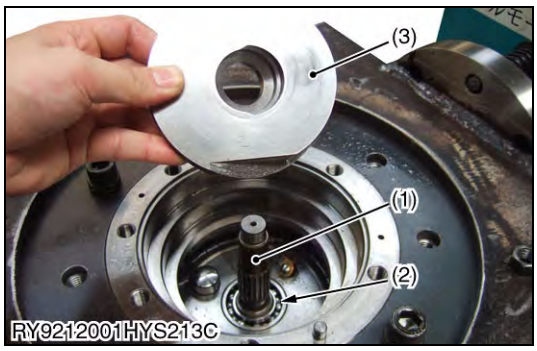
(1) Spring
(2) Piston Assy
(3) Steel Ball

(A) Correct
(B) Incorrect

RY9212119HYS0078US0



RY9212001HYS318A



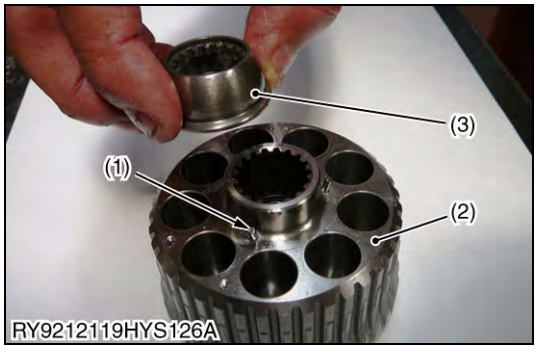
RY9212001HYS213C

4. Install the shaft and bearing and then the swash-plate (variable).

■ **IMPORTANT**
- **Make sure the piston Assy moves smoothly.**

(1) Shaft
(2) Bearing
(3) Swash-Plate (Variable)

RY9212119HYS0079US0



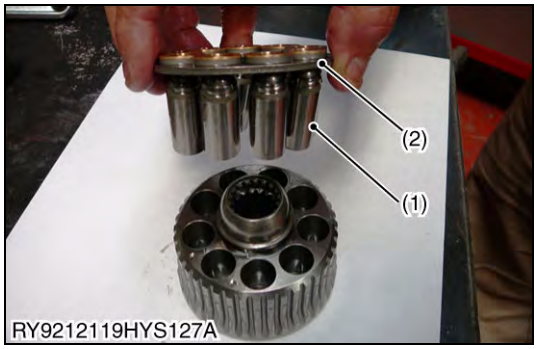
RY9212119HYS126A

5. Install the three pins into the cylinder block.
6. Install the holder (retainer).

■ **IMPORTANT**
- **Apply grease to the pins.**

(1) Pin
(2) Cylinder Block (Travel)
(3) Holder (Retainer)

RY9212119HYS0080US0

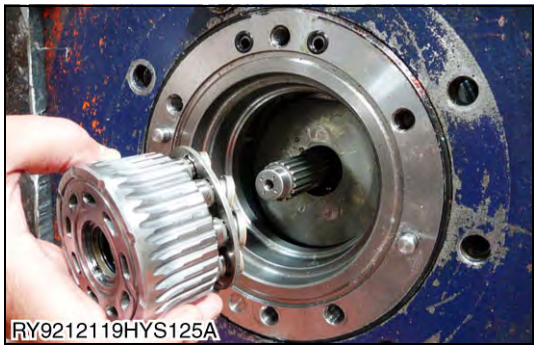


7. Install the piston Assy into the plate (retainer) and then install it into the cylinder block.

■ **IMPORTANT**
- **Apply hydraulic oil to the pistons.**
- **Make sure the pistons move smoothly.**

(1) Piston Assy (2) Plate (Retainer)

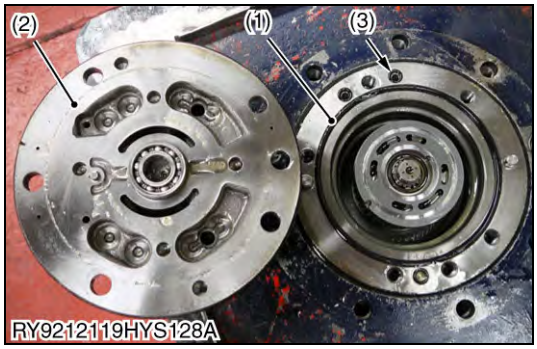
RY9212119HYS0081US0



8. Install the cylinder block, sub-assembly.

■ **IMPORTANT**
- **Turn the disassembly / assembly platform on its side.**

RY9212119HYS0082US0

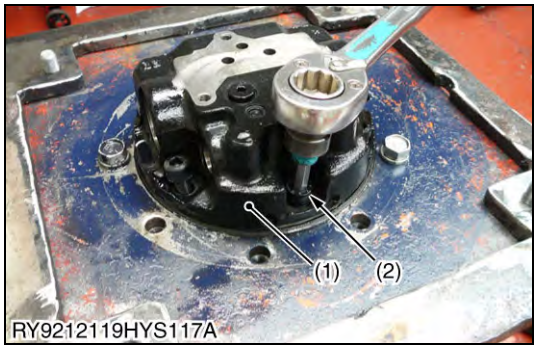


9. Install the plate (valve) and O-ring on the body (counterbalance).
Install the O-ring on the holder (flange).

■ **IMPORTANT**
- **Apply grease on the back of the plate (valve) so it does not fall off the base plate.**
- **Be careful so the plate (valve) faces in the correct direction.**
- **Apply grease to the O-ring.**

(1) O-Ring (3) O-Ring
(2) Plate (Valve)

RY9212119HYS0083US0



10. Install the body (counterbalance).

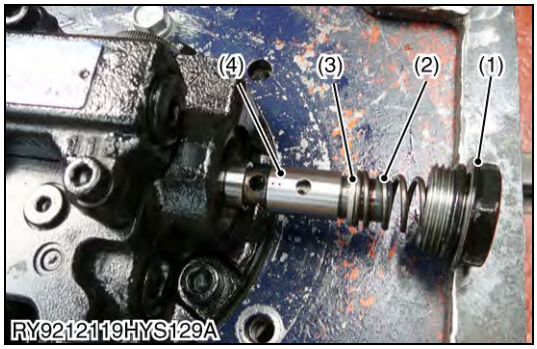
■ **IMPORTANT**
- **Be careful so the plate (valve) does not fall off.**
- **Tighten the hex socket bolts in a criss-cross pattern.**

Tightening torque	Hex socket bolt	59 to 69 N·m 6.0 to 7.0 kgf·m 43.5 to 50.9 lbf·ft

- Tool to use: M8 hex socket

(1) Body (Counterbalance) (2) Hex Socket Bolt

RY9212119HYS0084US0



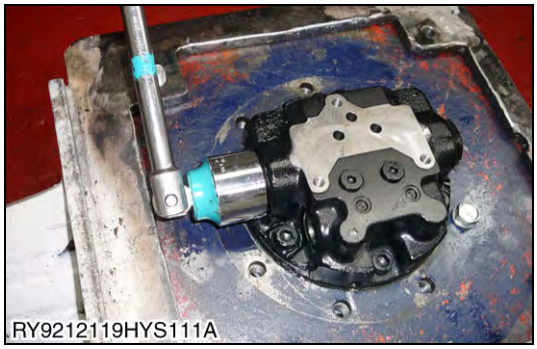
11. Install the counterbalance unit. Install the plunger (counterbalance) and metal washer (spring) in order.

■ **IMPORTANT**
- **The spool itself slides smoothly.**
- **The rounder side of the metal washer (spring) goes on the plug side.**
- **Apply hydraulic oil to the spool.**

12. Install the compression spring and plugs.

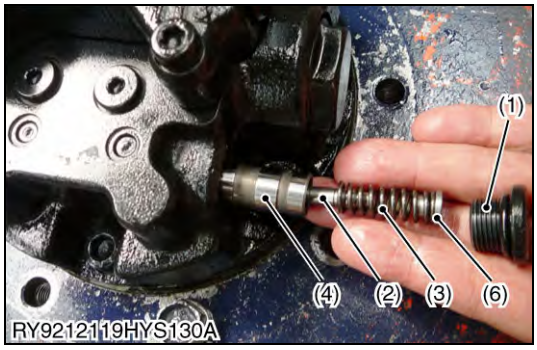
Tightening torque	Plug	235 to 245 N·m 24 to 25 kgf·m 173 to 181 lbf·ft

- Tool to use: M36 wrench (socket)



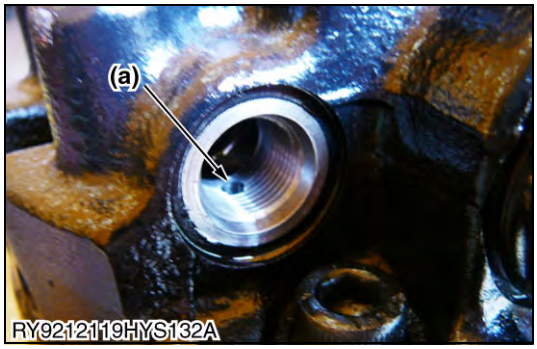
(1) Plug
(2) Compression Spring
(3) Metal Washer (Spring)
(4) Plunger (Counterbalance)

RY9212119HYS0085US0



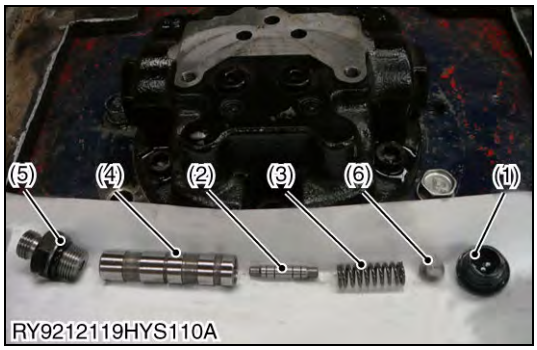
13. Install spool (2-speed switch).
Install the spring (2-speed, S) and spool (2-speed, S) on the spool (2-speed switch).

■ **IMPORTANT**
- **The spool itself slides smoothly.**
- **Be careful to install the spool in the right direction.**
- **Apply hydraulic oil to the spool.**



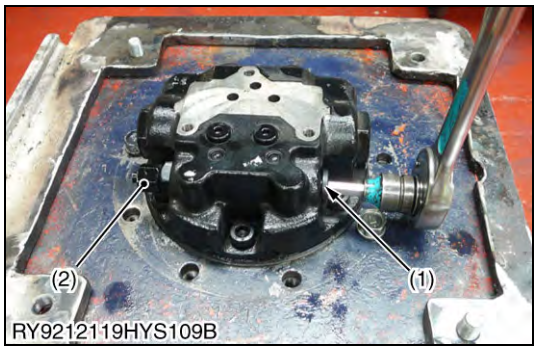
Install so the spool side is toward the side with the hole **(a)**.

Components of the 2-speed Assy



(1) Plug
(2) Spool (2-Speed, S)
(3) Spring (2-Speed, S)
(4) Spool (2-Speed Switch)
(5) Pipe connector (2-Speed)

RY9212119HYS0094US0



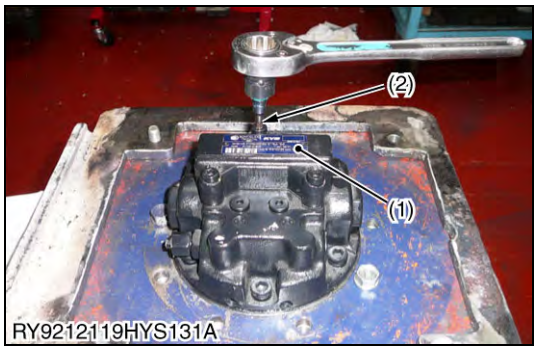
14. Install the pipe connector (2-speed) and the plug.

Tightening torque	Plug and pipe connector (2-speed)	49 to 58.8 N·m 5.0 to 6.0 kgf·m 36 to 43.4 lbf·ft

- Tool to use: M8 hex socket, M22 socket wrench

(1) Plug
(2) Pipe Connector (2-Speed)

RY9212119HYS0087US0



15. Install the body (anti-cavitation).

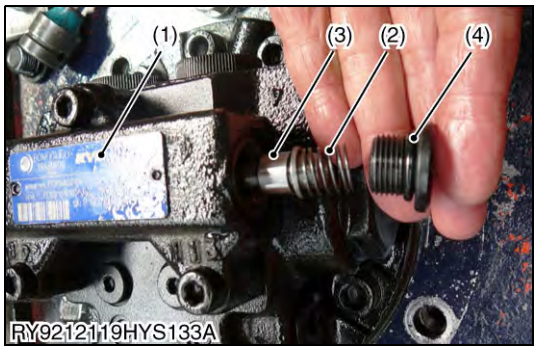
■ **IMPORTANT**
- **There are many O-rings, so be careful not to forget to install any of them.**

- Tool to use: M6 hex socket

Tightening torque	Hex socket bolt	35 to 39 N·m 3.6 to 4.0 kgf·m 25.8 to 28.8 lbf·ft

(1) Body (Anti-Cavitation)
(2) Hex Socket Bolt

RY9212119HYS0088US0



16. Install the spool (anti-cavitation) and spring (anti-cavitation).

■ **IMPORTANT**
- **Apply hydraulic oil to the entire spool.**
- **The spool itself slides smoothly.**

(1) Body (Anti-Cavitation)
(2) Spring (Anti-Cavitation)
(3) Spool (Anti-Cavitation)
(4) Plug

RY9212119HYS0089US0

17. Install the two plugs.

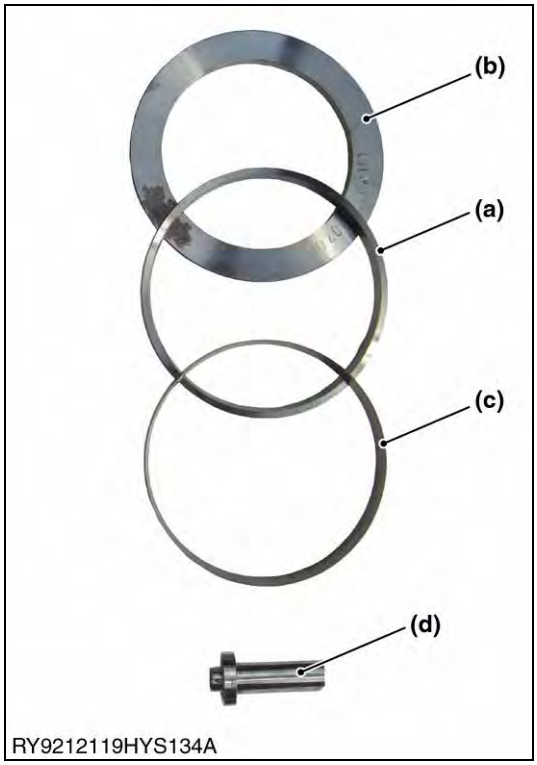
- Tool to use: M8 hex socket

Tightening torque	Plug	49 to 58.8 N·m 5.0 to 6.0 kgf·m 36 to 43.4 lbf·ft

(1) Plug

RY9212119HYS0090US0

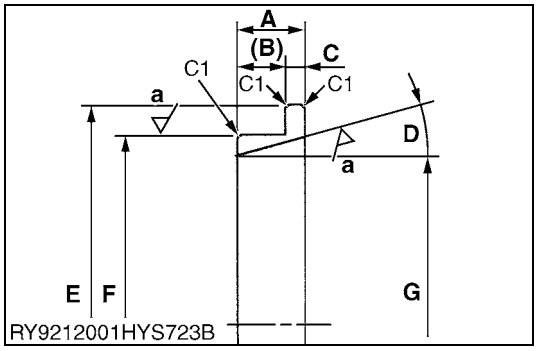
[3] SPECIAL TOOLS



RY9212119HYS134A

No.	Parts Name
(a)	Floating seal installation tool [Guide (for housing)]
(b)	Floating seal installation tool (pusher)
(c)	Floating seal installation tool [Guide (for flange holder)]
(d)	Oil seal installation tool

RY9212119HYS0024US0

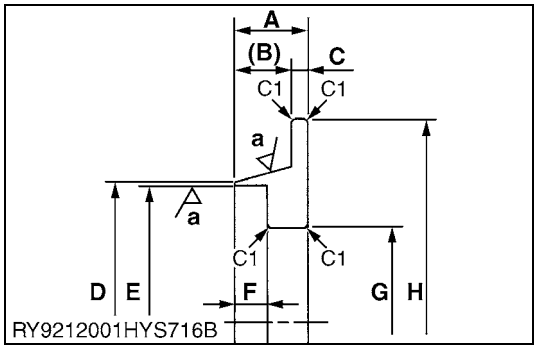


RY9212001HYS723B

(a) Floating seal installation tool [Guide (for housing)]

A	17 mm, 0.67 in.
(B)	12 mm, 0.47 in.
C	5 mm, 0.2 in.
D	15 °
E	ϕ198 mm, 7.8 in.
F	ϕ179.6 mm, 7.071 in.
G	ϕ170.5 mm, 6.713 in.
C1	1 mm, 0.04 in. bevel
a	Ra=6.3a

RY9212119HYS0025US0

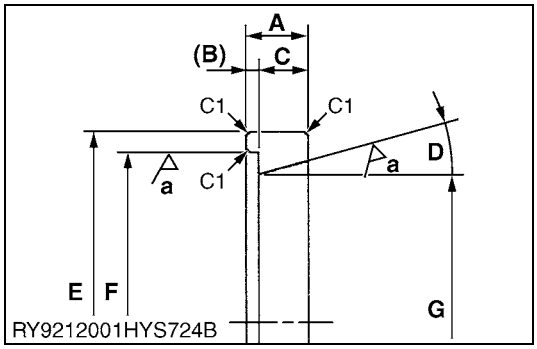


RY9212001HYS716B

(b) Floating seal installation tool (pusher)

A	22 mm, 0.87 in.
(B)	17 mm, 0.67 in.
C	5 mm, 0.2 in.
D	ϕ170.5 mm, 6.713 in.
E	ϕ168.5 mm, 6.634 in.
F	7.8 mm, 0.307 in.
G	ϕ156 mm, 6.142 in.
H	ϕ208 mm, 8.189 in.
C1	1 mm, 0.04 in. bevel
a	Ra=6.3a

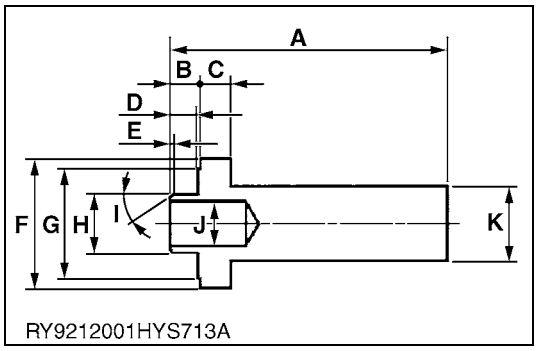
RY9212119HYS0026US0



(c) Floating seal installation tool [Guide (for flange holder)]

A	15 mm, 0.59 in.
(B)	3 mm, 0.1 in.
C	12 mm, 0.47 in.
D	15 °
E	ϕ189.5 mm, 7.461 in.
F	ϕ179.5 mm, 7.067 in.
G	ϕ170 mm, 6.693 in.
C1	1 mm, 0.04 in. bevel
a	Ra=6.3a

RY9212119HYS0027US0



(d) Oil seal installation tool

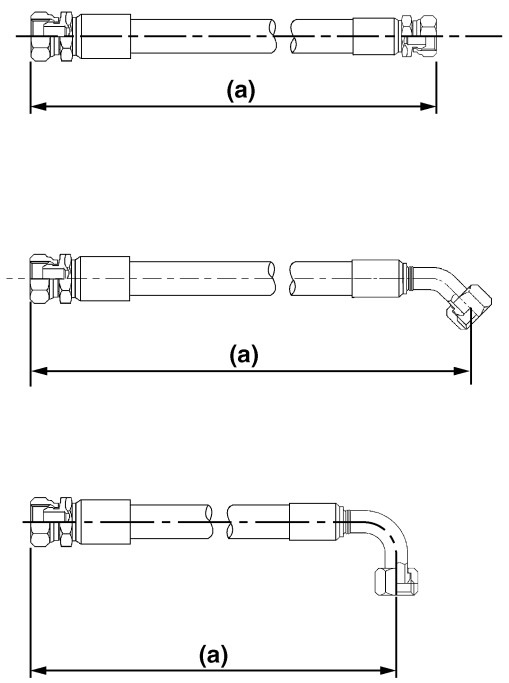
A	110 mm, 4.33 in.
B	12 mm, 0.47 in.
C	12 mm, 0.47 in.
D	11 mm, 0.43 in.
E	2 mm, 0.08 in.
F	ϕ52 mm, 2.0 in.
G	ϕ44 mm, 1.7 in.
H	23.8 mm, 0.937 in.
I	30 °
J	ϕ18 mm, 0.71 in.
K	ϕ30 mm, 1.2 in.

RY9212119HYS0028US0

5. ROUTING OF HYDRAULIC HOSES

[1] HYDRAULIC HOSE SPECIFICATIONS

(1) Total Length of Hydraulic Hose

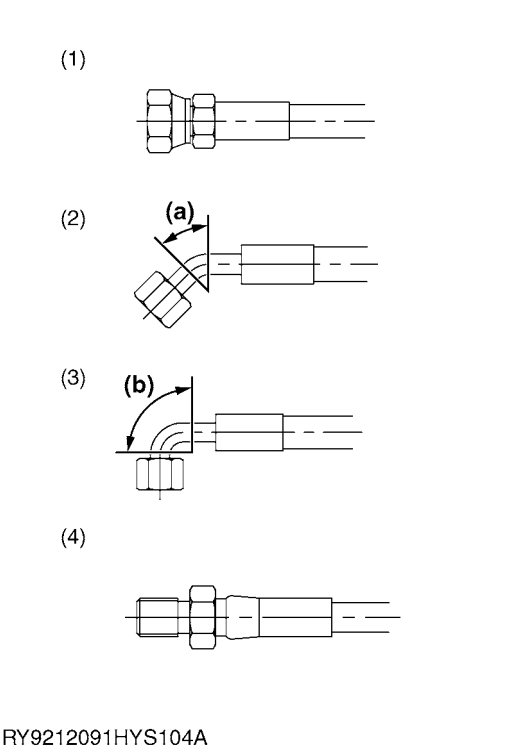


RY9212004HYS250A

(a) Total length

RY9212004HYS0147US0

(2) Types of Connector Fittings (Screw)



RY9212091HYS104A

(1) C type (straight)
(2) CR4 type (45°)
(3) CR9 type (90°)
(4) CM type (male thread)

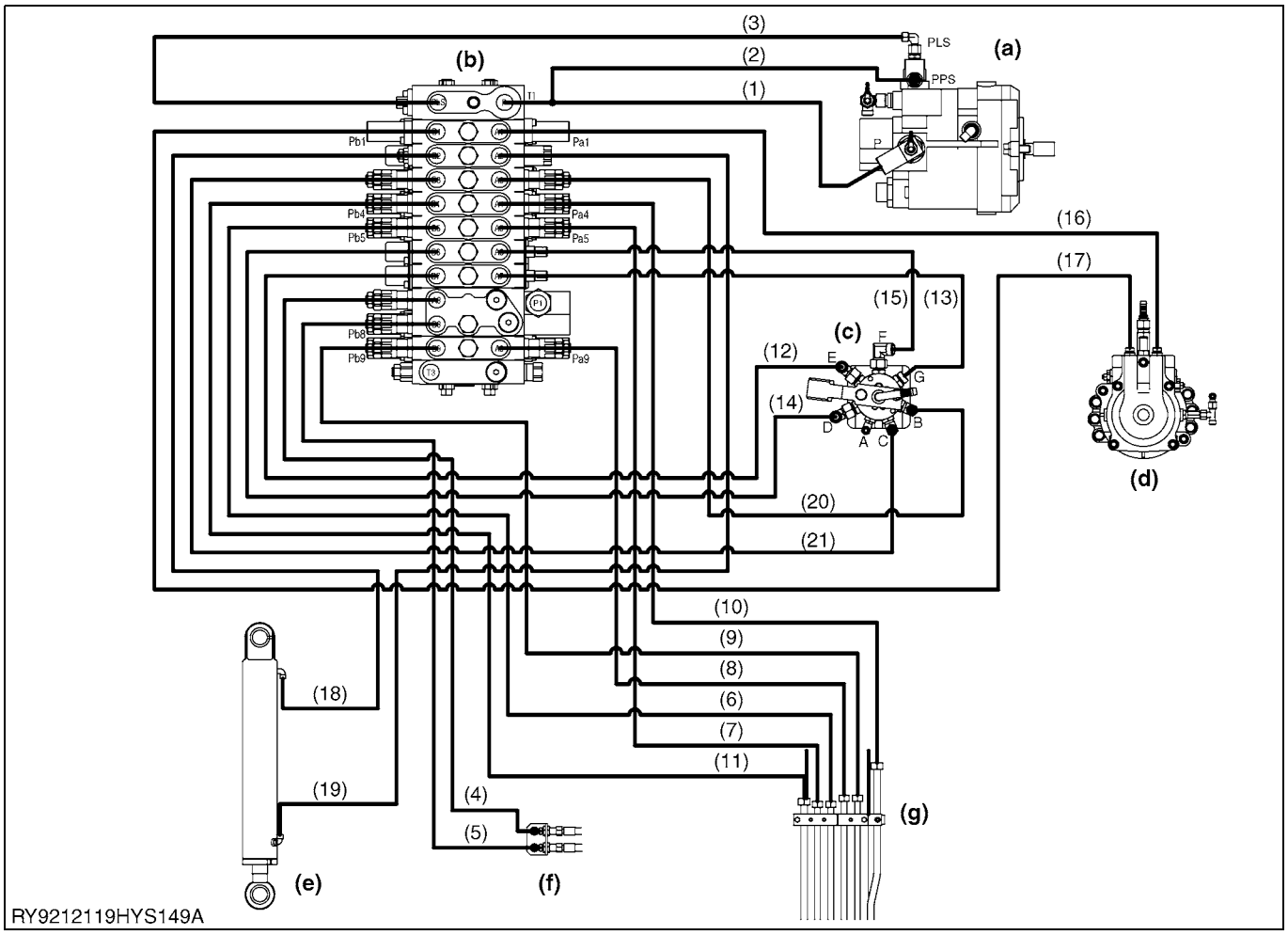
(a) 45 °
(b) 90 °

RY9212091HYS0047US0

[2] ROUTING of HYDRAULIC HOSES

(1) Delivery Hose Routing

■ **KX101-3α3**

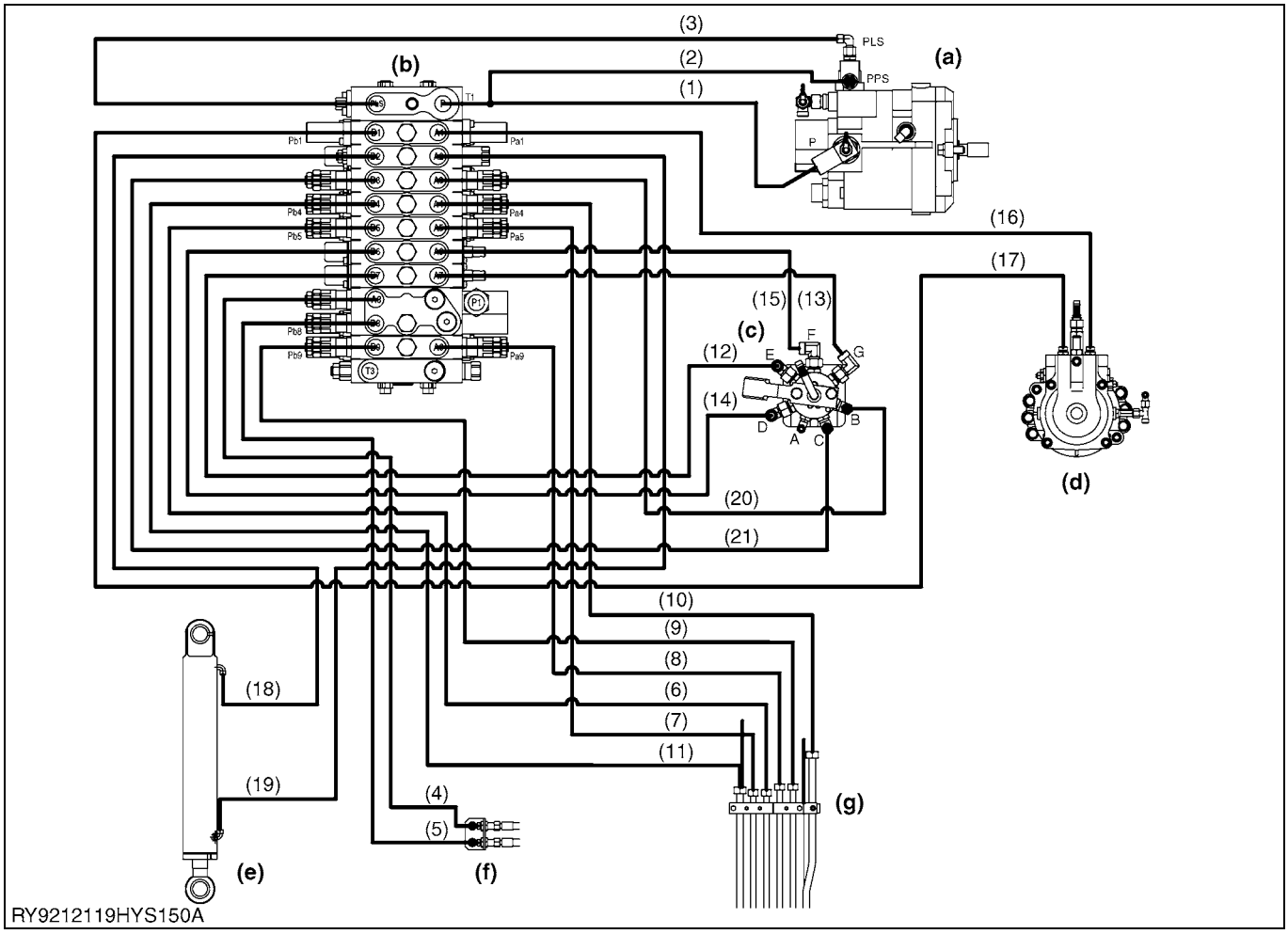


(a) Pump
(b) Control Valve
(c) Rotary Joint
(d) Swivel Motor
(e) Swing Cylinder
(f) Swing Bracket, Right Side
(g) Front Attachment, Back Side

(To be continued)

(Continued)

■ U35-3α3



(a) Pump
(b) Control Valve
(c) Rotary Joint
(d) Swivel Motor
(e) Swing Cylinder
(f) Swing Bracket, Right Side
(g) Front Attachment, Back Side

(To be continued)

(Continued)

■ Delivery Hose Routing

No.	Function	Hose					Fitting		Guard	Position Used
		Total length	Size	Tape color	O.D.	I.D.	Type	Size		
(1)	(P)	1310 mm (51.6 in.)	3/4	2 x White	27.7 mm (1.1 in.)	19 mm (0.7 in.)	CR4-C	M30		Pump P to C/V
(2)	(PPS)	1570 mm (61.8 in.)	1/4	2 x Red	11.8mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	Pump PPS to C/V
(3)	(PLS)	1420 mm (55.9 in.)	1/4	2 x Blue	11.8mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	Pump PLS to C/V
(4)	Boom Up (Bottom)	1160 mm (45.7 in.)	3/8	2 x Yellow	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	C-C	M18	PWR	C/V (A8) to Hose On
(5)	Boom Up (Rod)	1150 mm (45.3 in.)	3/8	2 x Green	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR9-C	M18	PWR	C/V (b8) to Hose Under
(6)	Arm Crowd (Bottom)	2320 mm (91.3 in.)	3/8	2 x Blue	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR9-CM	M18	PWR	C/V (B5) to Hose
(7)	Arm Dump (Rod)	2070 mm (81.5 in.)	3/8	2 x Gray	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR4-CM	M18	PWR	C/V (A5) to Hose
(8)	Bucket Dump (Rod)	1970 mm (77.6 in.)	3/8	2 x Yellow	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR9-CM	M18	PWR	C/V (A9) to Hose
(9)	Bucket Crowd (Bottom)	2070 mm (81.5 in.)	3/8	2 x White	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR9-CM	M18	PWR	C/V (b9) to Hose
(10)	AUX Left	2140 mm (84.3 in.)	1/2	2 x Brown	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	CR4-CM	M22	PWR	C/V (A4) to Hose
(11)	AUX Right	2180 mm (85.8 in.)	1/2	2 x White	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	C-CM	M22	PWR	C/V (b4) to Hose
(12)	Travel Right Forward	640 mm (25.2 in.)	1/2	2 x Green	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	CR9-C	M22		C/V (B7) to R/J (E)
(13)	Travel Right Rear	660 mm (26 in.)	1/2	2 x Yellow	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	C-CR9	M22		C/V (A7) to R/J (G)
(14)	Travel Left Forward	640 mm (25.2 in.)	1/2	2 x Blue	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	CR9-C	M22		C/V (B6) to R/J (D)
(15)	Travel Left Rear	570 mm (22.4 in.)	12	2 x Red	20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	C-CR9	M22		C/V (A6) to R/J (F)
(16)	Swivel Left	880 mm (34.6 in.)	3/8	2 x Gray	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR9-C	M18		C/V (A1) to S/M (A)
(17)	Swivel Right	900 mm (35.4 in.)	3/8	2 x Blue	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	C-CR9	M18		C/V (B1) to S/M (B)
(18)	Swing Left (Rod)	460 mm (18.1 in.)	1/4	2 x Yellow Green	11.8mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		C/V (B2) to Swing Cyl
(19)	Swing Right (Bottom)	930 mm (36.6 in.)	1/4	2 x Orange	11.8mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		C/V (a2) to Swing Cyl
(20)	Blade Up (Bottom)	760 mm (29.9 in.)	3/8	2x Red	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	C-C	M18		C/V (A3) to R/J (B)
(21)	Blade Down (Rod)	720 mm (28.3 in.)	3/8	2 x Brown	17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	CR4-C	M18		C/V (B3) to R/J (C)

- C/V: Control Valve
- R/J: Rotary Joint
- S/M: Swivel Motor
- PWR: Plastic Corrugated Tube

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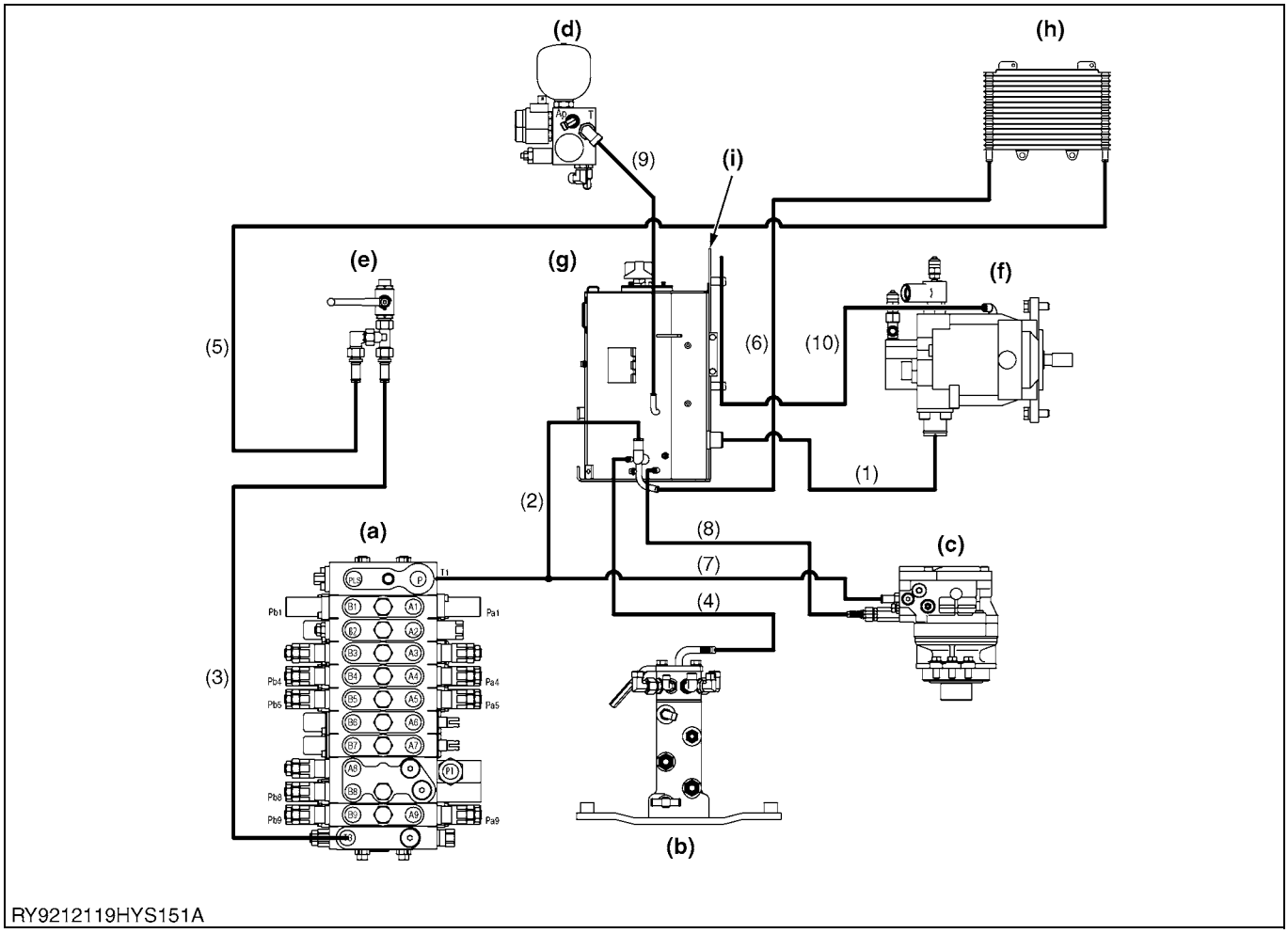
(2) Return Hose Routing



(a) Control Valve
(b) Rotary Joint
(c) Swivel Motor
(d) Unload Valve
(e) Third Line Valve
(f) Pump
(g) Oil Tank
(h) Oil Cooler
(i) Partition

(To be continued)

(Continued)

■ Return Hose Routing

No.	Function	Hose				Guard	Position Used
		KX101-3α3		U35-3α3			
		Total length	Size	Total length	Size		
(1)	Suction						Oil Tank to Pump
(2)	Return						C/V (T1) to Oil Tank
(3)	Oil Cooler IN	730 mm (28.7 in.)	5/8	700 mm (27.6 in.)	5/8	PWR	C/V (T3) to Third Line Valve
(4)	Travel Motor Drain	1000 mm (39.4 in.)	1/2	380 mm (15 in.)	1/2		R/J to Oil Tank
(5)	Oil Cooler IN	1890 mm (74.4 in.)	5/8	1890 mm (74.4 in.)	5/8	PWR	Third Line Valve to Oil Cooler (Back)
(6)	Oil Cooler OUT	1170 mm (46.1 in.)	5/8	1170 mm (46.1 in.)	5/8	PWR	Oil Cooler (Front) to Oil Tank
(7)	Swivel Make Up	1200 mm (47.2 in.)	5/8	650 mm (25.6 in.)	5/8	PWR	S/M M to C/V (T1)
(8)	Swivel Motor Drain	450 mm (17.7 in.)		350 mm (13.8 in.)			S/M DR to Oil Tank
(9)	Unload Drain	560 mm (22 in.)	1/2	560 mm (22 in.)	1/2	PWR	U/V (T) to Oil Tank
(10)	Air Drain Hose	750 mm (29.5 in.)	3/16	750 mm (29.5 in.)	3/16		Pump to Partition

- U/V: Unload Valve
- C/V: Control Valve
- R/J: Rotary Joint
- S/M: Swivel Motor
- PWR: Plastic Corrugated Tube

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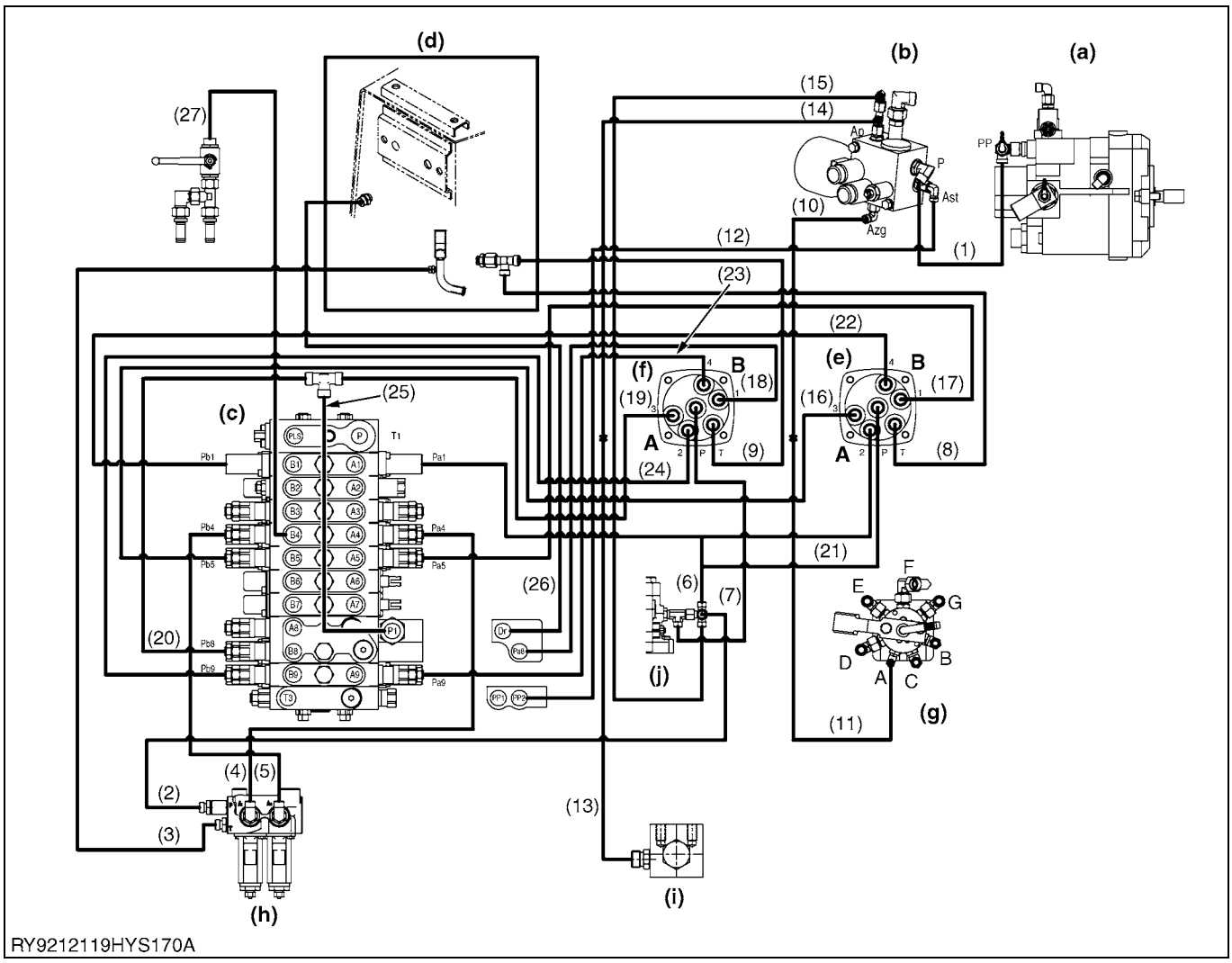
(3) Pilot Hose Routing



(a) Pump
(b) Unload Valve
(c) Control Valve
(d) Oil Tank
(e) Pilot Valve (L)
(f) Pilot Valve (R)
(g) Rotary Joint
(h) AUX1 Solenoid Valve
(i) Travel Lock Release
(j) Swivel Motor
A : Front
B : Rear

(To be continued)

(Continued)

■ Pilot Hose Routing (KX101-3α3)

No.	Function	Hose					Fitting		Guard	Position Used
		Total length	Size	Tape color	O.D.	I.D.	Type	Size		
(1)		520 mm (20.5 in.)	3/8		17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	C-CR4	M18	PWR	Pump PP to U/V (P)
(2)	AUX Solenoid P	940 mm (37 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	S/M to S/V (P)
(3)	AUX Solenoid T	710 mm (28 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	S/V (T) to Tank
(4)	AUX RH	675 mm (26.6 in.)	1/4	2 x Pink	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		S/V (A1) to C/V (Pa4)
(5)	AUX LH	1310 mm (51.6 in.)	1/4	2 x Yellow Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		S/V (A2) to C/V (Pb4)
(6)		1600 mm (63 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		S/M to P/V (Left) P
(7)		1070 mm (42.1 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		S/M to P/V (Right) P
(8)	Pilot T, LH	1500 mm (59.1 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V L to Tank
(9)	Pilot T, RH	880 mm (34.6 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V R to Tank
(10)	High Speed Signal	980 mm (38.6 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		U/V (Azg) to Hose
(11)	High Speed Signal	1130 mm (44.5 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CM-CR9	M14	PWR	Hose to R/J (Shaft) A
(12)	Travel Lock Release	1515 mm (59.6 in.)	1/4	2 x Brown	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		U/V (Ast) to C/V (PP2)
(13)	Travel Lock Release	1810 mm (71.3 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-CM	M14		Travel Lock Release to Hose
(14)	Travel Lock Release	1000 mm (39.4 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		Hose to U/V (Ap)
(15)		2140 mm (84.3 in.)	1/4	2 x Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		U/V (Ap) to S/M
(16)	Arm Dump (Rod)	1915 mm (75.4 in.)	1/4	2 x Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L,3) to C/V (Pb5)
(17)	Arm Crowd (Bottom)	2675 mm (105.3 in.)	1/4	2 x Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L,1) to C/V (Pa5)
(18)	Boom Up (Bottom)	1100 mm (43.3 in.)	1/4	2 x Yellow Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 1) to C/V (Pa8)
(19)	Boom Down (Rod)	1500 mm (59.1 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 3) to T-Adapter
(20)	Boom Down (Rod)	490 mm (19.3 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		T-Adapter to C/V (Pb8)
(21)	Swivel LH	1980 mm (78 in.)	1/4	2 x Red	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L, 2) to C/V (Pa1)
(22)	Swivel RH	2425 mm (95.5 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (L, 4) to C/V (Pb1)
(23)	Bucket Dump (Rod)	1070 mm (42.1 in.)	1/4	2 x Brown	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 4) to C/V (Pa9)
(24)	Bucket Crowd (Bottom)	2050 mm (80.7 in.)	1/4	2 x Pink	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 2) to C/V (Pb9)
(25)	Boom Lock	400 mm (15.7 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		C/V (P1) to T-Adapter

No.	Function	Hose					Fitting		Guard	Position Used
		Total length	Size	Tape color	O.D.	I.D.	Type	Size		
(26)	Boom Drain	660 mm (26 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		C/V (Dr) to Tank
(27)	AUX LH	580 mm (22.8 in.)	1/2		20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	C-CR9	M22	PWR	Third Line to C/V (B4)

- U/V: Unload Valve
- C/V: Control Valve
- P/V: Pilot Valve
- R/J: Rotary Joint
- S/M: Swivel Motor
- S/V: Solenoid Valve
- PWR: Plastic Corrugated Tube

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■ Pilot Hose Routing (U35-3α3)

No.	Function	Hose					Fitting		Guard	Position Used
		Total length	Size	Tape color	O.D.	I.D.	Type	Size		
(1)		520 mm (20.5 in.)	3/8		17.4 mm (0.7 in.)	9.5 mm (0.4 in.)	C-CR4	M18	PWR	Pump PP to U/V (P)
(2)	AUX Solenoid P	1190 mm (46.9 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	S/M to S/V (P)
(3)	AUX Solenoid T	500 mm (19.7 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14	PWR	S/V (T) to Tank
(4)	AUX RH	440 mm (17.3 in.)	1/4	2 x Pink	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		S/V (A1) to C/V (Pa4)
(5)	AUX LH	1115 mm (43.9 in.)	1/4	2 x Yellow Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		S/V (A2) to C/V (Pb4)
(6)		1460 mm (57.5 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		S/M to P/V (Left) P
(7)		920 mm (36.2 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		S/M to P/V (Right) P
(8)	Pilot T, LH	1500 mm (59.1 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V L to Tank
(9)	Pilot T, RH	880 mm (34.6 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V R to Tank
(10)	High Speed Signal	1725 mm (67.9 in.)	1/4	2 x White	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		U/V (Azg) to Hose
(11)										
(12)	Travel Lock Release	1515 mm (59.6 in.)	1/4	2 x Brown	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		U/V (Ast) to C/V (PP2)
(13)	Travel Lock Release	1640 mm (764.6 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-CM	M14		Travel Lock Release to Hose
(14)	Travel Lock Release	1000 mm (39.4 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		Hose to U/V (Ap)
(15)		1990 mm (78.3 in.)	1/4	2 x Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-C	M14		U/V (Ap) to S/M
(16)	Arm Dump (Rod)	1915 mm (75.4 in.)	1/4	2 x Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L,3) to C/V (Pb5)
(17)	Arm Crowd (Bottom)	2675 mm (105.3 in.)	1/4	2 x Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L,1) to C/V (Pa5)
(18)	Boom Up (Bottom)	1100 mm (43.3 in.)	1/4	2 x Yellow Green	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 1) to C/V (Pa8)
(19)	Boom Down (Rod)	1500 mm (59.1 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 3) to T-Adapter
(20)	Boom Down (Rod)	490 mm (19.3 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		T-Adapter to C/V (Pb8)
(21)	Swivel LH	1980 mm (78 in.)	1/4	2 x Red	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		P/V (L, 2) to C/V (Pa1)
(22)	Swivel RH	2425 mm (95.5 in.)	1/4	2 x Yellow	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (L, 4) to C/V (Pb1)
(23)	Bucket Dump (Rod)	1070 mm (42.1 in.)	1/4	2 x Brown	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 4) to C/V (Pa9)
(24)	Bucket Crowd (Bottom)	2050 mm (80.7 in.)	1/4	2 x Pink	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR4	M14		P/V (R, 2) to C/V (Pb9)
(25)	Boom Lock	400 mm (15.7 in.)	1/4	2 x Light Blue	11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	CR9-C	M14		C/V (P1) to T-Adapter

No.	Function	Hose					Fitting		Guard	Position Used
		Total length	Size	Tape color	O.D.	I.D.	Type	Size		
(26)	Boom Drain	660 mm (26 in.)	1/4		11.8 mm (0.5 in.)	6.4 mm (0.3 in.)	C-CR9	M14		C/V (Dr) to Tank
(27)	AUX LH	580 mm (22.8 in.)	1/2		20.4 mm (0.8 in.)	12.7 mm (0.5 in.)	C-CR9	M22	PWR	Third Line to C/V (B4)

- U/V: Unload Valve
- C/V: Control Valve
- P/V: Pilot Valve
- R/J: Rotary Joint
- S/M: Swivel Motor
- S/V: Solenoid Valve
- PWR: Plastic Corrugated Tube

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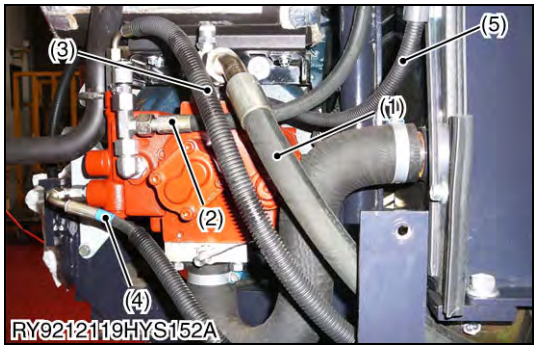
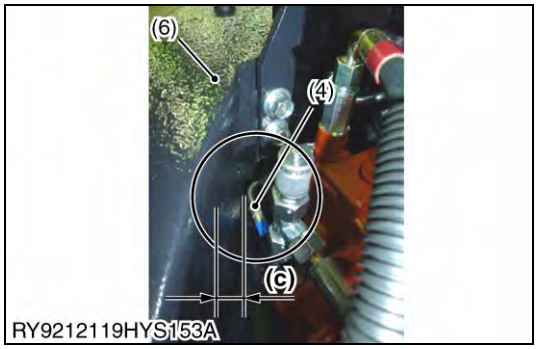
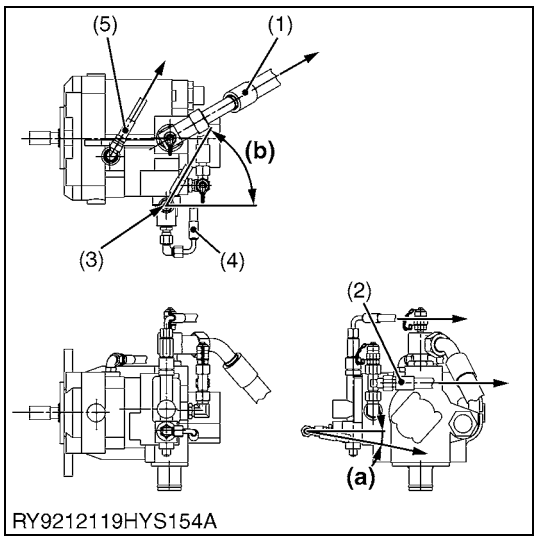
(4) Hose Routing and Clamp Positions







Pump

Clearance between weight and pump hose fitting is 10 mm (0.39 in.) or more.

Tightening torque	P	118 to 127 N·m 12 to 13 kgf·m 87 to 93.7 lbf·ft
	PP	49 to 54 N·m 5.0 to 5.51 kgf·m 36.1 to 39.8 lbf·ft
	PLS	25 to 30 N·m 2.55 to 3.06 kgf·m 18.4 to 22.1 lbf·ft
	PPS	
	Air Port	

(1) P
(2) PP
(3) PPS
(4) PLS
(5) Air Port
(6) Weight

(a) 10 °
(b) 60 °
(c) 10 mm (0.39 in.)

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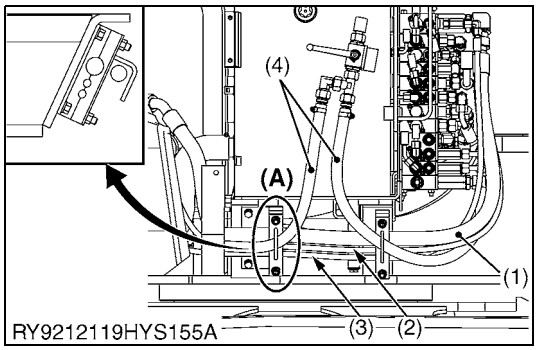

Delivery Hoses and Clamping

(1) P
(2) PP
(3) PPS
(4) Third Line

(A) Clamping of delivery hoses

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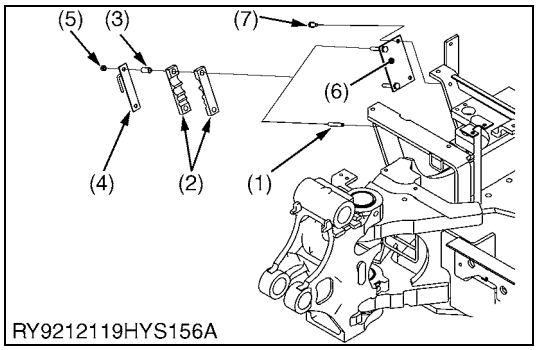

- **Clamping of delivery hoses**

(1) Bolt, Stud
(2) Cushion (Hose)
(3) Collar
(4) Clamp (Hose)
(5) Nut
(6) Bracket (Clamp)
(7) Bolt

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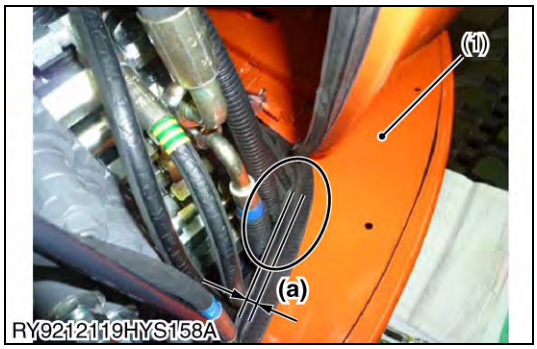
Control Valve

Clearance between cover (swivel RH) and control valve hoses is 15 mm (0.59 in.) or more.



(1) Cover (Swivel RH)

(a) 15 mm (0.59 in.)

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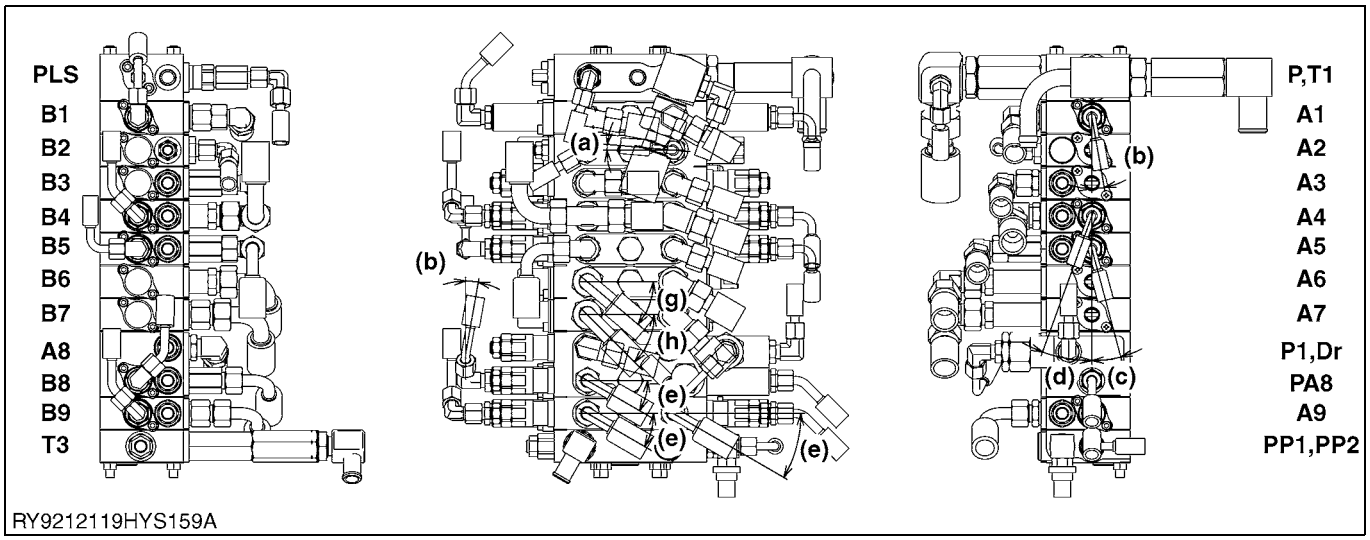
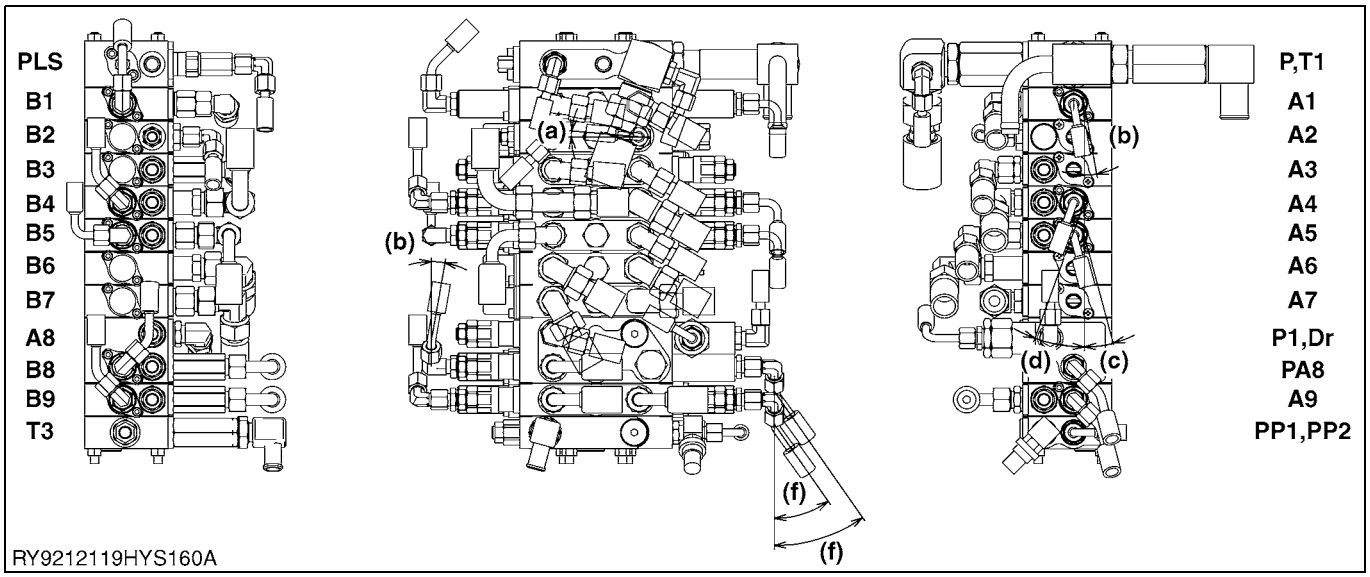
■ KX101-3α3



■ KXU35-3α3



A1: Swivel Left (Pb1)
B1: Swivel Right (Pb1)
A2: Swing Rod
B2: Swing Bottom
A3: Blade Bottom
B3: Blade Rod
A4: AUX (Pb4)
B4: AUX (Pb4)
A5: Arm Rod (Pb5)
B5: Arm Bottom (Pb5)
A6: Travel Left Reverse
B6: Travel Left Forward
A7: Travel Right Reverse
B7: Travel Right Forward
A8: Boom Bottom (Pb8)
B8: Boom Rod (Pb8)
A9: Bucket Rod (Pb9)
B9: Bucket Bottom (Pb9)
(a) 5 °
(b) 10 °
(c) 15 °
(d) 20 °
(e) 30 °
(f) 35 °
(g) 40 °
(h) 45 °

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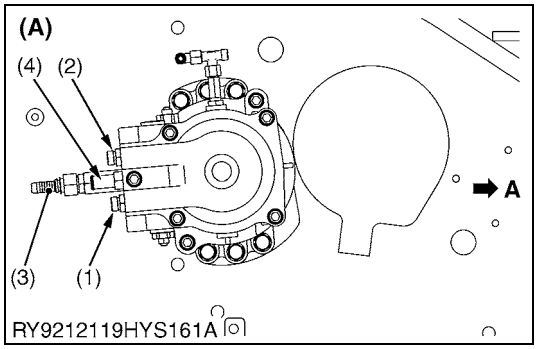
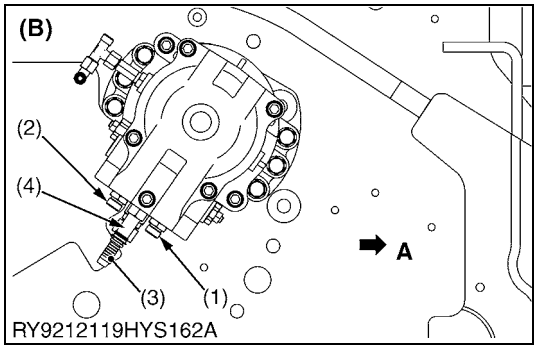




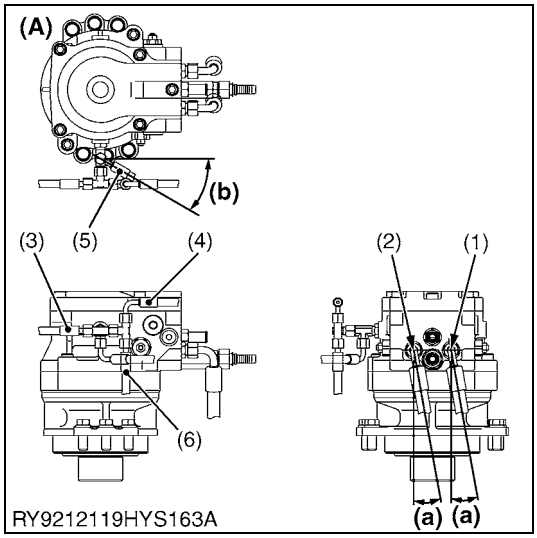
Swivel Motor

(1) Swivel Right (Control Valve)
(2) Swivel Left (Control Valve)
(3) Swivel Motor Make Up
(4) Swivel Motor Drain

(A) KX101-3α3
(B) U35-3α3

A: Front

RY9212119HYS0177US0



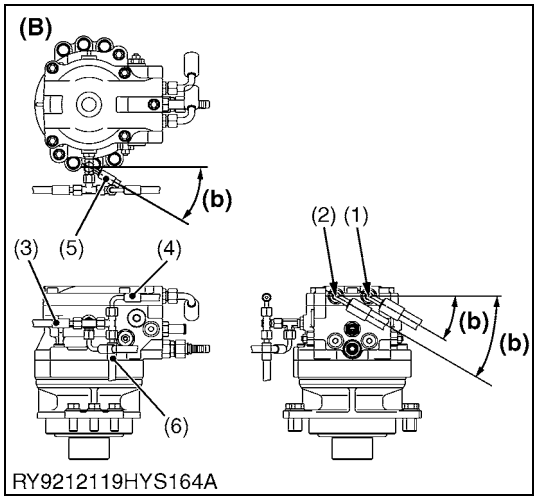
Tightening torque	Swivel Right	40 to 50 N·m 4.1 to 5.1 kgf·m 29.5 to 36.9 lbf·ft
	Swivel Left	15 to 20 N·m 1.53 to 2.04 kgf·m 11.1 to 14.8 lbf·ft
	AUX Solenoid Valve	
	Pilot Valve (Left, P)	
	Pilot Valve (Right, P)	
	Unload Valve (P)	

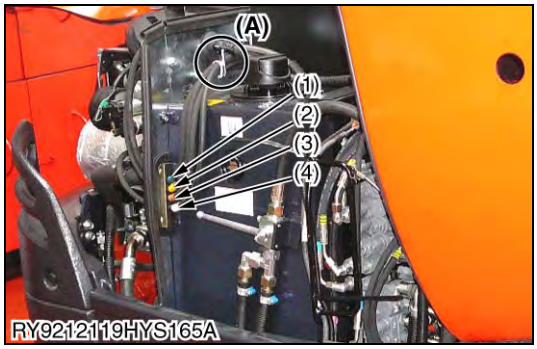
(1) Swivel Right (Control Valve)
(2) Swivel Left (Control Valve)
(3) AUX Solenoid Valve (P)
(4) Pilot Valve (Left, P)
(5) Pilot Valve (Right, P)
(6) Unload Valve (P)

(A) KX101-3α3
(B) U35-3α3

(a) 10 °
(b) 30 °

RY9212119HYS0178US0





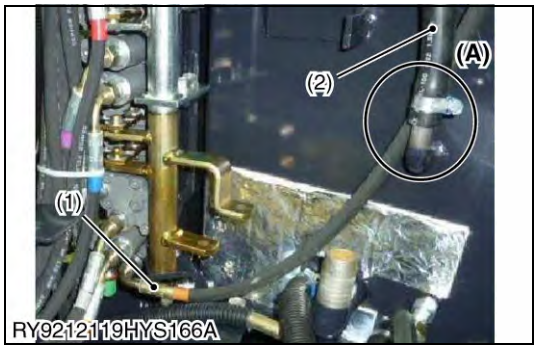
Pilot Hoses and Clamping

1. Clamp hoses in position of tape.
2. Keep the gap between the delivery hose and cover RH.

(1) Blue
(2) Yellow
(3) Brown
(4) White

(A) Piping to on orderly

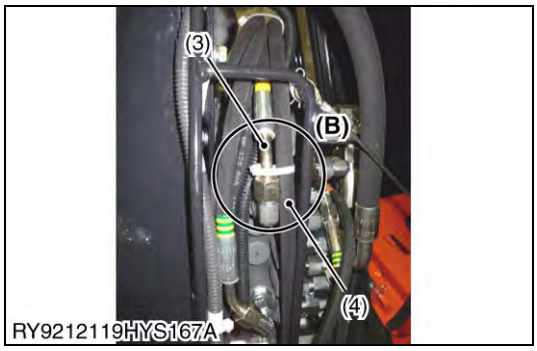
RY9212119HYS0179US0



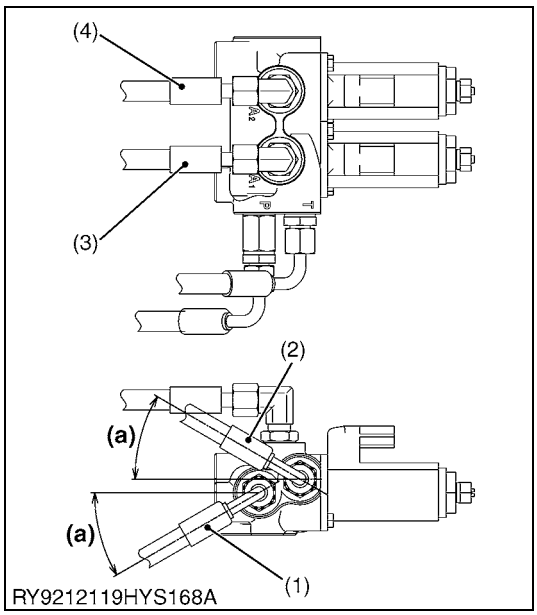
(1) Hose (PP1)
(2) Hose (Unload Valve Return)
(3) Hose (Swivel RH)
(4) Hose (Boom Rod)

(A) Pass the inferior part of return hose connection pipe (unload valve return)
(B) Assembling a hose band to hose

RY9212119HYS0180US0



Tightening torque	Hose (AUX Solenoid P)	17.5 to 20.6 N·m 1.78 to 2.1 kgf·m 12.9 to 15.2 lbf·ft
	Hose (AUX Solenoid T)	
	Hose (AUX RH)	
	Hose (AUX LH)	



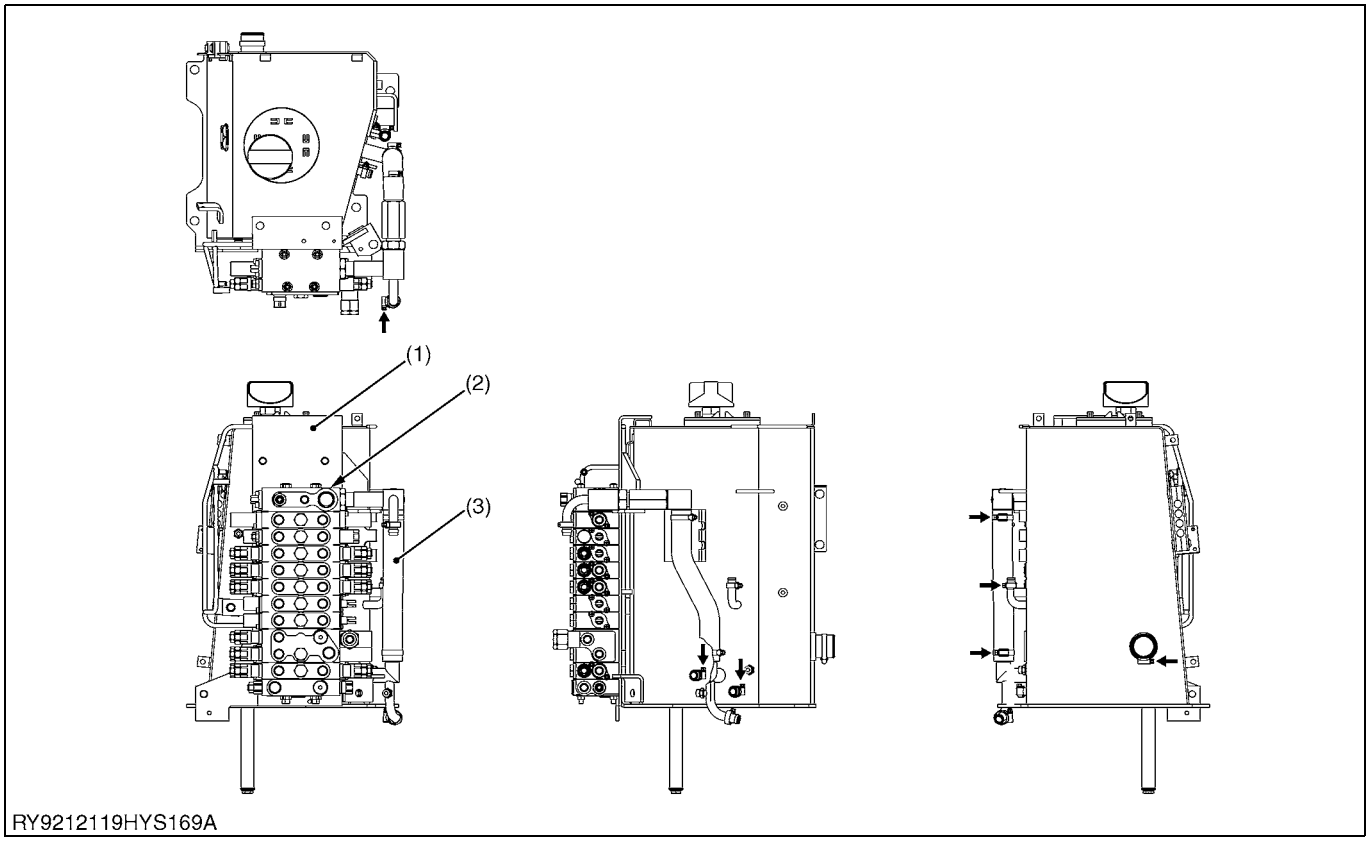
(1) Hose (AUX Solenoid P)
(2) Hose (AUX Solenoid T)
(3) Hose (AUX RH)
(4) Hose (AUX LH)

(a) 30 °

RY9212119HYS0181US0

Return Hoses and Clamping

Assembling hose clamps as illustrated.

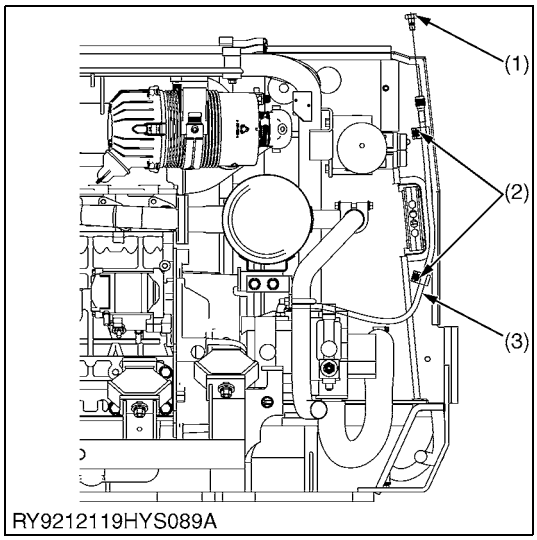


RY9212119HYS169A

(1) Oil Tank (2) Control Valve (3) Hose (Return)

RY9212119HYS0182US0

6. HYDRAULIC DEVICE PERFORMANCE MEASUREMENT



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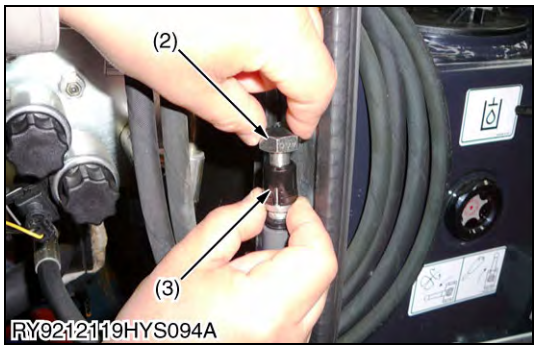


RY9212119HYS094A

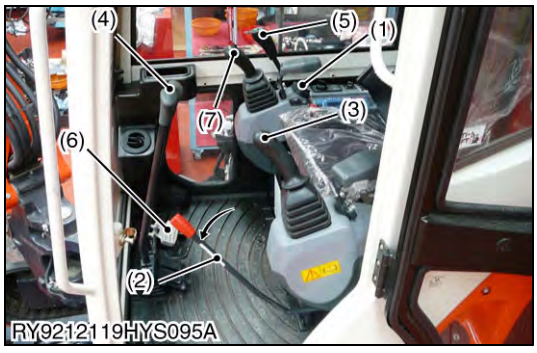
Piston Pump Air Bleeding Procedure

When disassembling hydraulic equipment and replacing hoses, etc., or after changing the hydraulic fluid and using the vacuum pump, before operating the machine, be sure to carry out air bleeding to prevent pump scorching and cavitation.

1. After operating, with the engine stopped, remove the hose at the top of the pump from its clamp.
2. Press in the hexagonal plug and the black plastic lock section as well. Then hold the black plastic lock section and pull out the hexagonal plug.
3. Drape the hose on the front of the weight, and leave for 30 seconds.
4. Fit a hexagonal plug to the hose, start and idle the engine, and check whether there is any cavitation noise from the pump.
5. Repeat operations in 2. 3. 4 until pump cavitation noise disappears.
6. When cavitation noise disappears, raise the engine speed to 1500 rpm, slowly operated the arm and check whether cavitation noise is emitted. (Make sure there is no relief when operating the arm.)
7. If there is no cavitation noise, raise the engine speed to 2000 rpm, slowly operate the arm, and check again for cavitation noise. If cavitation noise is emitted, stop the engine and carry out 2. 3.
8. If there is no cavitation noise in step 7, raise the engine speed to maximum rpm, slowly operate the aim, and check again for cavitation noise. If cavitation noise is emitted, stop the engine and carry out 2. 3. (Make sure there is no relief when operating the arm.)
9. If there was no cavitation noise when performing step 8, air bleeding is finished. Clamp the air bleed hose in its original position.

(1) Hexagonal Plug
(2) Clamp
(3) Air Bleed Hose
(4) Lock Section

RY9212119HYS0029US0



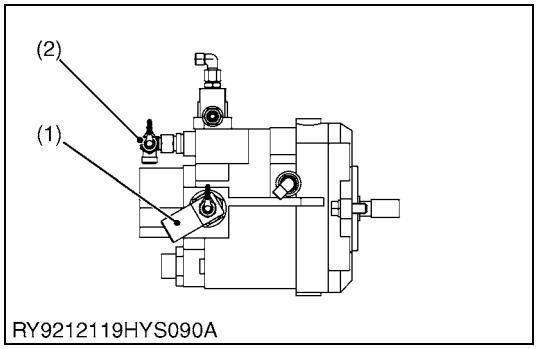
RY9212119HYS095A

Hydraulic System Pressure Release Procedure

1. Place the mini excavator on flat hard ground, lower the bucket and the blade, and stop the engine.
2. Without starting the engine, place the engine starter switch in the "RUN" position.
3. Place the machine lock lever in the release position.
4. Operate each control lever for the boom, arm, bucket and swivel to full stroke.
5. Operate the travel lever, blade lever, swing pedal, pedal and service port switch each to full stroke.
6. Place the machine's lock lever in the "Lock" position, and the engine starter switch to the "STOP" position.

(1) Starter Switch
(2) Machine Lock Lever
(3) Control Lever
(4) Travel Lever
(5) Blade Control Lever
(6) Swing Pedal
(7) Service Port Switch

RY9212119HYS0030US0



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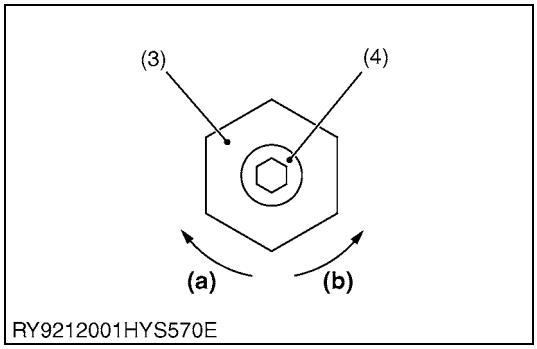

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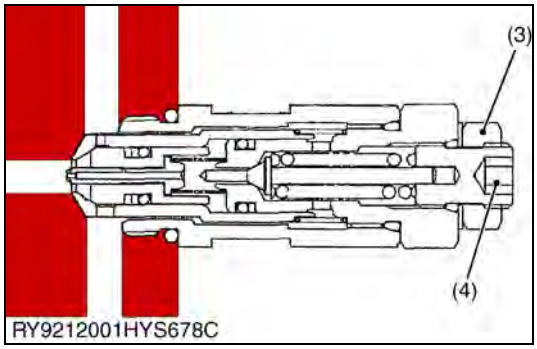

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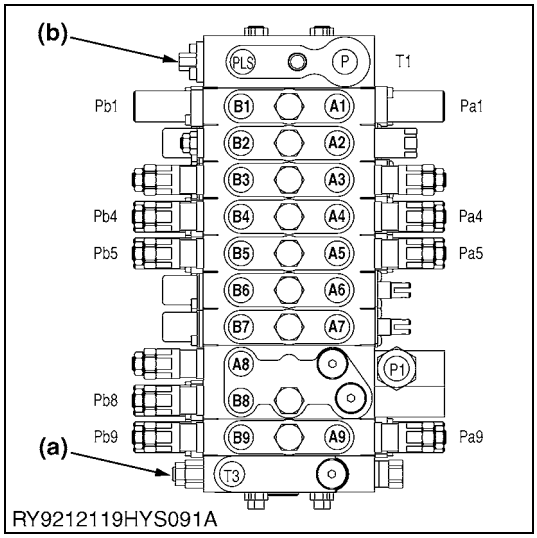


RY9212119HYS091A

Main Relief Valve Pressure

Procedure for Measuring the Main Relief Valve

1. Place the mini excavator on flat, hard ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic lines.
3. Attach a pressure gauge to the pump pressure detection port.
4. Start and idle the engine, and check that there is no oil leakage.
5. Slowly operate the control lever of the front operation to be measured, operate until the cylinder reaches the end of its stroke, then relieve.
6. In the case of travel, lock the travel section, gradually operate the travel lever, then relieve.
7. Measure three times at maximum engine speed, and take the average value as the measurement.
8. Conduct at oil temperature 50 ± 5 °C (122 ± 9 °F).

Main Relief Valve Adjustment Procedure

1. Loosen the relief valve lock nut.
   Use a hexagonal wrench to turn the adjuster screw, and tighten the lock nut.
2. Operate the lever at maximum engine speed, and check the pressure setting.

(1) Pump Pressure Detection Port
(2) Pilot pump Pressure Detection Port
(3) Lock Nut
(4) Adjuster Screw

(a) Pressure Increase
(b) Pressure Decrease

RY9212119HYS0031US0

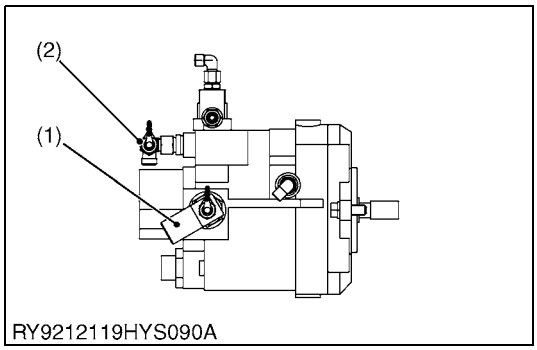
Points to Measure	Bench Data	Actual Measured Values (Reference)
Main LS (aLS)	24.5 MPa 250 kgf/cm^2 3550 psi	25.5±0.5 MPa 260 ±5kgf/cm 3700±73 psi

CAUTION

- **Actual measured values may vary with the machine.**

(a) Main LS Relief Valve
(b) Unload LS Valve

RY9212119HYS0032US0



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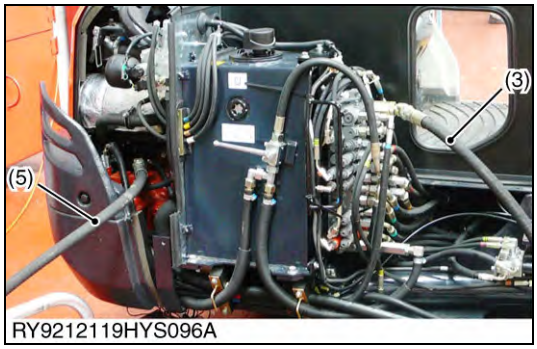

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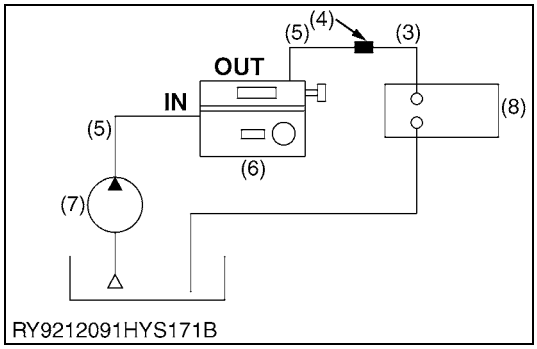


RY9212091HYS171B

Main Pump Flow Measurement

Measurement preparation

1. Place the mini-excavator on hard, flat ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic line.
3. Connect a vacuum pump.
4. Attach a pressure gauge to the pump pressure detection port.
5. Connect the pipe joint of the pump to be measured to the IN side of the flow gauge with a test hose.
6. Connect the removed hose to a test hose and connect them to the OUT side of the flow meter.
7. Remove the vacuum pump.
8. Start and idle the engine, and check that there is no oil leakage.

Measurement

1. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. Open the loading valve of the flow meter and start the engine. Set the engine speed to maximum, gradually close the loading valve of the flow meter, and measure the flow and engine speed at each pressure level.
3. Perform the measurement 3 times; take the average and use this as the measurement value.

(Pump Performance Inspection Procedure)

The pump performance inspection entails placing a specified pressure load on the pump discharge and taking measurements at a specified engine speed to check the volumetric efficiency.

$$\text{Volumetric efficiency} = \frac{\text{Rated load discharge rate}}{\text{Logical discharge value (Calculated value)}} \times 100\,(\%)$$

RY9212032HYS074A

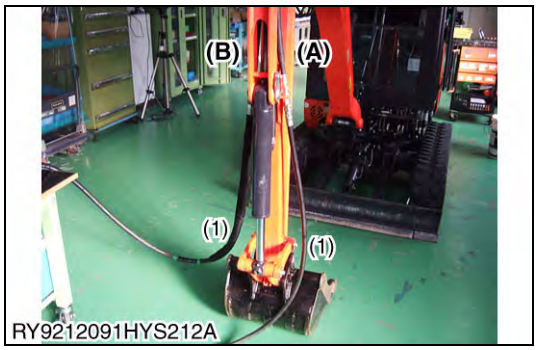
1. The pump volumetric efficiency is proportional to pump rotational speed and inversely proportional to load pressure so set the engine speed at maximum speed for the test.
2. Volumetric efficiency is the ratio of the discharge amount per revolution (cc/rev) at a specified load and the theoretical discharge amount (calculated value). The specified load is the main relief set pressure.
3. The measurement value of the discharge flow at the specified load must be corrected to one pump revolution because the rotational speed of the pump is reduced from its normal speed.

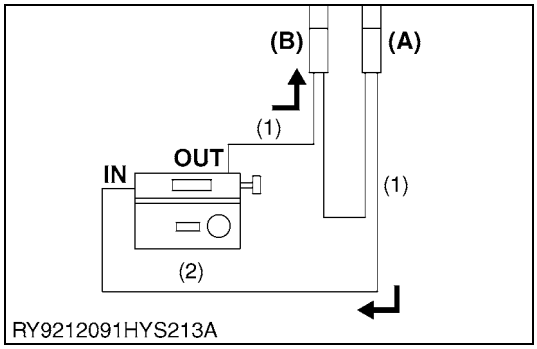
$$\text{Rated load discharge rate} = \frac{\text{Rated load discharge rate (L/min)} \times 1000}{\text{Rated load pump (rpm)}}$$

RY9212032HYS073A

(1) Pump Pressure Detection Port
(2) Pilot Pump Pressure Detection Port
(3) P1 Hose
(4) Adapter
(5) Test Hose
(6) Flow Meter
(7) Pump
(8) Control Valve

RY9212119HYS0033US0





Actual AUX PQ Value Measurement

Measurement preparation

1. Place the mini excavator on flat, hard ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic lines.
3. Connect a vacuum pump.
4. Connect the AUX discharge (high pressure side) and the IN side of the flow meter with a test hose.
5. Connect the OUT side of the flow meter and the AUX discharge (low pressure side) with a test hose.
6. Remove the vacuum pump.

Measurement

1. Hydraulic oil temperature of 50 ± 5 °C (122 ± 9 °F).
2. Open the loading valve of the flow meter and start the engine.
3. After bringing the engine to maximum RPM, operate the AUX.
4. Gradually close down the loading valve of the flow meter and measure the flow at each pressure level.
5. Perform the measurement 3 times; take the average and use this as the measurement value.

■ IMPORTANT

- **Take care not to make an error in the direction of oil flow and the IN direction of the flow meter.**

(1) Test Hose
(2) Flow Meter
(A) AUX High Pressure Side
(B) AUX Low Pressure Side

RY9212091HYS0282US0

Actual Measured Values

Model	KX101-3α3, U35-3α3	KX101-3α2
System	LS	OPEN
Port Relief	20.6 MPa	absent
Load (10 MPa)	52.6 L/min 13.9 USGPM	43.3 L/min 11.4 USGPM
Load (15 MPa)	51 L/min 13.5 USGPM	542.3 L/min 11.2 USGPM
Load (20 MPa)	48.3 L/min 12.8 USGPM	39.4 L/min 10.4 USGPM

CAUTION

- **Actual measured values may vary with the machine.**

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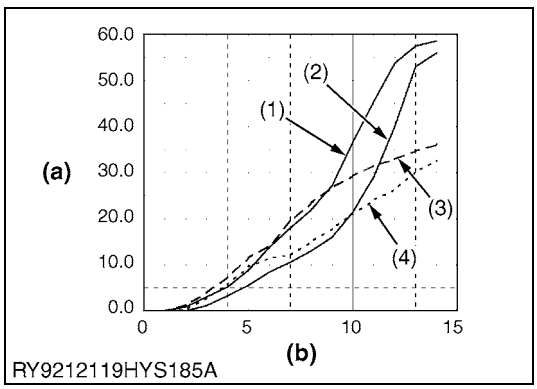

Relationship between Lever Operation and Hydraulic Flow (Proportional Control)

The relationship between pressure P, flow Q lever knob operation (limit value) changes proportionally as shown in the figures above.

CAUTION

- **Actual measured values may very with the machine.**

(1) Right (Max. Engine RPM)
(2) Left (Max. Engine RPM)
(3) Right (Min. Engine RPM)
(4) Left (Min. Engine RPM)
(a) Flow Volume (L/min)
(b) Max. Flow Setting (Limit Value)

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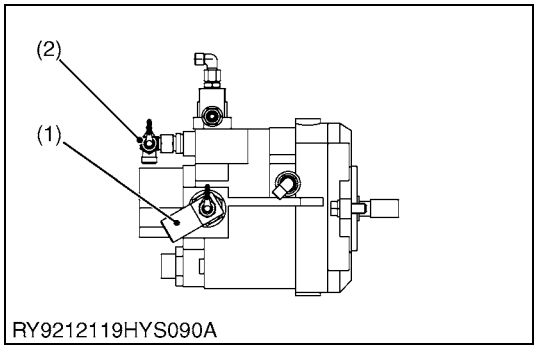

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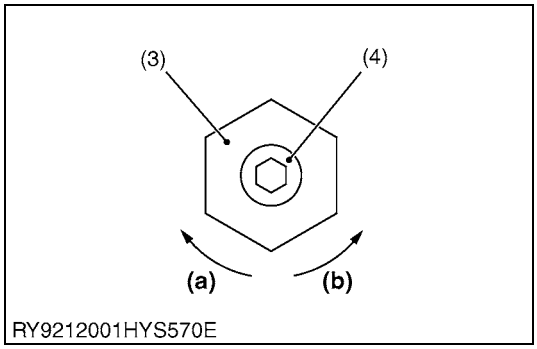

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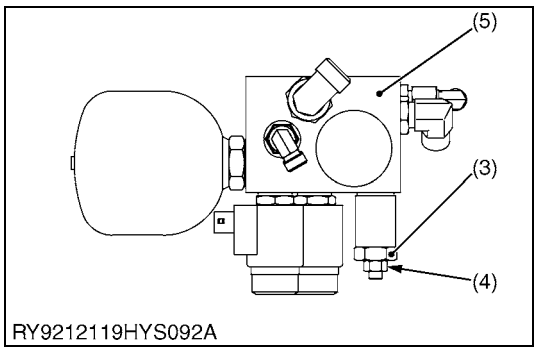

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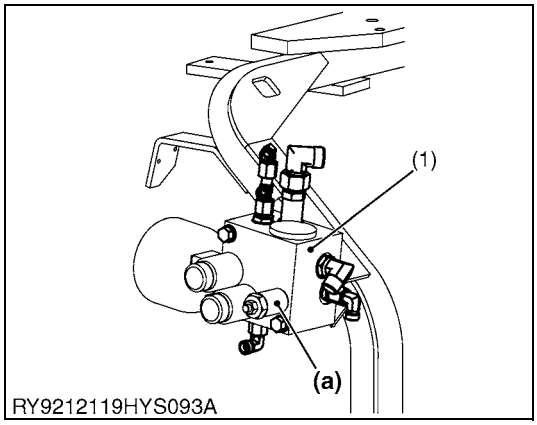

RY9212119HYS093A

Pilot Pressure

Pilot Primary Pressure Measuring Procedure

1. Place the mini excavator on flat, hard ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic lines.
3. Attach a pressure gauge to the pilot pressure detection port.
4. Start and idle the engine, and check that there is no oil leakage when the machine's lock lever is released.
5. Raise engine speed to maximum rpm, and use the pressure gauge to measure pilot pressure under no load.
   Perform the measurement 3 times; take the average and use this as the measurement value.
   Conduct at oil temperature 50 ± 5 °C (122 ± 9 °F).

Pilot Primary Pressure Adjustment Method

1. Loosen the relief valve lock nut of the unload valve.
   Adjust by turning the adjuster screw with a hexagonal wrench and then tighten the lock nut.
2. After adjusting, check the set pressure.

(1) Pump Pressure Detection port
(2) Pilot Pump Pressure Detection Port
(3) Lock Nut
(4) Adjuster Screw
(5) Unload Valve

(a) Pressure Increase
(b) Pressure Decrease

RY9212119HYS0034US0

Points to Measure	Bench Data	Actual Measured Values (Reference)
Pilot primary pressure (aPP)	3.9 MPa 40 kgf/cm^2 570 psi	4.6 MPa 47 kgf/cm^2 670 psi

CAUTION

- **Actual measured values may vary with the machine.**

(1) Unload Valve

(a) Pilot Primary Pressure

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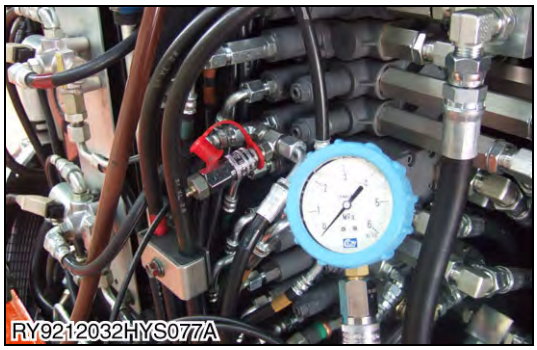

Pilot Secondary Pressure Measuring Procedure

1. Place the mini excavator on flat hard ground, lower the bucket and the blade, and stop the engine.
2. In accordance with "Releasing Residual Hydraulic System Pressure" in this manual, release pressure from the hydraulic line.
3. Fit a T-joint to the pilot port on the control valve side to be measured, and attach a pressure gage.
4. Start and idle the engine, and after checking that there is no oil leakage.
5. Operate the measuring lever after raise engine speed to maximum rpm, and take the pilot pressure reading at full throttle.
6. Perform the measurement 3 times, take the average and use this as the measurement value. Conduct at oil temperature 50 ± 5 °C (122 ± 9 °F).

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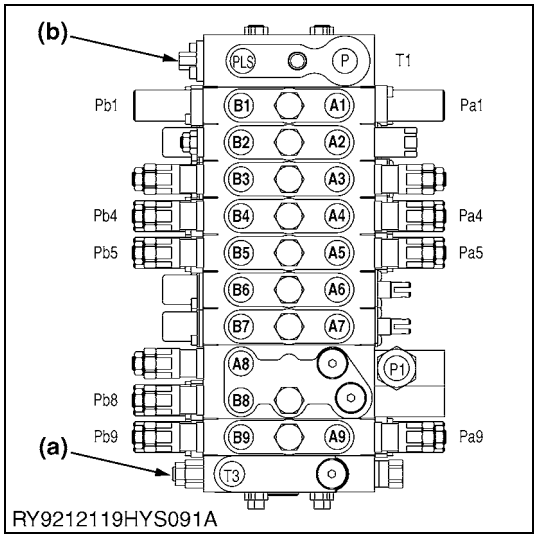
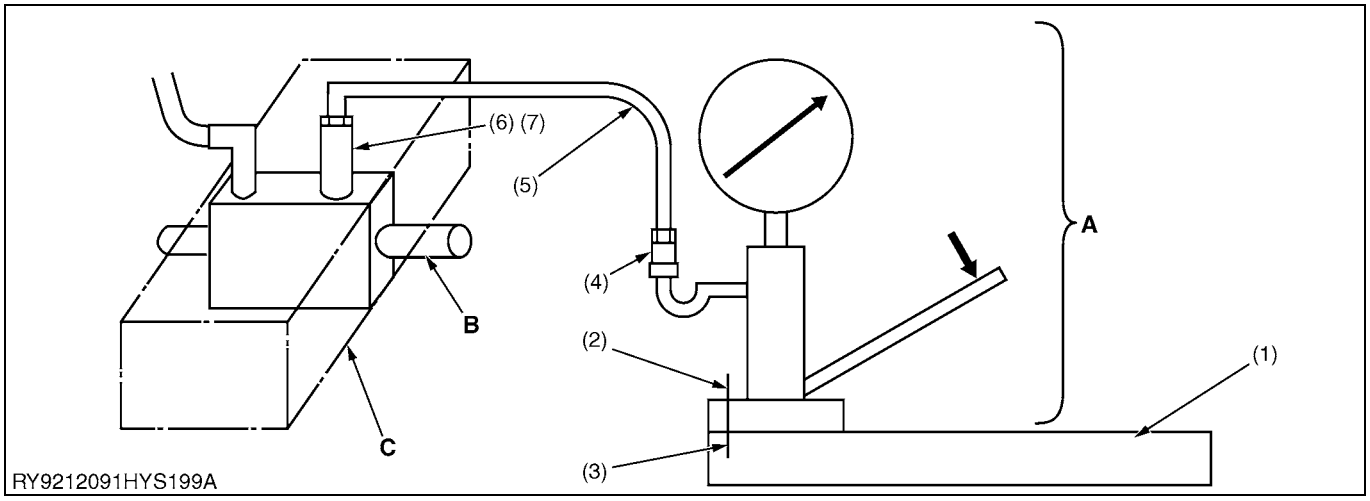


A1: Swivel Left (Pa1)
B1: Swivel Right (Pb1)
A2: Swing Rod
B2: Swing Bottom
A3: Blade Bottom
B3: Blade Rod
A4: AUX1 (Pa4)
B4: AUX1 (Pb4)
A5: Arm Rod (Pa5)
B5: Arm Bottom (Pb5)
A6: Travel Left Reverse
B6: Travel Left Forward
A7: Travel Right Reverse
B7: Travel Right Forward
A8: Boom Bottom
B8: Boom Rod (Pb8)
A9: Bucket Rod (Pa9)
B9: Bucket Bottom (Pb9)
(a) Main LS Relief Valve
(b) Unload LS Valve

RY9212119HYS0038US0

Overload Relief Valve Pressure Measurement Procedure



A : Injection pressure tester B : Overload relief valve tested C : Control valve

No.	Parts Name	Qty	Notes
(1)	Support	1	To hold the tester steady, fasten the tester to this support with bolts/nuts (2) and (3).
(2)	Bolt (M10 x 35)	2	
(3)	Nut (M12)	2	
(4)	Pipe joint (M12-G2)	1	Connect the hose and the tester.
(5)	Test hose (1/4)	1	
(6)	Straight pipe joint (S, G3-G2)	1	
(7)	Plug (PT1/8)	1	Plug the pressure detection port of the straight pipe joint (6).

Measurement preparation

1. Place the mini excavator on flat, hard ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic lines.
3. Using the vacuum pump, disconnect the high pressure hose on the valve suction port fitted for the overload relief valve to be tested and then plug the disconnected hose.
4. Remove the pipe joint from where the hose was disconnected and fit a straight pipe joint (6).
5. Connect a test hose to this pipe joint (6) and to the injection pressure tester.
6. Remove the vacuum pump.

Overload Relief Valve Measurement

1. Add pressure until the overload relief valve opens and then read the pressure at that point.
2. Perform the measurement 3 times; take the average and use this as the measurement value.

CAUTION

- **Be sure to use a test hose that is durable enough to withstand the set pressure that is being tested.**
- **Be careful to tighten connections fully and to the right ports.**
- **When removing hoses after the tests, loosen the pipe joint (4) and the injection pressure tester slightly and make sure the pressure is relieved before disconnecting any hoses.**

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Inspection Points		Bench Data	Measurement Values (Reference)
Boom	Bottom (b1B) Rod (b1R)	27.4 Mpa 279 kgf/cm^2 3970 psi	27.4± 1 Mpa 279± 10 kgf/cm2 3970± 145 psi
Arm	Bottom (b2B) Rod (b2R)	27.9 Mpa 284 kgf/cm^2 4050 psi	27.9± 1 Mpa 284± 10 kgf/cm2 4050± 1450 psi
Bucket	Bottom (b3B) Rod (b3R)	27.9 Mpa 284 kgf/cm^2 4050 psi	27.9 ± 1Mpa 284± 10 kgf/cm2 4050± 145 psi

CAUTION

- **Actual measured values may vary with the machine.**

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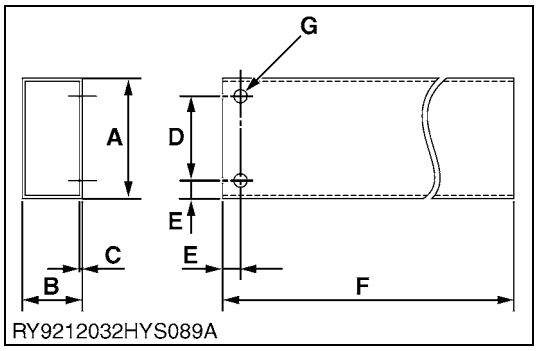
Measurement Equipment



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(1) Support

A	100 mm (3.94 in.)
B	50 mm (2.0 in.)
C	**t** = 2.3 mm, 0.09 in.
D	70 mm (2.8 in.)
E	15 mm (0.59 in.)
F	600 mm (23.6 in.)
G	2-11 mm, 2-0.43 in.

Material quality: STKR400

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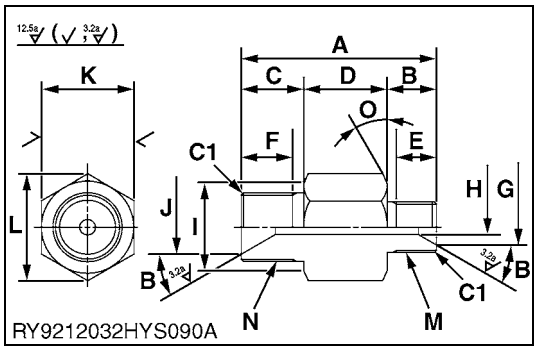

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(4) Pipe joint (M12-G2)

A	47 mm (1.8 in.)
B	12 mm (0.47 in.)
C	15 mm (0.59 in.)
D	20 mm (0.79 in.)
E	10 mm (0.39 in.)
F	12 mm (0.47 in.)
G	ϕ 8 mm (0.3 in.)
H	ϕ 3 mm (0.1 in.)
I	ϕ 18 mm (0.71 in.)
J	ϕ 9.5 ± 0.2 mm, 0.37 ± 0.01 in.
K	19 + 0, − 0.35 mm, 0.75 + 0, − 0.01 in.
L	21.9 mm (0.86 in.)
M	M12 × 1.5
N	G1/4
O	30 °

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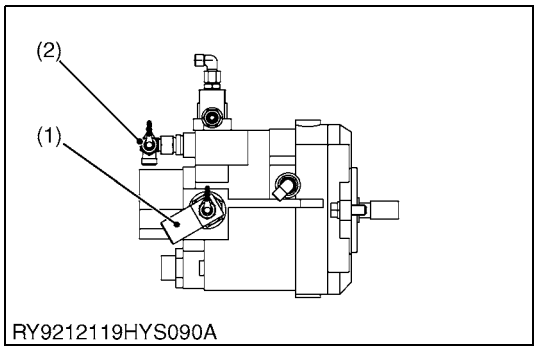

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Unload LS Valve Pressure

1. Place the machine on firm, level ground, lower the bucket and blade to ground level, and stop the engine.
2. In accordance with "Releasing Hydraulic System Pressure" in this manual, release pressure from the hydraulic line.
3. Remove the plug from the adapter's inspection port on the discharge side of the pump to be measured, and attach a pressure gage.
4. Start and idle the engine, and check that there is no oil leakage.
5. Raise engine speed to maximum rpm, and measure the pressure during load-free operation (control lever in neutral).
6. Measure three times at maximum engine speed, and take the average value as the measurement.
7. Conduct at oil temperature 50 ± 5 °C (122 ± 9 °F).

(1) Pump Pressure Detection Port (2) Pilot Pump Pressure Detection Port

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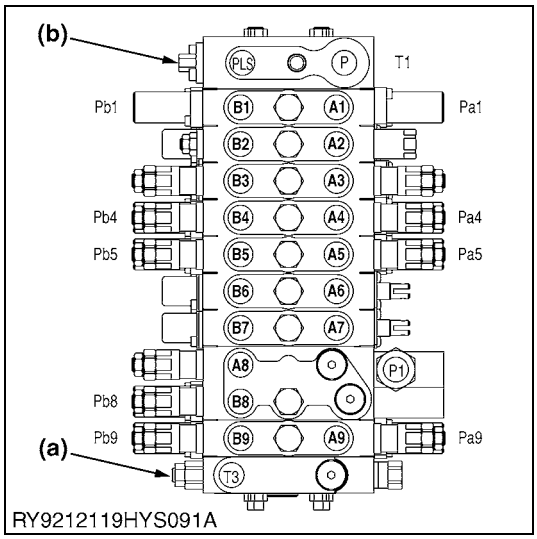

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Points to Measure	Bench Data	Actual Measured Values (Reference)
Unload LS (aUN)	2.5 MPa 25.5 kgf/cm^2 363 psi	3.2 MPa 32.6 kgf/cm^2 464 psi

CAUTION

- **Actual measured values may vary with the machine.**

(a) Main LS Relief Valve **(b) Unload LS Valve**

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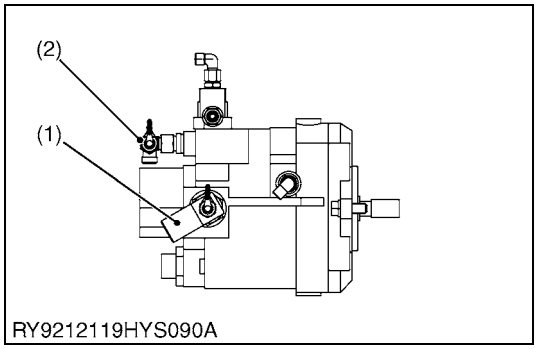

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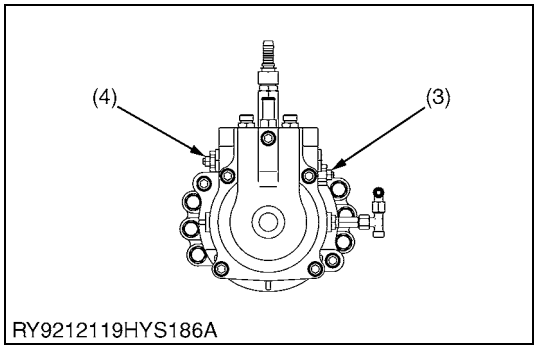

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Swivel Relief Valve Pressure

1. Place the mini excavator on flat, hard ground, lower the bucket and the blade and stop the engine.
2. Follow the chapter on "Releasing Pressure in the Hydraulic System" and release pressure in the hydraulic lines.
3. Attach a pressure gauge to the pump pressure detection port.
4. Start and idle the engine, and check that there is no oil leakage.
5. Place the bucket against something robust, lock the machine so that it does not move, slowly operate the swivel lever from left to right and from right to left, and take the relief pressure reading at maximum engine speed.
   Perform the measurement 3 times, take the average and use this as the measurement value.
   Conduct at oil temperature 50 ± 5 °C (122 ± 9 °F).

■ **NOTE**

- **When measuring the relief valve pressure of the swivel motor on the pump inspection port side, the pressure is higher than the relief valve pressure setting.**
  For a more accurate measurement, attach the pressure gauge to the swivel motor.

Inspection Points		Bench Data	Actual Measured Values (Reference)
Swivel relief valve	LH (cSL)	20.1 MPa 205 kgf/cm^2 2920 psi	23 MPa 235 kgf/cm^2 3340 psi
	RH (cSR)		

CAUTION

- **Actual measured values may vary with the machine.**

(1) Pump Pressure Detection Port (3) Left Swivel Relief Valve (cSL)
(2) Pilot Pump Pressure Detection Port (4) Right Swivel Relief Valve (cSR)

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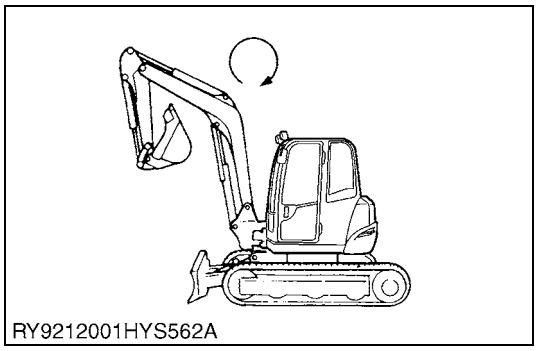
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LS Control Pressure

The actual measurement of LS control differential pressure requires special equipment such as a differential pressure instrument. General maintenance shops do not have such a expertise measuring device. This section introduces a simple method that makes use of one of the LS functions, such as the swivel motion of an actual machine.

1. Place the machine on hard ground.
2. Warm up the machine to the oil temperature of 50 ± 5 °C (122 ± 9 °F).
3. Raise up the engine speed at Max. rpm.
4. Measure the time for three turns constant swivel

Swivel function	
Reference value [three turns]	18.2 - 22.2 sec.
Actual measurement	

- Machine condition:
  Boom raised, arm and bucket crowd
  Dozer-down on ground.

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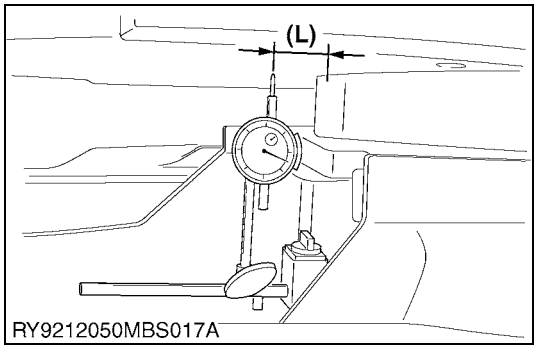

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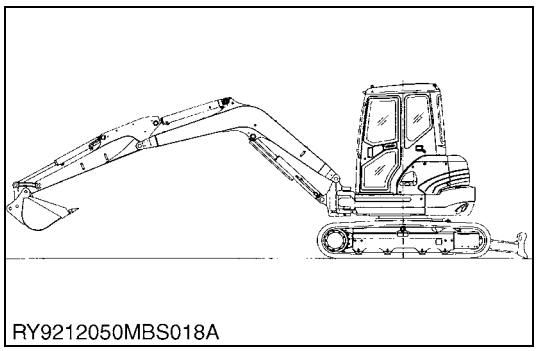
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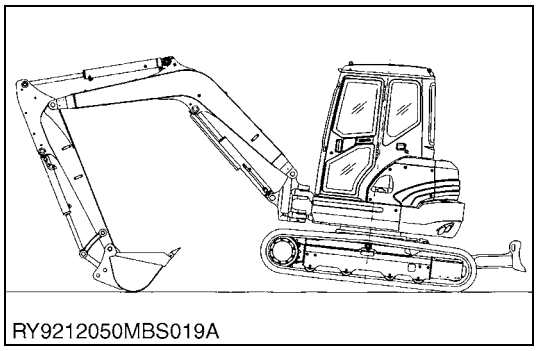
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Measuring the swivel bearing play

1. Attach the dial gauge and the dial gauge fixture on the machine front. (Measurement position differs with the machine model.)
2. Fully stretch the arm and place the bucket in the crowded position. Set the dial gauge to the zero point.
3. Using the attachment, tilt up the machine body, and take the dial gauge reading. Make this measurement several times and take their average as the final measurement.

CAUTION

- **Perform the measurement three times, determine the average value, and take this as the measured value.**

(L) : 50 mm (2.0 in.) away from swivel race	Factory specification	1.06 mm 0.04 in.
	Allowable limit	2.12 mm 0.08 in.

(L) Measurement position

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7. TROUBLESHOOTING

Front System Troubleshooting

All front operations slow or not moving

Cause	Inspection point	Remedy
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
Suction line (suction filter) blockage	Inspect the suction line (suction filter)	Wash the suction line Replace the suction line
Pilot filter blockage	Pilot filter blockage inspection	Replace pilot filter
Pilot relief valve faulty operation or poor pilot pump performance	Pilot primary pressure measurement	Adjust, wash or replace pilot relief valve Replace pilot pump
Poor main relief valve operation or seating	Main relief valve pressure measurement	Adjust, wash or replace main relief valve
Poor unload valve operation or seating	Control valve unload pressure measurement	Wash unload valve seat surface or replace
Drop in control differential pressure due to LS regulator spool stick	Pump LS regulator spool inspection	Wash LS regulator spool Replace LS regulator spool
Defective pump installation coupling	Pump installation coupling inspection	Replace pump coupling
Pump drive shaft breakage	Pump drive shaft inspection	Replace shaft
Pump internal parts wear or damage	Pump inspection	Repair or replace pump

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

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

Low power of entire hydraulic system

Cause	Inspection point	Remedy
Pilot relief valve faulty operation or poor pilot pump performance	Pilot primary pressure measurement	Adjust, wash or replace pilot relief valve Replace pilot pump
Poor main relief valve operation or seating	Main relief valve pressure measurement	Adjust, wash or replace main relief valve
Defective control differential pressure due to LS regulator spool stick	Pump LS regulator spool inspection	Wash LS regulator spool Replace LS regulator spool

A certain cylinder only does not move or is slow

Cause	Inspection point	Remedy
Applicable pilot valve defect	Pilot secondary pressure measurement of applicable cylinder	Pilot valve disassembly, cleaning or replacement
Defective specified pressure of overload relief valve	Inspection of overload relief valve of applicable cylinder	Wash overload relief valve seat surface or replace
Control valve spool stick	Inspection of control valve spool of applicable cylinder	Control valve spool disassembly and washing
Defective seal of cylinder internal parts	Inspection of applicable cylinder	Cylinder disassembly and seal replacement

Low power of certain implement

Cause	Inspection point	Remedy
Pilot relief valve faulty operation or poor pilot pump performance	Pilot primary pressure measurement	Adjust, wash or replace pilot relief valve Replace pilot pump
Defective specified pressure of overload relief valve	Inspection of overload relief valve of applicable cylinder	Wash overload relief valve seat surface or replace
Drop in control differential pressure due to LS regulator spool stick	Pump LS regulator spool inspection	Disassemble and wash LS regulator spool Replace LS regulator spool

Major front leak (drift) volume

Cause	Inspection point	Remedy
Defective specified pressure of overload relief valve	Inspection of overload relief valve of applicable cylinder	Wash overload relief valve seat surface or replace
Control valve spool stick	Inspection of control valve spool of applicable cylinder	Control valve spool disassembly and washing
Defective seal of cylinder internal parts	Inspection of applicable cylinder	Cylinder disassembly and seal replacement

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Travel System Troubleshooting

No travel on one side. Slow Meandering

Cause	Inspection point	Remedy
Crawler tension trouble or earth blockage around crawler	Crawler tension and blockage inspection	Earth removal around crawler and crawler tension adjustment
Defective travel pilot valve operation	Travel pilot valve secondary pressure measurement	Travel pilot valve disassembly, cleaning or replacement
Control valve spool stick	Control valve spool stick inspection	Control valve spool disassembly and washing
Control valve spool stick	Travel motor counterbalance spool inspection	Travel motor counterbalance valve disassembly, cleaning or replacement
Defective travel motor	Travel motor drain volume measurement	Travel motor disassembly, replacement
Internal leak of swivel joint	Remove the travel outlet hose of the swivel joint, plug it and measure the relief pressure	Swivel joint seal replacement

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Swivel System Troubleshooting

Swivel speed low or no swivel

Cause	Inspection point	Remedy
Defective pilot valve	Travel pilot valve secondary pressure measurement	Pilot valve disassembly, cleaning or replacement
Swivel section spool stick	Control valve swivel section spool inspection	Clean spool
Defective swivel relief specified pressure	Swivel relief pressure measurement	Swivel relief valve washing or replacement
Internal defect of swivel motor	Swivel motor drain volume measurement	Swivel motor disassembly, replacement
Snagging or sticking of friction plate for swivel motor parking brake	Inspection for snagging or sticking of friction plate for swivel motor parking brake	Replace friction plate

Swivel drift

Cause	Inspection point	Remedy
Pilot valve spool stick	Check that the pilot valve spool has returned to neutral	Pilot valve disassembly, cleaning or replacement
Swivel section spool stick	Control valve swivel section spool inspection	Control valve spool disassembly and washing
Defective swivel relief specified pressure	Swivel relief pressure measurement	Swivel relief valve washing or replacement
Swivel motor make-up poppet stick or defective seat surface	Swivel motor make-up poppet inspection	Make-up poppet disassembly and washing
Internal defect of swivel motor	Swivel motor drain volume measurement	Swivel motor disassembly, replacement

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KUBOTA Corporation Printed in Japan 2011. 06, H, EI, EI, e Code No. RY921-21200