WSM

WORKSHOP MANUAL
BACKHOE

BH65

Kubota

KiSC issued 02, 2008 A

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of KUBOTA Backhoe BH65. It is divided into three parts, “General”, “Mechanism” and “Servicing”.

■ **General**

Information on the tractor identification, the general precautions, maintenance check list, check and maintenance and special tools are described.

■ **Mechanism**

Information on the construction and function are included. This part should be understood before proceeding with troubleshooting, disassembling and servicing.

■ **Servicing**

Under the heading “General” section comes general precautions, check and maintenance and special tools. Other section, there are troubleshooting, servicing specification lists, checking and adjusting, disassembling and assembling, and servicing which cover procedures, precautions, factory specifications and allowable limits.

All information, illustrations and specifications contained in this manual are based on the latest production information available at the time of publication.

The right is reserved to make changes in all information at any time without notice.

February 2008

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KiSC issued 02, 2008 A

SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.

It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.

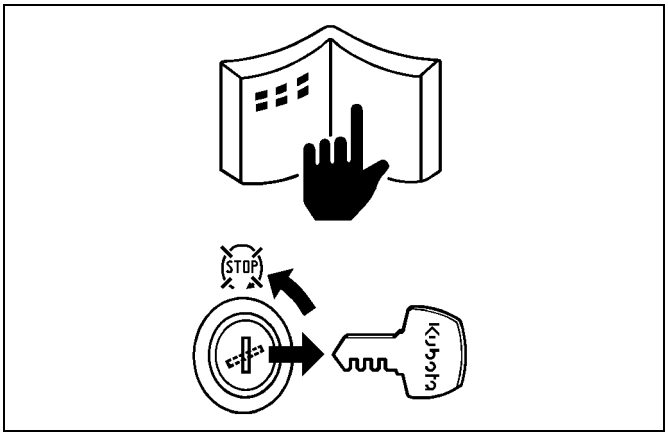
DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

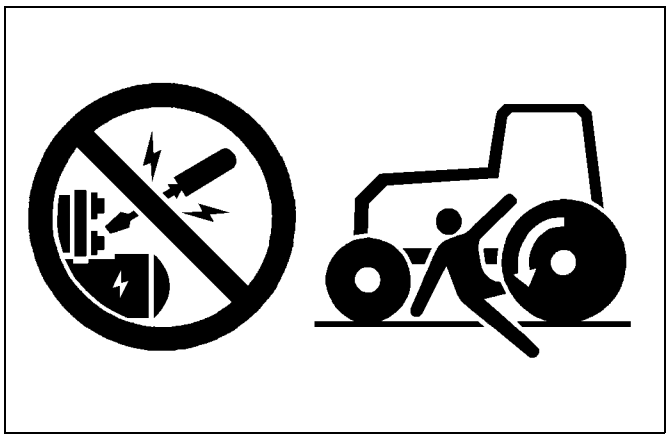
■ IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

■ NOTE : Gives helpful information.



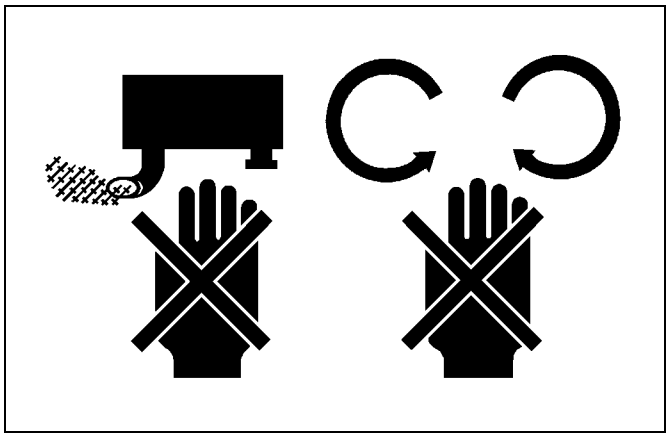
BEFORE SERVICING AND REPAIRING

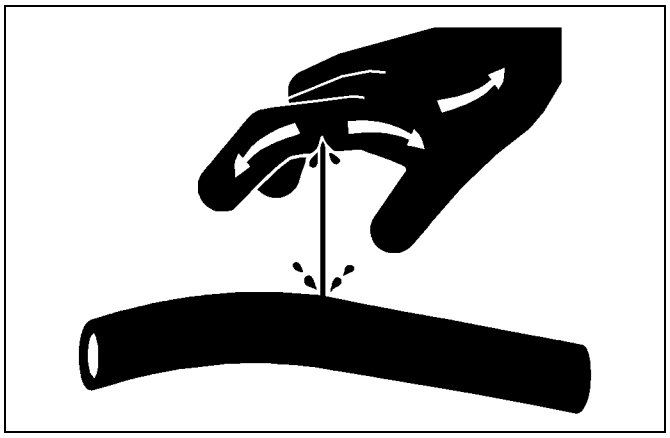
- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.
- Hang a "**DO NOT OPERATE**" tag in operator station.

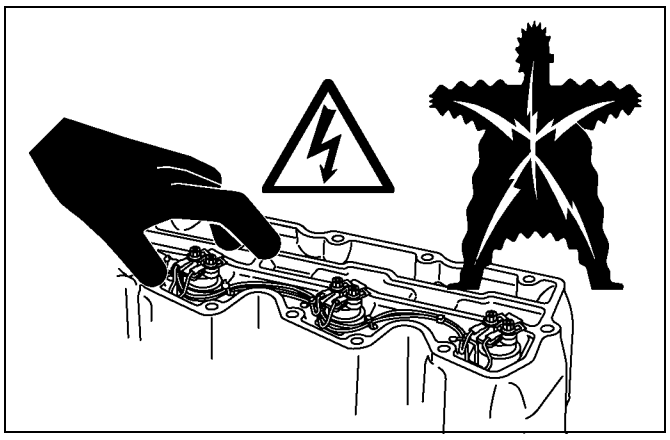


SAFETY STARTING

- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine while standing on ground. Start the engine only from operator's seat.

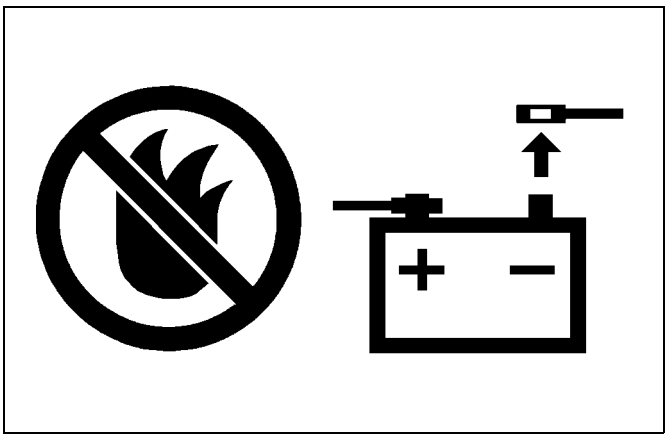






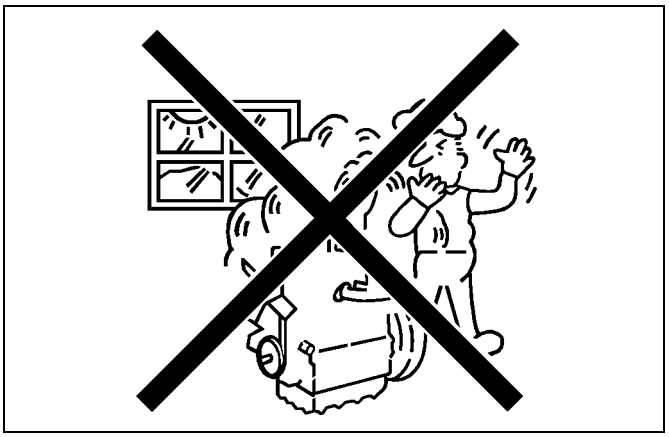
SAFETY WORKING

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU, and is applied to the injector. Pay sufficient caution to electric shock when performing work activities.



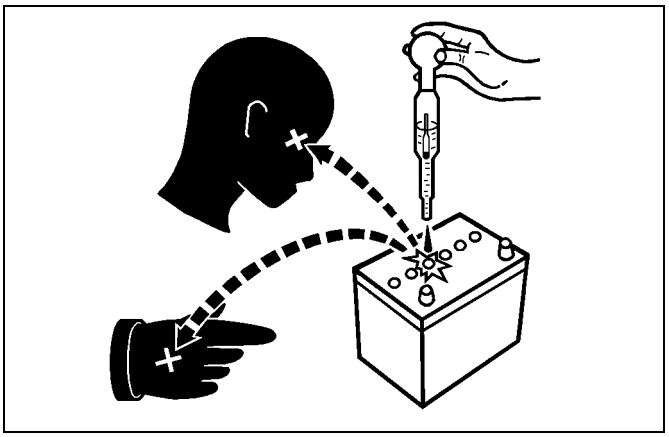
AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.



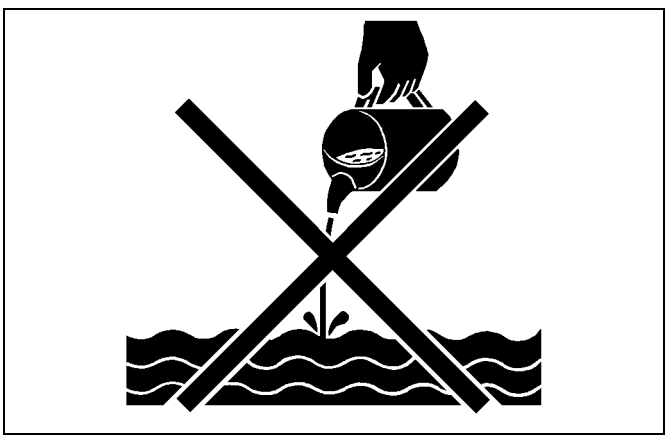
VENTILATE WORK AREA

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.



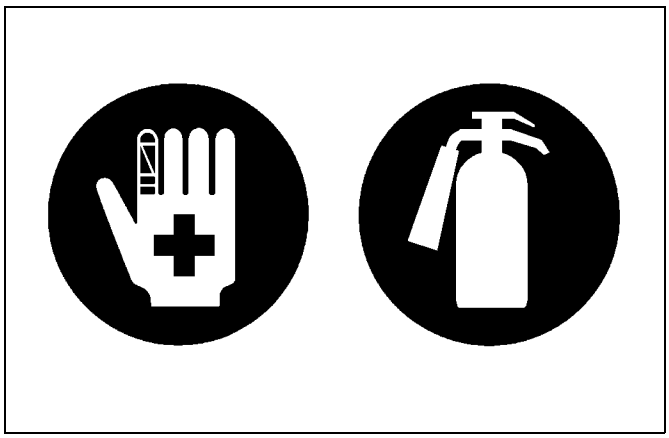
PREVENT ACID BURNS

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.



DISPOSE OF FLUIDS PROPERLY

- Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.



PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

SAFETY DECALS

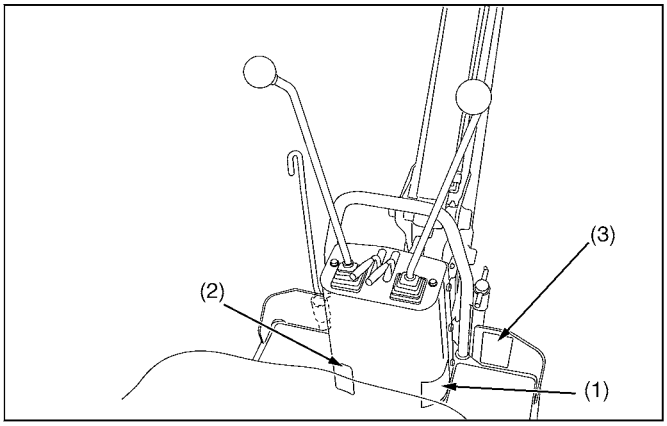
The following safety decals are installed on the machine.
If a decal becomes damaged, illegible or is not on the machine, replace it. The decal part number is listed in the parts list.

(1) Part No. 75597-7528-0

(2) Part No. 7K501-7529-0

1AJABAEAP028A

(3) Part No. 75595-7524-0



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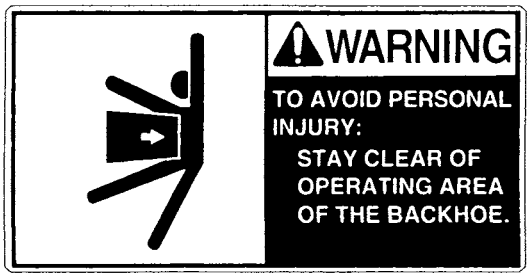
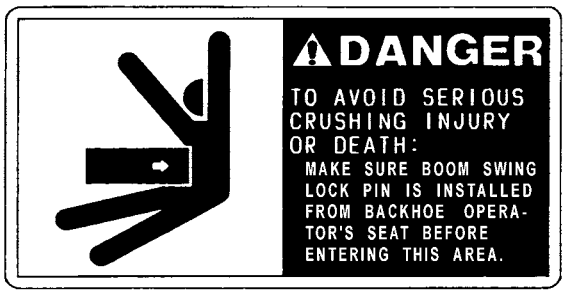
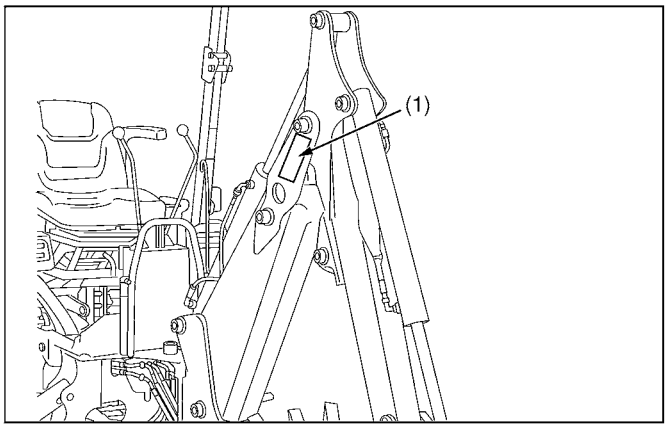
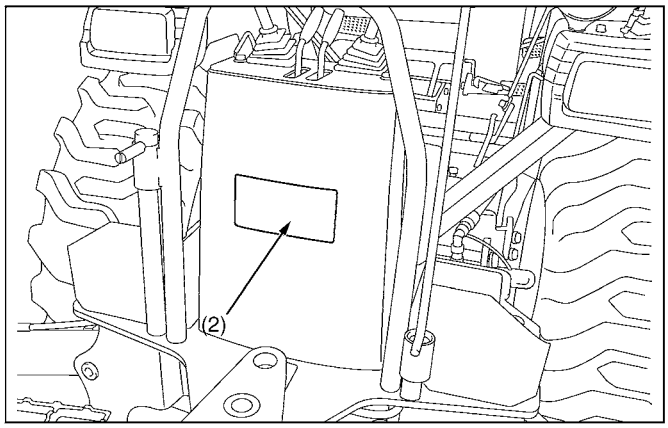
(1) Part No. 75595-7517-0 (Both sides)



(2) Part No. 75597-7517-0







CARE OF DANGER, WARNING AND CAUTION LABELS

1. Keep danger, warning and caution labels clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels.
4. If a component with danger, warning and caution label(s) affixed is replaced with new part, make sure new label(s) is (are) attached in the same location(s) as the replaced component.
5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

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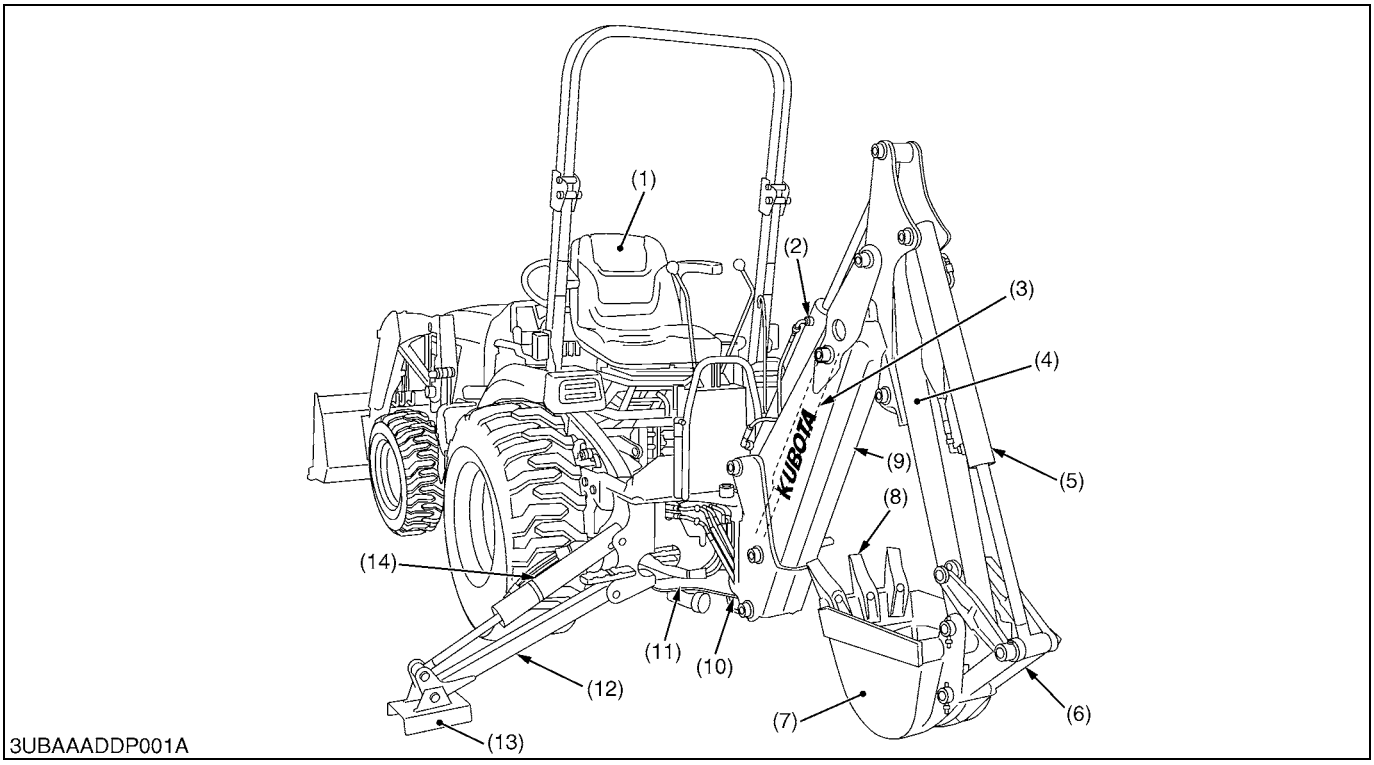
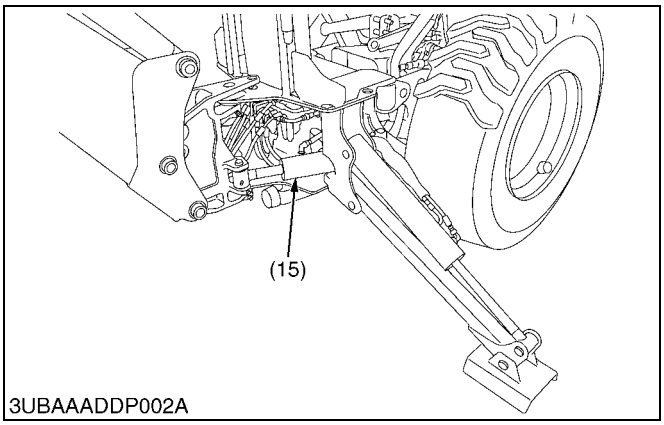
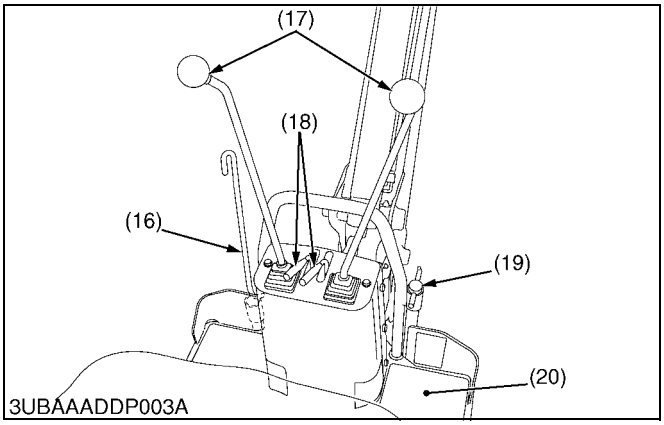
TERMINOLOGY



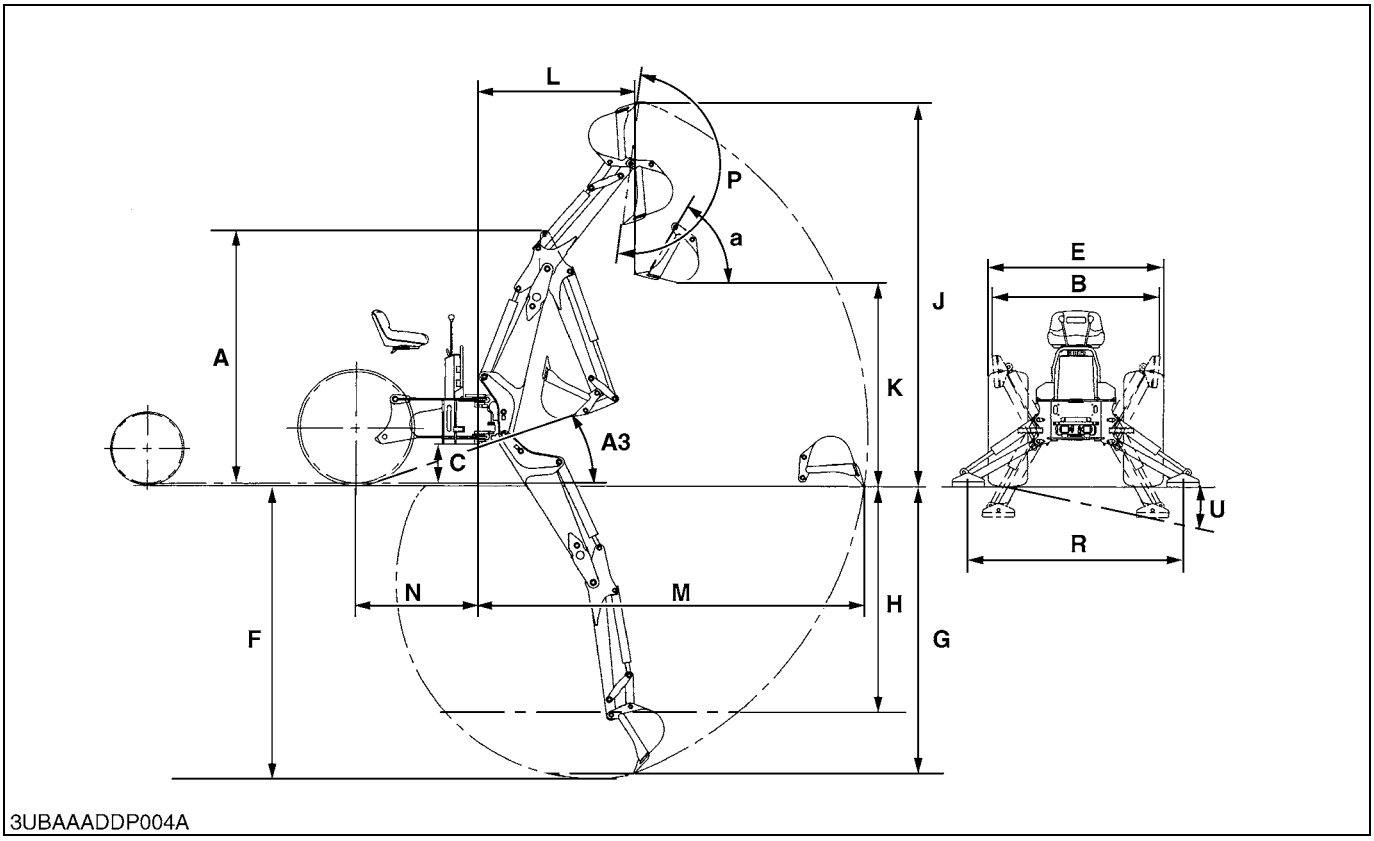




(1) Seat
(2) Cylinder, Dipperstick
(3) Cylinder, Boom
(4) Dipperstick
(5) Cylinder, Bucket
(6) Link, Bucket
(7) Backhoe Bucket
(8) Bucket Teeth
(9) Boom
(10) Swing Frame
(11) Main Frame
(12) Stabilizer
(13) Stabilizer Pad
(14) Cylinder, Stabilizer
(15) Cylinder, Swing
(16) Swing Lock Pin
(17) Joystick Control Lever
(18) Stabilizer Control Lever
(19) Boom Lock Pin
(20) Step

SPECIFICATIONS

■ Operating Dimensions



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Model		BH65
A	Transport Height	1850 mm (72.8 in.)
B	Stabilizer Spread Transport	1280 mm (50.4 in.)
C	Ground Clearance	294 mm (11.6 in.)
E	Overall Rall Width	1260 mm (49.6 in.)
F	Maximum Digging Depth	2034 mm (80.1 in.)
G	Digging Depth, 2 ft. Flat Bottom	2001 mm (78.8 in.)
H	Digging Depth, 8 ft. Flat Bottom	1432 mm (56.4 in.)
J	Operating Height, Fully Raised	2677 mm (105.4 in.)
K	Loading Height (at 60 deg.)	1637 mm (64.5 in.)
L	Loading Reach	1009 mm (39.7 in.)
M	Reach from Swing Pivot	2767 mm (108.9 in.)
N	Swing Pivot to Rear Axle Center Line	797 mm (31.4 in.)
P	Bucket Rotation	171 deg.
R	Stabilizer Spread-Operation	1854 mm (73.0 in.)
A3	Angle of Departure per SAE J1234	19.0 deg.
U	Leveling Angle	11.8 deg.
	Swing Arc	150 deg.
a	—	60 deg.

NOTE: The specifications are taken with KUBOTA B2320, B2620, B2920 tractor. (Tire size : Front 23 × 8.5-14, Rear 12-16.5)

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■ Digging Force (Per SAE J49)

With bucket cylinder	11500 N (2585 lbf)
With dipperstick cylinder	7500 N (1687 lbf)

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■ Cycle Time (Seconds)

Boom cylinder, extend	4.5
Boom cylinder, retract	3.0
Swing cylinder, from 70 ° to center	1.3
Dipperstick cylinder, extend	4.7
Dipperstick cylinder, retract	3.5
Bucket cylinder, extend	2.9
Bucket cylinder, retract	2.0
Stabilizer cylinder, max. height to ground	2.5
Stabilizer cylinder, ground to max. height	1.9

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■ Hydraulic Cylinders

	Boom cm (in.)	Dipperstick cm (in.)	Bucket cm (in.)	Stabilizer cm (in.)	Swing cm (in.)
Rod diameter	3.0 (1.18)	3.0 (1.18)	3.0 (1.18)	2.5 (0.98)	3.0 (1.18)
Cylinder bore	6.0 (2.36)	6.0 (2.36)	5.0 (1.97)	6.0 (2.36)	6.0 (2.36)

W1028958

■ Bucket Alternatives (Option)

	Width cm (in.)	SAE Struck Capacity m^3 (cu-ft)	SAE Heaped Capacity m^3 (cu-ft)	Number of Teeth	Weight kg (lb)
Trenching 10”	25.4 (10)	0.017 (0.60)	0.021 (0.74)	3	29 (64)
Trenching 12”	30.5 (12)	0.022 (0.77)	0.027 (0.95)	3	32 (71)
Trenching 16”	40.6 (16)	0.031 (1.09)	0.039 (1.38)	4	38 (84)

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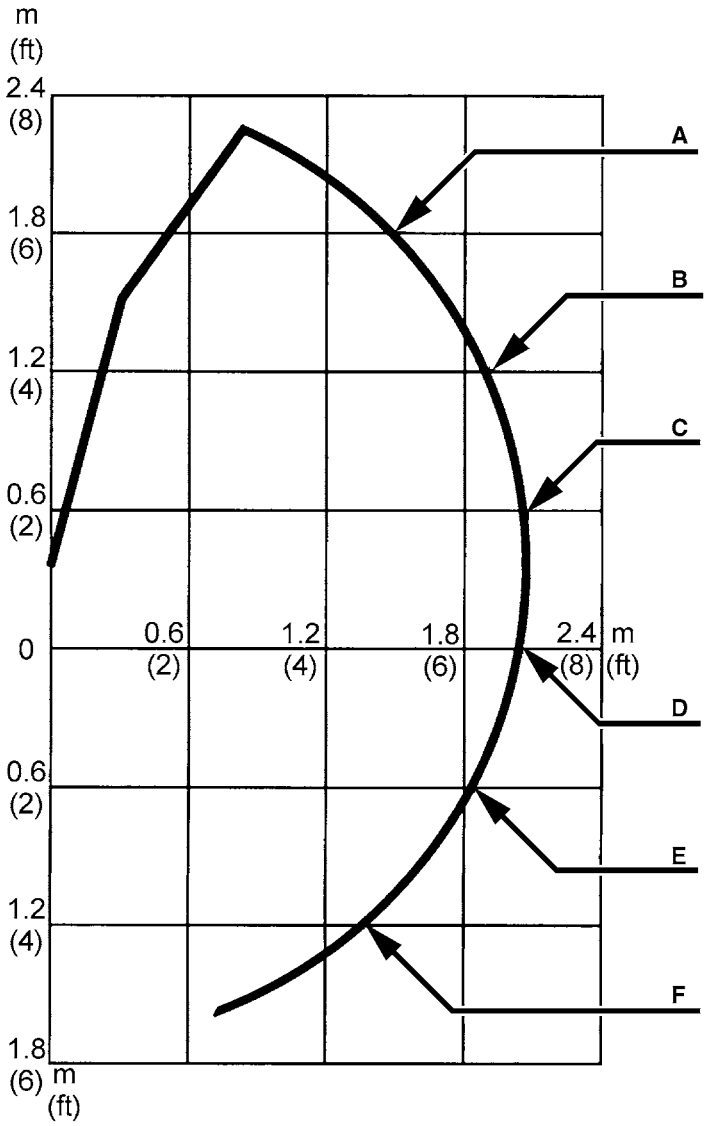
■ Lift Capacity (Per SAE J31)

Rated Lift Capacity (Over end)



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Lift capacites shown are 87 % of maximum lift force, according to SAE definition.

A	235 kg (518 lbs)
B	246 kg (542 lbs)
C	243 kg (536 lbs)
D	238 kg (525 lbs)
E	237 kg (523 lbs)
F	253 kg (558 lbs)

W1029646

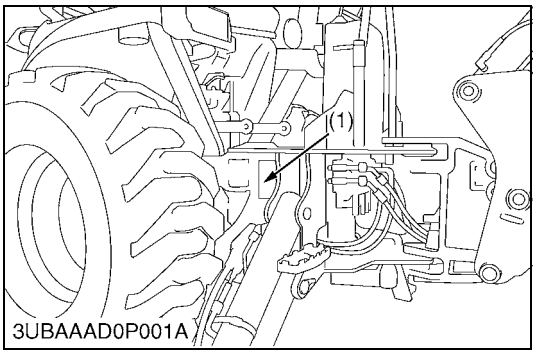
G GENERAL

GENERAL

CONTENTS

1. BACKHOE IDENTIFICATION G-1
2. GENERAL PRECAUTIONS G-2
3. LUBRICANTS G-3
4. TIGHTENING TORQUES G-4
   [1] GENERAL USE SCREWS, BOLTS AND NUTS G-4
   [2] HYDRAULIC FITTINGS G-5
5. MAINTENANCE CHECK LIST G-6
6. CHECK AND MAINTENANCE G-7
   [1] CHECK POINTS OF EACH USE OR DAILY G-7
   [2] CHECK POINT OF EVERY 10 HOURS G-8
   [3] CHECK POINT OF EVERY 50 HOURS G-8
7. SPECIAL TOOLS G-9

1. BACKHOE IDENTIFICATION



When contacting your local KUBOTA distributor, always specify backhoe serial number.

(1) Serial Number

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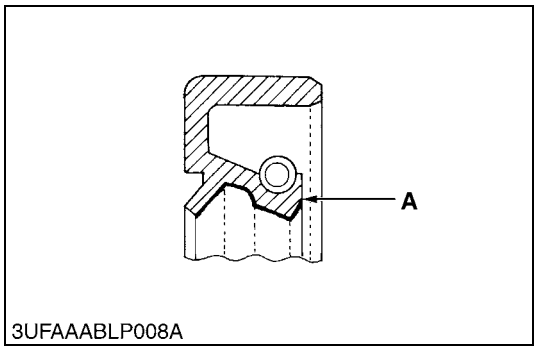
2. GENERAL PRECAUTIONS



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- During disassembly, carefully arrange removed parts in a clean area to prevent later confusion. Screws, bolts and nuts should be replaced in their original positions to prevent reassembly errors.
- When special tools are required, use genuine KUBOTA tools. Special tools which are not used frequently should be made according to the drawings provided.
- Clean parts before measuring them.
- Use only genuine KUBOTA parts for parts replacement to maintain backhoe performance and to assure safety.
- O-rings and oil seals must be replaced during reassembly. Apply grease to new O-rings or oil seals before reassembling.
- Nipples must be tightened to the specified torque. Excessive torque may cause damages hydraulic units or nipples, and insufficient torque will result in oil leaks.
- When using a new hose or pipe, tighten nuts to the specified torque once, then loosen them (approx. by 45 °) to allow hose or pipe to settle before retightening to the specified torque (except sealtaped parts).
- When removing both ends of a pipe, remove the lower end first.
- Use two pliers in removal and reinstallation; one to hold the static side, and the other to turn the side being removed to avoid twisting.
- Check to see that sleeves of flareless connectors and tapered sections of hoses are free of dust and scratches.
- After tightening nipples, clean the joint and apply the maximum working pressure 2 to 3 times to check for oil leak.

A : Grease

W1010572

3. LUBRICANTS

To prevent serious damage to hydraulic systems, use only specified fluid or its equivalent.

Place	Capacity		Lubricants, type of grease
	B2320DT	**B2320 HSD B2620 HSD B2920 HSD**	
Transmission case	14 L 3.7 U.S.gals 3.1 Imp.gals	15 L 4.0 U.S.gals 3.3 Imp.gals	KUBOTA SUPER UDT fluid*
Grease nipples	Until grease overflows.		Moly Ep type grease**

* KUBOTA original transmission hydraulic fluid

** “Extreme pressure” and containing Molybdenum disulfide is recommended. This grease may specify “Moly Ep” on it’s label.

4. TIGHTENING TORQUES

Screws, bolts, nuts and hydraulic fittings that tightening torques are not specified in this Workshop Manual should be tightened according to tables below.

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Indication on top of bolt	⬡ 4 No-grade or 4T						⬡ 7 7T						⬡ 9 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit / Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6 (6 mm, 0.24 in.)	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8 (8 mm, 0.31 in.)	18 to 20	1.8 to 2.1	13 to 15	17 to 19	1.7 to 2.0	13 to 14	24 to 27	2.4 to 2.8	18 to 20	18 to 20	1.8 to 2.1	13 to 15	30 to 34	3.0 to 3.5	22 to 25
M10 (10 mm, 0.39 in.)	40 to 45	4.0 to 4.6	29 to 33	32 to 34	3.2 to 3.5	24 to 25	48 to 55	4.9 to 5.7	36 to 41	40 to 44	4.0 to 4.5	29 to 32	61 to 70	6.2 to 7.2	45 to 52
M12 (12 mm, 0.47 in.)	63 to 72	6.4 to 7.4	47 to 53	–	–	–	78 to 90	7.9 to 9.2	58 to 66	63 to 72	6.4 to 7.4	47 to 53	103 to 117	10.5 to 12.0	76.0 to 86.7
M14 (14 mm, 0.55 in.)	108 to 125	11.0 to 12.8	79.6 to 92.5	–	–	–	124 to 147	12.6 to 15.0	91.2 to 108	–	–	–	167 to 196	17.0 to 20.0	123 to 144
M16 (16 mm, 0.63 in.)	167 to 191	17.0 to 19.5	123 to 141	–	–	–	197 to 225	20.0 to 23.0	145 to 166	–	–	–	260 to 304	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	246 to 284	25.0 to 29.0	181 to 209	–	–	–	275 to 318	28.0 to 32.5	203 to 235	–	–	–	344 to 402	35.0 to 41.0	254 to 296
M20 (20 mm, 0.79 in.)	334 to 392	34.0 to 40.0	246 to 289	–	–	–	368 to 431	37.5 to 44.0	272 to 318	–	–	–	491 to 568	50.0 to 58.0	362 to 419

W1034542

American standard cap screws with UNC or UNF threads						
Grade	SAE 5			SAE 8		
Unit / Size	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
1/4	12.0 to 15.7	1.22 to 1.60	8.80 to 11.6	16.3 to 19.7	1.66 to 2.01	12.0 to 14.6
5/16	23.1 to 27.7	2.35 to 2.83	17.0 to 20.5	32.6 to 39.3	3.32 to 4.00	24.0 to 29.0
3/8	47.5 to 56.9	4.84 to 5.80	35.0 to 42.0	61.1 to 73.2	6.22 to 7.46	45.0 to 54.0
1/2	109 to 130	11.1 to 13.2	80.0 to 96.0	149.2 to 178.9	15.21 to 18.24	110.0 to 132.0
9/16	149.2 to 178.9	15.21 to 18.24	110.0 to 132.0	217.0 to 260.3	22.12 to 26.54	160.0 to 192.0
5/8	203.4 to 244.1	20.74 to 24.88	150.0 to 180.0	298.3 to 357.9	30.42 to 36.49	220.0 to 264.0

W1013653

Metric cap screws			
Grade	Property class 8.8 (Approx. SAE grade 5)		
Unit / Size	N·m	kgf·m	lbf·ft
M6	9.8 to 10	1.0 to 1.1	7.3 to 7.9
M8	24 to 27	2.4 to 2.8	18 to 20
M10	48 to 55	4.9 to 5.7	36 to 41
M12	78 to 90	7.9 to 9.2	58 to 66
M14	124 to 147	12.6 to 15.0	91.2 to 108
M16	196 to 225	20.0 to 23.0	145 to 166
M18	275 to 318	28.0 to 32.5	203 to 235

W1013699

[2] HYDRAULIC FITTINGS

■ Adaptors, Elbows and Others

Item	Thread size	Tightening torque		
		N·m	kgf·m	lbf·ft
Adjustable elbow, Adaptor	9/16	37 to 44	3.8 to 4.5	27 to 33
	3/4	48 to 54	4.9 to 5.5	35 to 40
Hose fitting, Flare nut	9/16	22 to 25	2.3 to 2.6	16 to 19
	3/4	36 to 40	3.6 to 4.1	26 to 30
Adaptor (NPT)	3/8	38 to 43	3.9 to 4.4	28 to 32
	1/2	49 to 58	5.0 to 5.9	36 to 43

■ **NOTE**

- **When connecting a hose with flare nut, after tightening the nut with specified torque, return it approximately 45 degrees (0.79 rad.) and re-tighten it to specified torque.**

W1015484

■ Hydraulic Pipe Cap Nuts

Pipe size (mm)	Tightening torque		
	N·m	kgf·m	ft-lbs
ϕ 6	25 to 34	2.5 to 3.5	18 to 25
ϕ 8	30 to 39	3.0 to 4.0	22 to 28
ϕ 10	40 to 49	4.0 to 5.0	29 to 36
ϕ 12	49 to 68	5.0 to 7.0	37 to 50
ϕ 15	108 to 117	11.0 to 12.0	79.6 to 86.7
ϕ 16	138 to 147	14.0 to 15.0	102 to 108
ϕ 18	108 to 117	11.0 to 12.0	79.6 to 86.7

W1014848

5. MAINTENANCE CHECK LIST

To keep the machine working in good condition as well as to avoid any accident and trouble, carry out periodic inspection and maintenance. Check the following points before use.

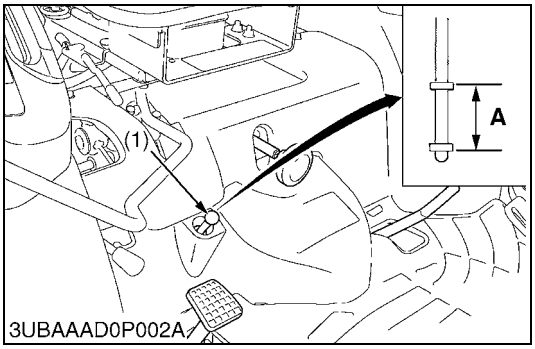
Service Interval	Check Points	Reference page
Daily (Each use)	• Check the transmission fluid level • Retighten the backhoe hardware to torque value • Check the hydraulic hoses	G-7
Every 10 hours	• Grease all grease nipples	G-8
Every 50 hours	• Check the sub frame mounting bolts and nuts torque	G-8

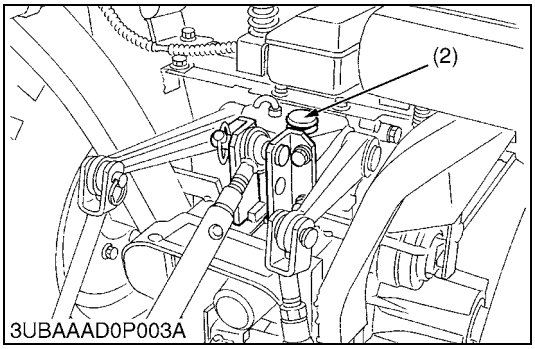
W1013874

6. CHECK AND MAINTENANCE

CAUTION
- **When checking and repairing, park the tractor on flat ground and apply the parking brake.**
- **When checking and repairing, lower the bucket and stabilizers, and stop the engine.**

[1] CHECK POINTS OF EACH USE OR DAILY





Checking Transmission Fluid

1. Check that the tractor hydraulic fluid level.
2. To check the oil level, remove the dipstick (1), wipe it clean, replace it, and remove it again.
   Check that the oil level is between the two notches.
3. If the level is too low, replenish new oil.

■ **IMPORTANT**
- **Use only KUBOTA UDT or SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "3. LUBRICANTS".**

(1) Dipstick
(2) Oil Filling Port

A : Oil level acceptable within this range.

W1011494

Retightening Backhoe Hardware

1. Check all hardware before daily operation.
2. If the screws, bolts and nuts are loosen, retighten them to the specified torque.

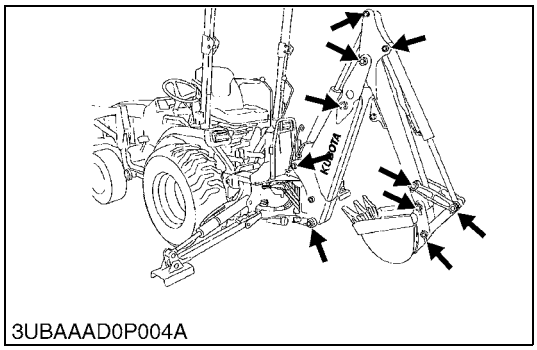
W1011636

Checking Hydraulic Hoses

1. Check all hydraulic hoses for cuts or wear.
2. If defects are found, replace them.

W1011703

[2] CHECK POINT OF EVERY 10 HOURS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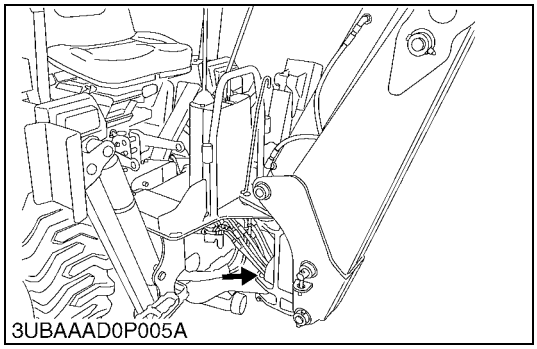
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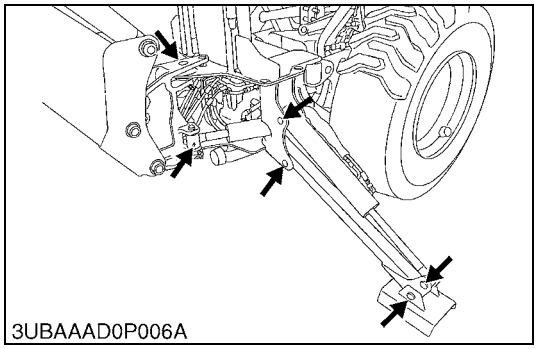
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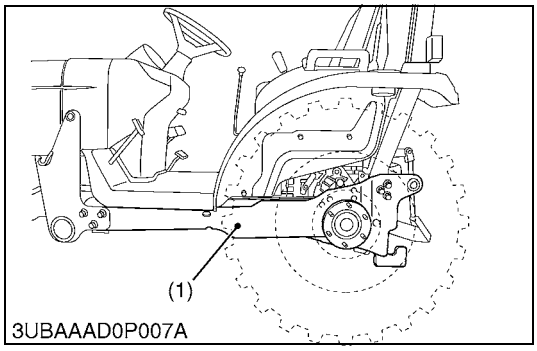
Greasing

1. Inject grease all grease nipples with a hand grease gun.

W1015410

[3] CHECK POINT OF EVERY 50 HOURS



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Checking Sub Frame Bolt Torque

CAUTION

- **Never operate backhoe and front loader with a loose sub frame.**
- **Any time bolts and nuts are loosened, retighten to specified torque.**
- **Check all bolts and nuts frequently and keep them tight.**

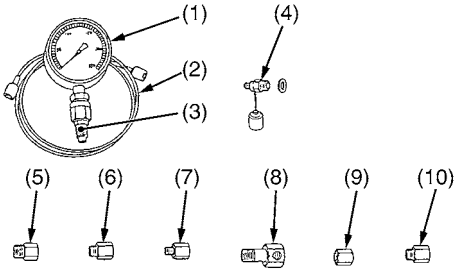
Check sub frame bolts and nuts regularly especially when new. If they are loose, tighten them as follows.

Tightening torque	Sub frame mounting bolt and nut (M16)	196 to 225 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft
	Sub frame mounting nut (M12)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

(1) Sub Frame

W1014200

7. SPECIAL TOOLS



3TMABAB0P077A

Relief Valve Pressure Tester

Code No: 07916-50045

Application: This allows easy measurement of relief set pressure.

(1) Gauge (07916-50322)
(2) Cable (07916-50331)
(3) Threaded Joint (07916-50401)
(4) Threaded Joint (07916-50341)
(5) Adaptor **B** (M18 × P1.5) (07916-50361)
(6) Adaptor **C** (PS3/8) (07916-50371)
(7) Adaptor **D** (PT1/8) (07916-50381)
(8) Adaptor **E** (PS3/8) (07916-50392)
(9) Adaptor **F** (PF1/2) (07916-62601)
(10) Adaptor **58** (PT1/4) (07916-52391)

W1026741

1 BACKHOE

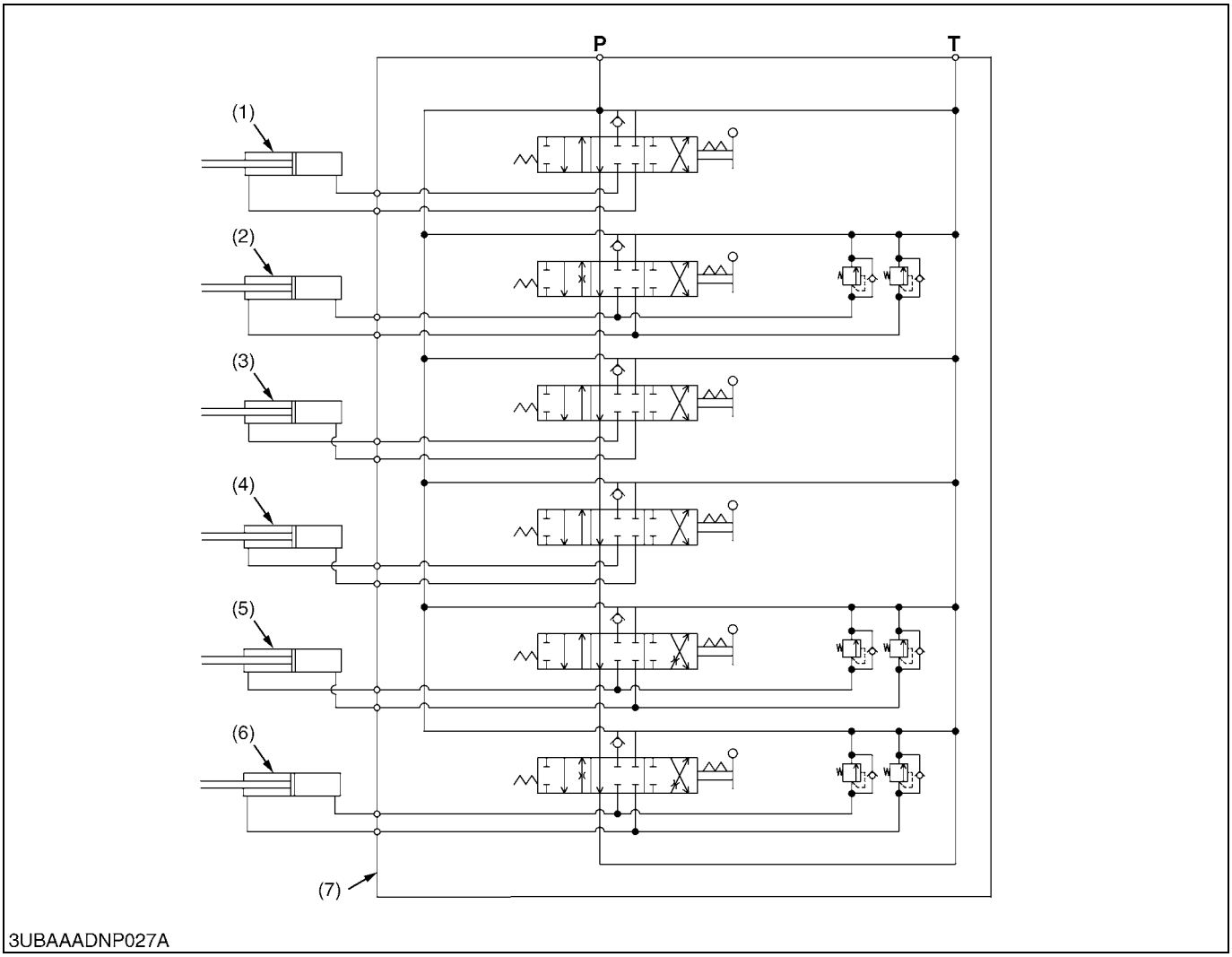
MECHANISM

CONTENTS

1. HYDRAULIC SYSTEM M-1
   [1] HYDRAULIC CIRCUIT M-1
   [2] CONTROL VALVE M-2
      (1) Structure M-2
      (2) Operation M-3
      (3) Overload Relief Valve M-16
   [3] HYDRAULIC CYLINDER M-18

1. HYDRAULIC SYSTEM

[1] HYDRAULIC CIRCUIT



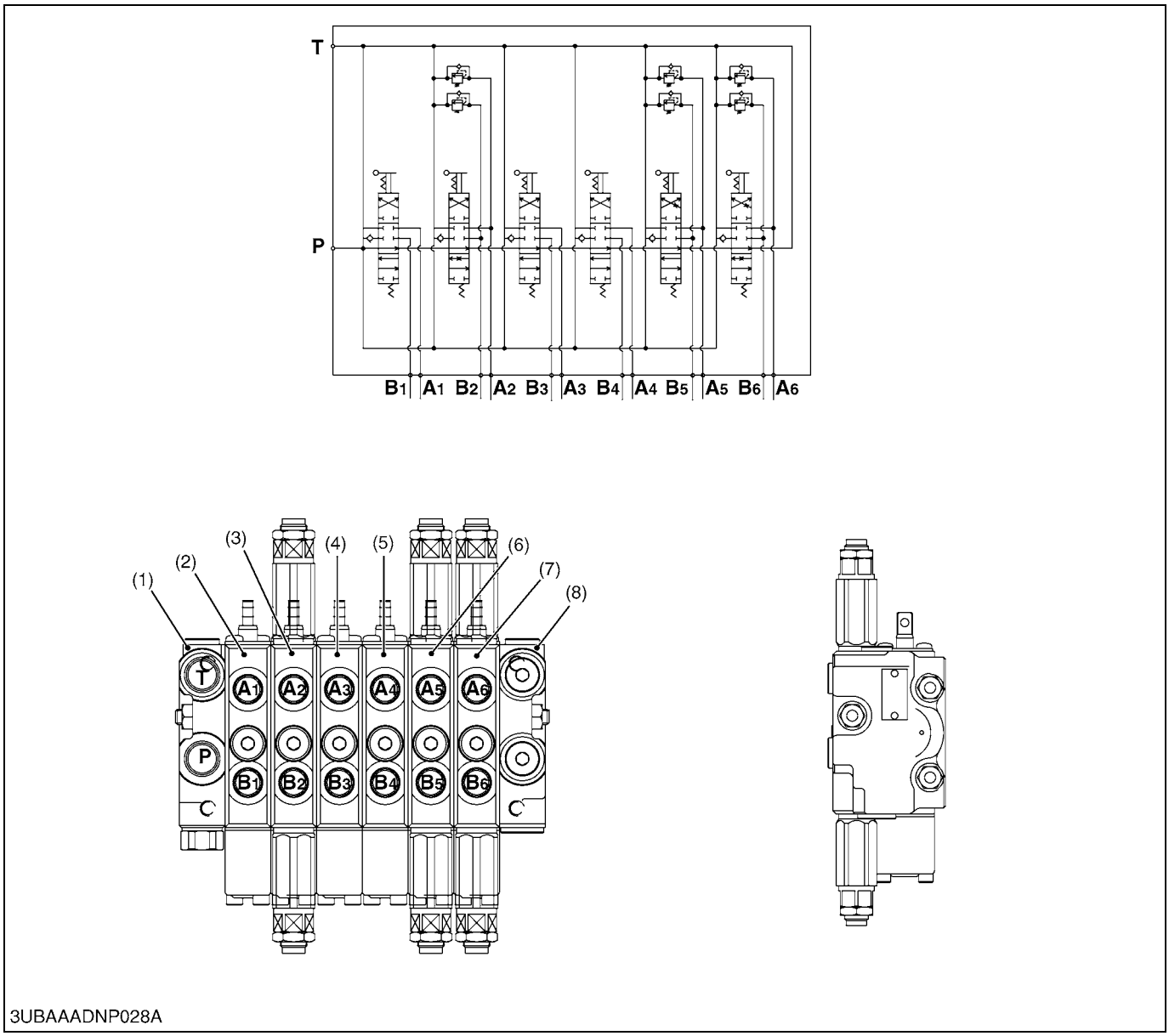
3UBAAADNP027A

(1) Bucket Cylinder
(2) Dipperstick Cylinder
(3) Stabilizer Cylinder, R.H.
(4) Stabilizer Cylinder, L.H.
(5) Boom Cylinder
(6) Swing Cylinder
(7) Backhoe Control Valve

P : Pump Port
T : Tank Port

[2] CONTROL VALVE

(1) Structure



(1) Inlet Section
(2) Bucket Control Valve
(3) Dipperstick Control Valve
(4) Stabilizer Control Valve, R.H.
(5) Stabilizer Control Valve, L.H.
(6) Boom Control Valve
(7) Swing Control Valve
(8) Outlet Section

P : Pump Port
T : Tank Port

A1 : A1 Port
A2 : A2 Port
A3 : A3 Port
A4 : A4 Port
A5 : A5 Port
A6 : A6 Port

B1 : B1 Port
B2 : B2 Port
B3 : B3 Port
B4 : B4 Port
B5 : B5 Port
B6 : B6 Port

(1) Inlet / Outlet Section

This section has **P** and **T** ports.

The **P** port is connected to the **OUTLET** port of tractor connected by the quick coupler.

The **T** port is connected to the **RETURN** port of tractor connected by the quick coupler.

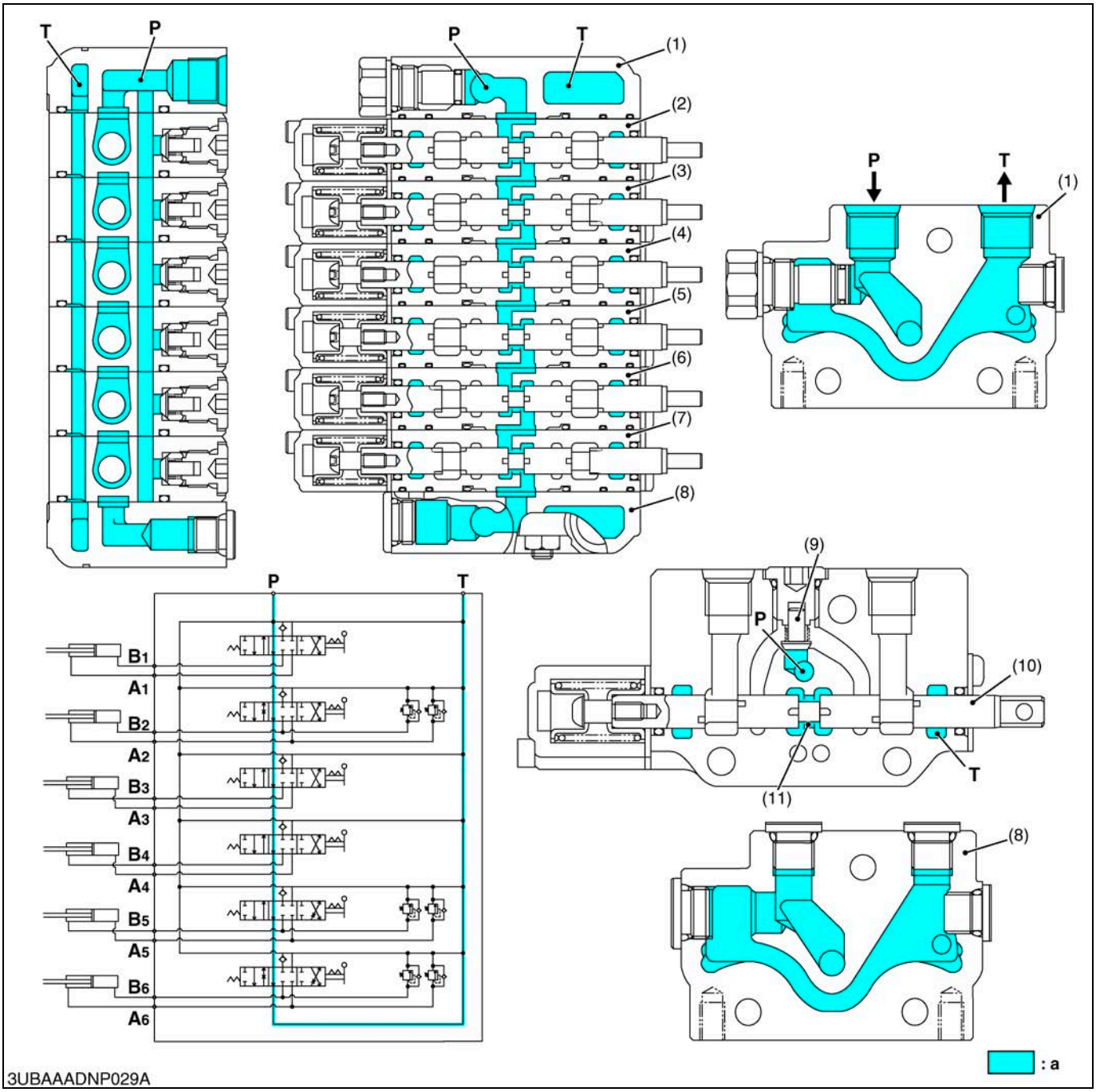
(2) Control Valve Section

The control valves are 3 positions, 6 connections, no detent and spring center type. These valves have **A** and **B** ports and control oil flow to each cylinders.

These are consisting of a valve housing, spool, load check valve, overload relief valve, etc..

(2) Operation

■ Neutral



(1) Inlet Section
(2) Bucket Control Valve
(3) Dipperstick Control Valve
(4) Stabilizer Control Valve, R.H.
(5) Stabilizer Control Valve, L.H.
(6) Boom Control Valve
(7) Swing Control Valve
(8) Outlet Section
(9) Load Check Valve
(10) Spool
(11) Neutral Passage

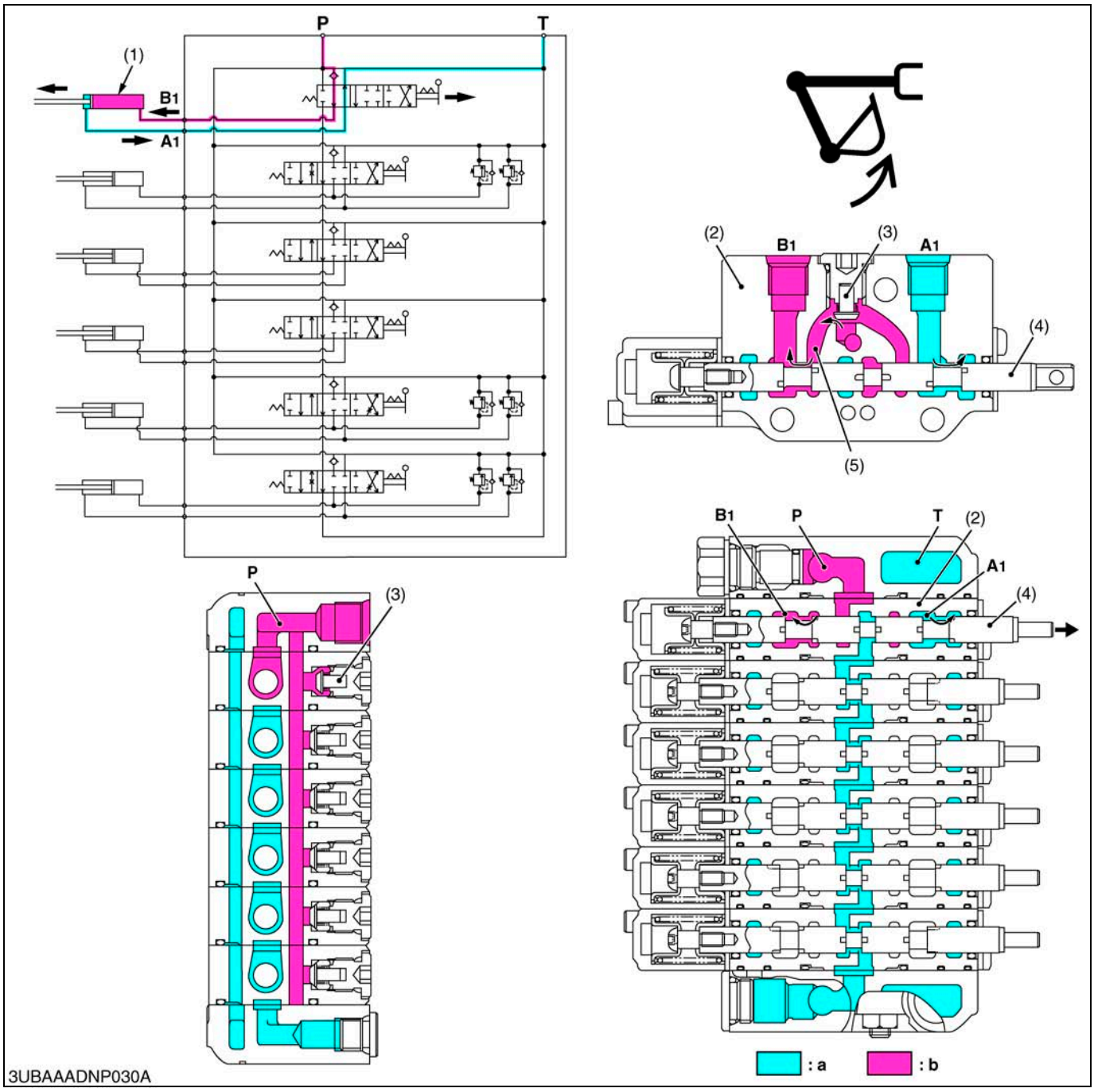
P : Pump Port
T : Tank Port
A1 : A1 Port
A2 : A2 Port
A3 : A3 Port
A4 : A4 Port
A5 : A5 Port
A6 : A6 Port
B1 : B1 Port
B2 : B2 Port
B3 : B3 Port
B4 : B4 Port
B5 : B5 Port
B6 : B6 Port
a : Low Pressure

Pressure-fed oil from the hydraulic pumps are delivered into **P** port in the inlet section (1).

As the load check valves (9) are kept closed in the neutral position, oil flows along the notched section of the spools (10) to the **T** port through the neutral passage (11).

Then the oil is fed to the transmission case via the return hose and pipe from the **T** port.

■ Bucket (Roll-back)

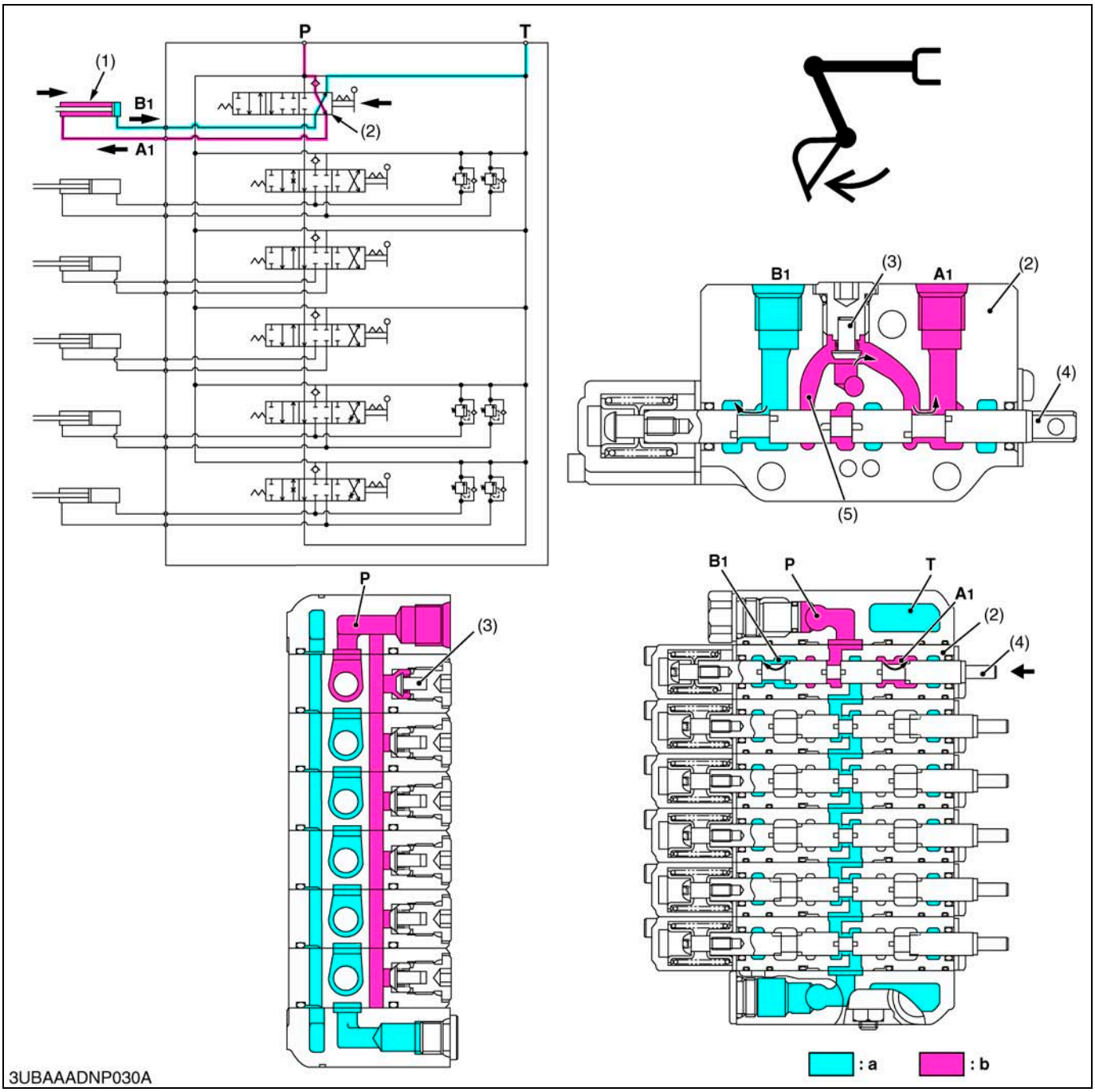


(1) Bucket Cylinder
(2) Bucket Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A1 : A1 Port (From Bucket Cylinder)
B1 : B1 Port (To Bucket Cylinder)

1. When the dipperstick and bucket lever is moved to the left to set to the **"ROLL-BACK"** position, the spool (4) of the bucket control valve (2) moves to the right, which forms oil passage between bridge passage (5) and **B1** port, and between **A1** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **B1** port to extend the bucket cylinder (1).
3. Return oil from the bucket cylinder (1) returns to the transmission case through the **A1** port, low pressure passage and **T** port.

■ Bucket (Dump)

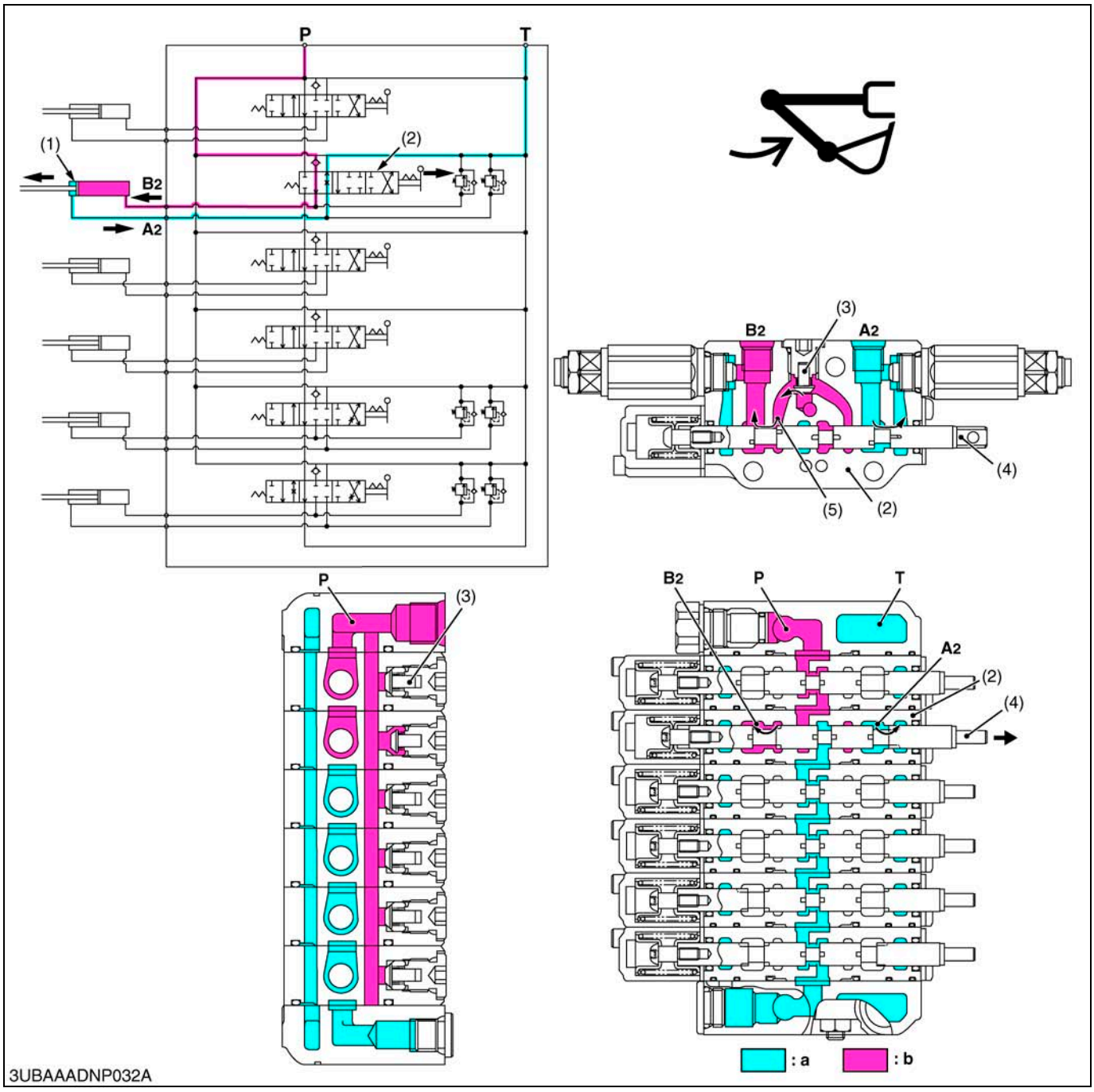


(1) Bucket Cylinder
(2) Bucket Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A1 : A1 Port (To Bucket Cylinder)
B1 : B1 Port (From Bucket Cylinder)

1. When the dipperstick and bucket lever is moved to the right to set to the **"DUMP"** position, the spool (4) of the bucket control valve (2) moves to the left, which forms oil passage between bridge passage (5) and **A1** port, and between **B1** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **A1** port to retract the bucket cylinder (1).
3. Return oil from the bucket cylinder (1) returns to the transmission case through the **B1** port, low pressure passage and **T** port.

■ Dipperstick (Crowd)



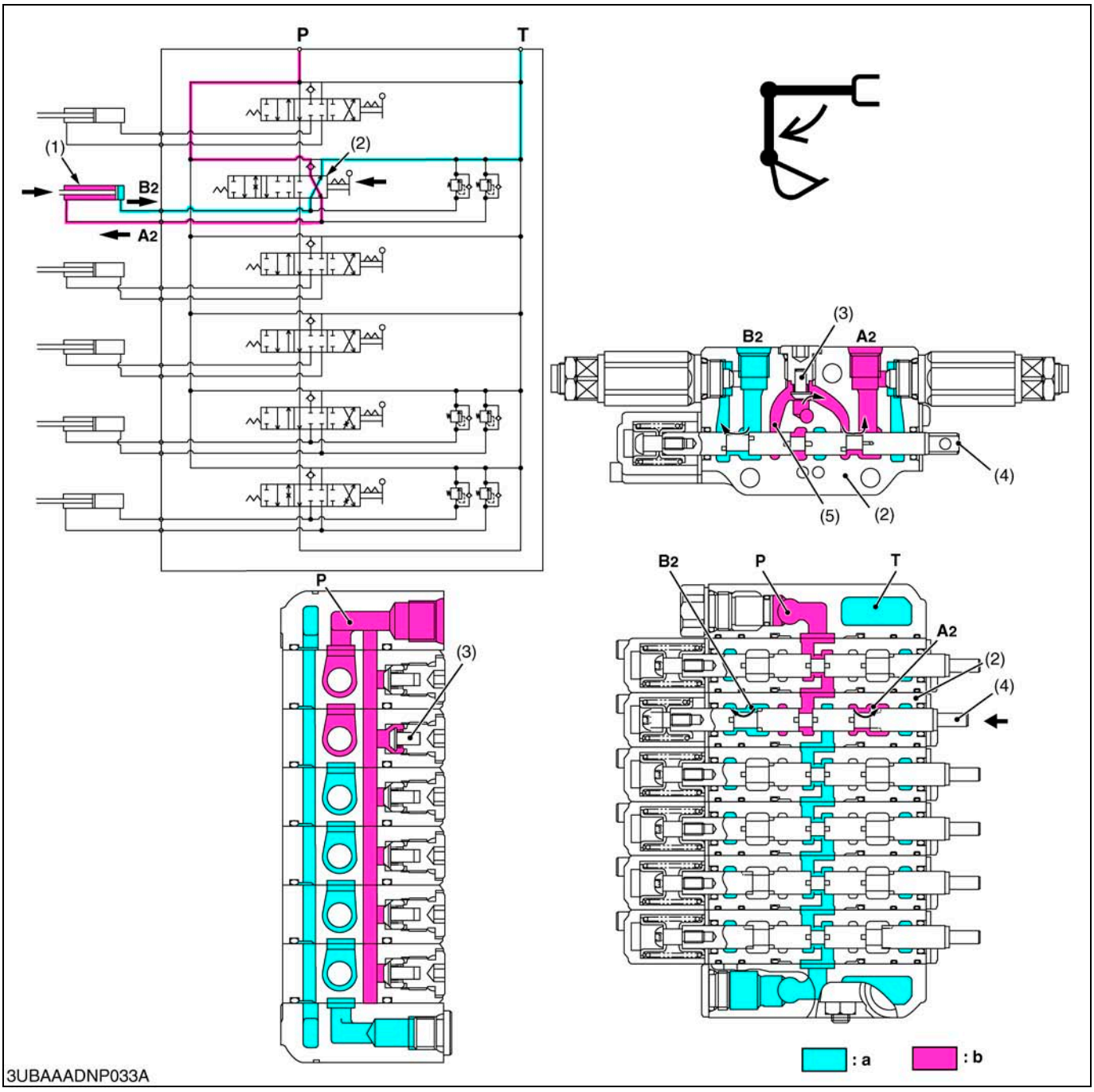
(1) Dipperstick Cylinder
(2) Dipperstick Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure

A2 : A2 Port (From Dipperstick Cylinder)
B2 : B2 Port (To Dipperstick Cylinder)

1. When the dipperstick and bucket lever is pulled to the backward to set to the **"CROWD"** position, the spool (4) of the dipperstick control valve (2) moves to the right, which forms oil passage between bridge passage (5) and **B2** port, and between **A2** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **B2** port to extend the dipperstick cylinder (1).
3. Return oil from the dipperstick cylinder (1) returns to the transmission case through the **A2** port, low pressure passage and **T** port.

■ Dipperstick (Extend)

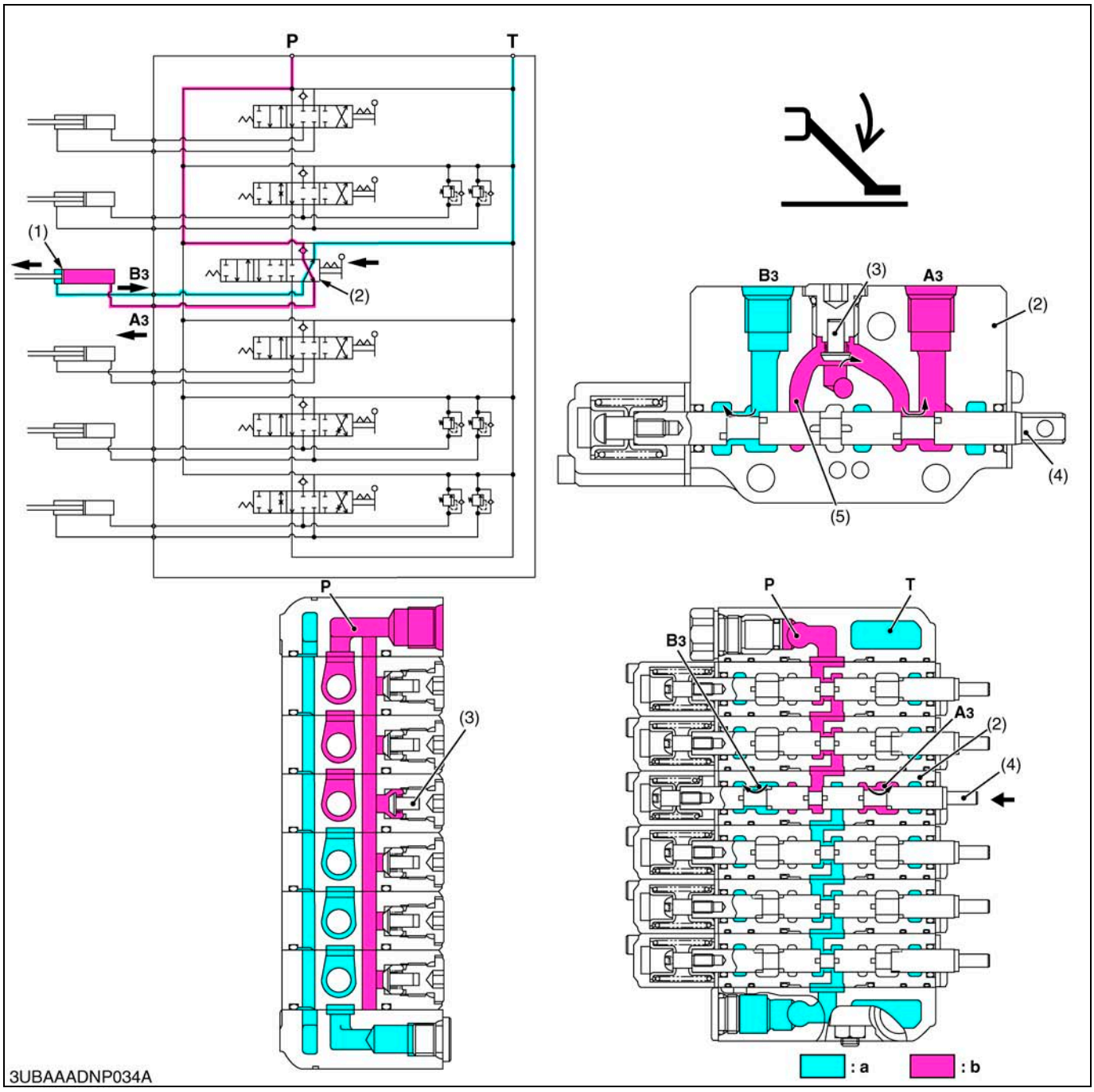


(1) Dipperstick Cylinder
(2) Dipperstick Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A2 : A2 Port (To Dipperstick Cylinder)
B2 : B2 Port (From Dipperstick Cylinder)

1. When the dipperstick and bucket lever is pushed to the forward to set to the **"EXTEND"** position, the spool (4) of the dipperstick control valve (2) moves to the left, which forms oil passage between bridge passage (5) and **A2** port, and between **B2** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **A2** port to retract the dipperstick cylinder (1).
3. Return oil from the dipperstick cylinder (1) returns to the transmission case through the **B2** port, low pressure passage and **T** port.

■ Stabilizer, R.H. (Extend)



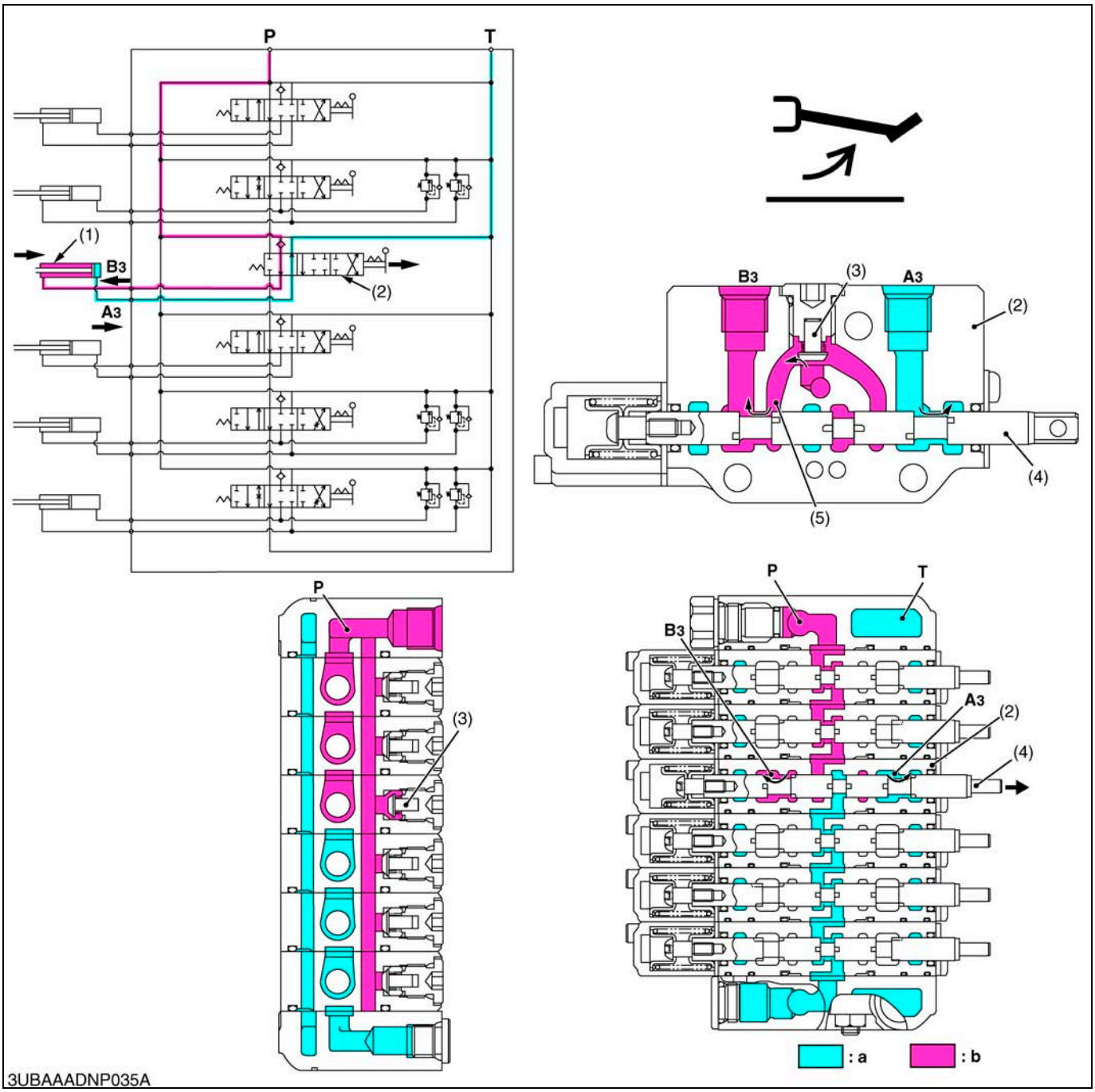
(1) Stabilizer Cylinder, R.H.
(2) Stabilizer Control Valve, R.H.
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure

A3 : A3 Port (To Stabilizer Cylinder, R.H.)
B3 : B3 Port (From Stabilizer Cylinder, R.H.)

1. When the right stabilizer control lever is pulled to the downward to set to the **"EXTEND"** position, the spool (4) of the stabilizer control valve, R.H. (2) moves to the left, which forms oil passage between bridge passage (5) and **A3** port, and between **B3** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3), and flows to **A3** port to extend the right stabilizer cylinder (1).
3. Return oil from the right stabilizer cylinder (1) returns to the transmission case through the **B3** port, low pressure passage and **T** port.

■ Stabilizer, R.H. (Shrink)



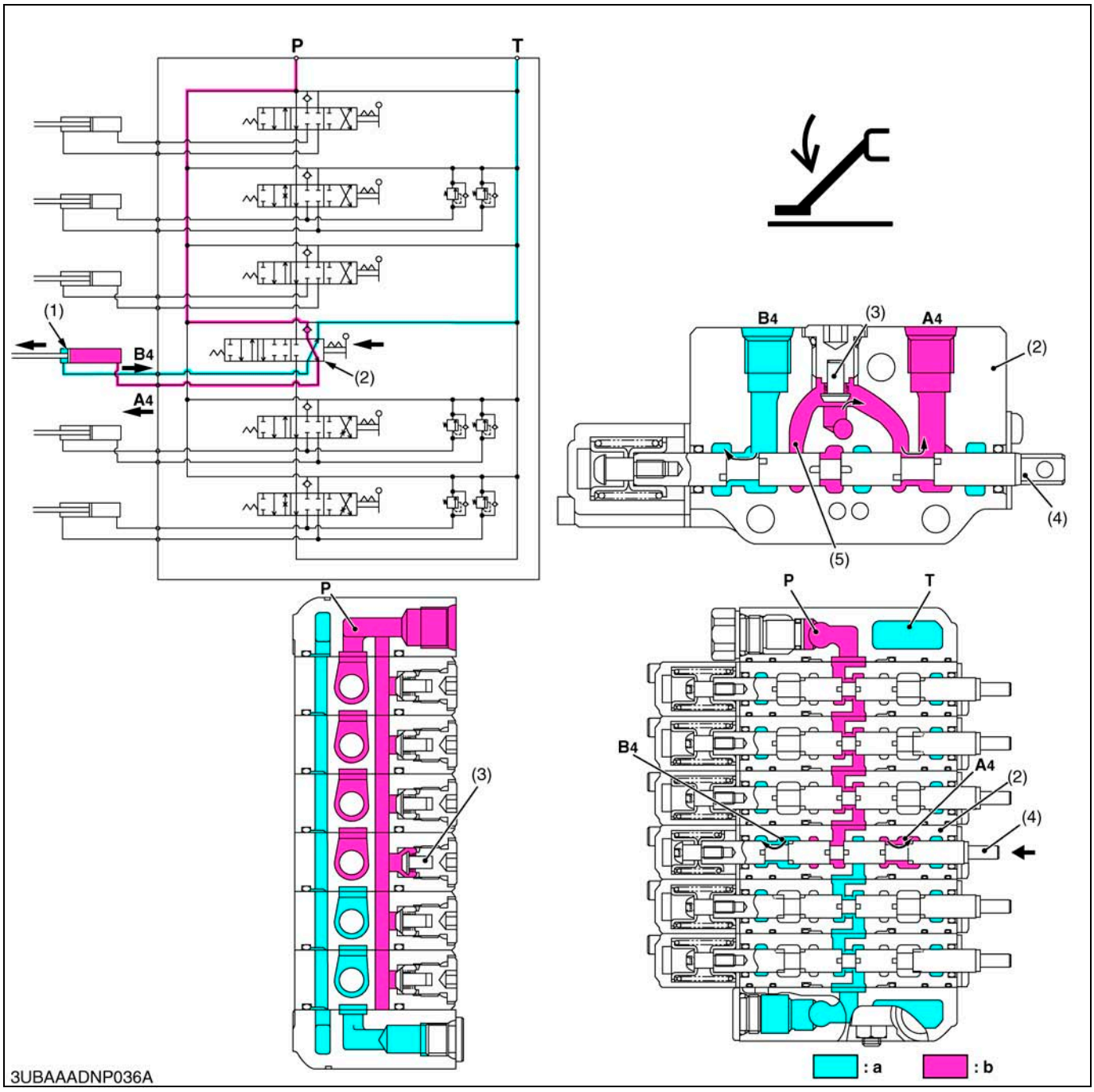
(1) Stabilizer Cylinder, R.H.
(2) Stabilizer Control Valve, R.H.
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure

A3 : A3 Port (From Stabilizer Cylinder, R.H.)
B3 : B3 Port (To Stabilizer Cylinder, R.H.)

1. When the right stabilizer control lever is pushed to the forward to set to the **"SHRINK"** position, the spool (4) of the stabilizer control valve, R.H. (2) moves to the right, which forms oil passage between bridge passage (5) and **B3** port, and between **A3** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3), and flows to **B3** port to retract the right stabilizer cylinder (1).
3. Return oil from the right stabilizer cylinder (1) returns to the transmission case through the **A3** port, low pressure passage and **T** port.

■ Stabilizer, L.H. (Extend)



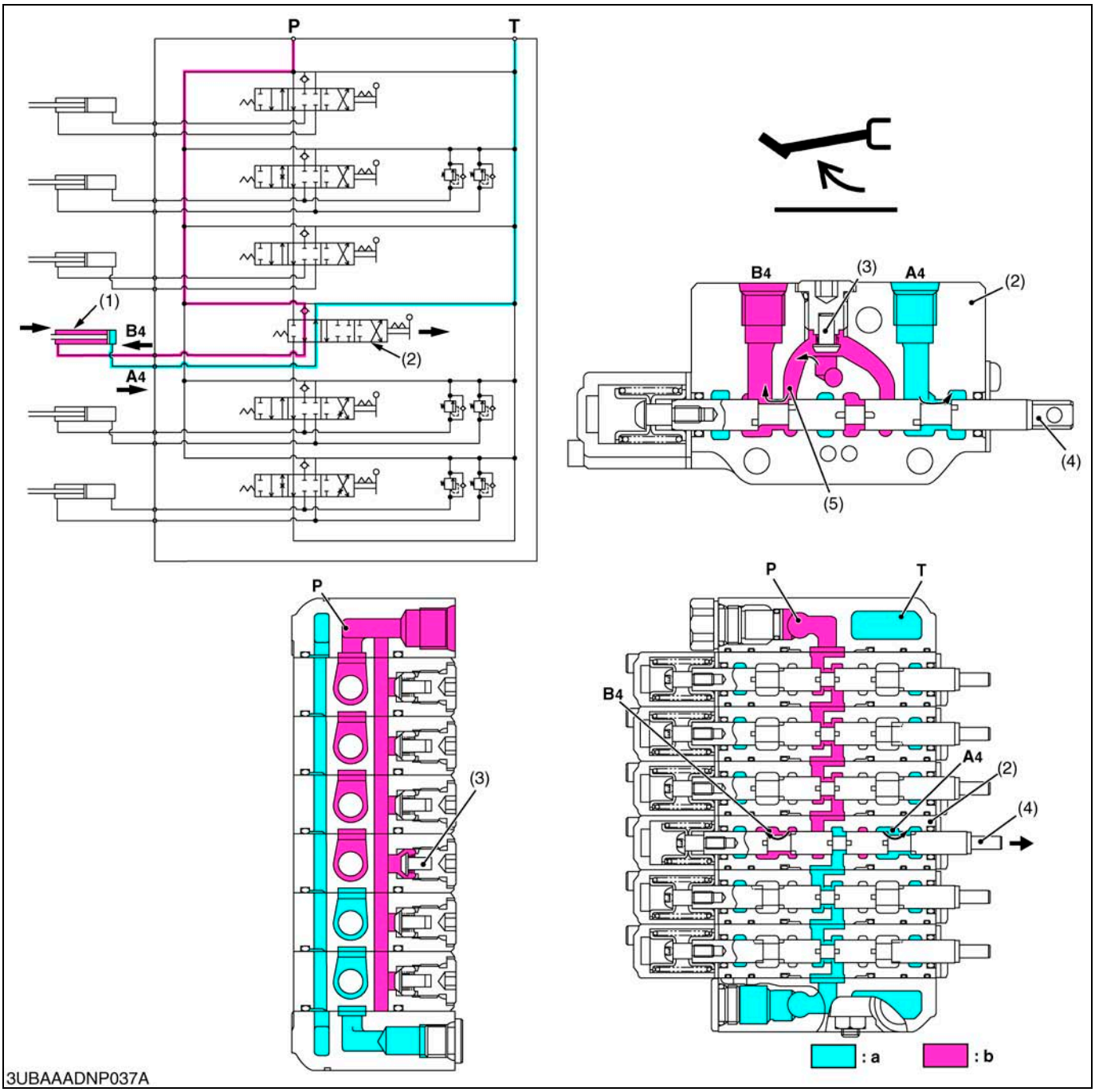
(1) Stabilizer Cylinder, L.H.
(2) Stabilizer Control Valve, L.H.
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure

A4 : A4 Port (To Stabilizer Cylinder, L.H.)
B4 : B4 Port (From Stabilizer Cylinder, L.H.)

1. When the left stabilizer control lever is pulled to the downward to set to the **"EXTEND"** position, the spool (4) of the stabilizer control valve, L.H. (2) moves to the left, which forms oil passage between bridge passage (5) and **A4** port, and between **B4** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3), and flows to **A4** port to extend the left stabilizer cylinder (1).
3. Return oil from the left stabilizer cylinder (1) returns to the transmission case through the **B4** port, low pressure passage and **T** port.

■ Stabilizer, L.H. (Shrink)



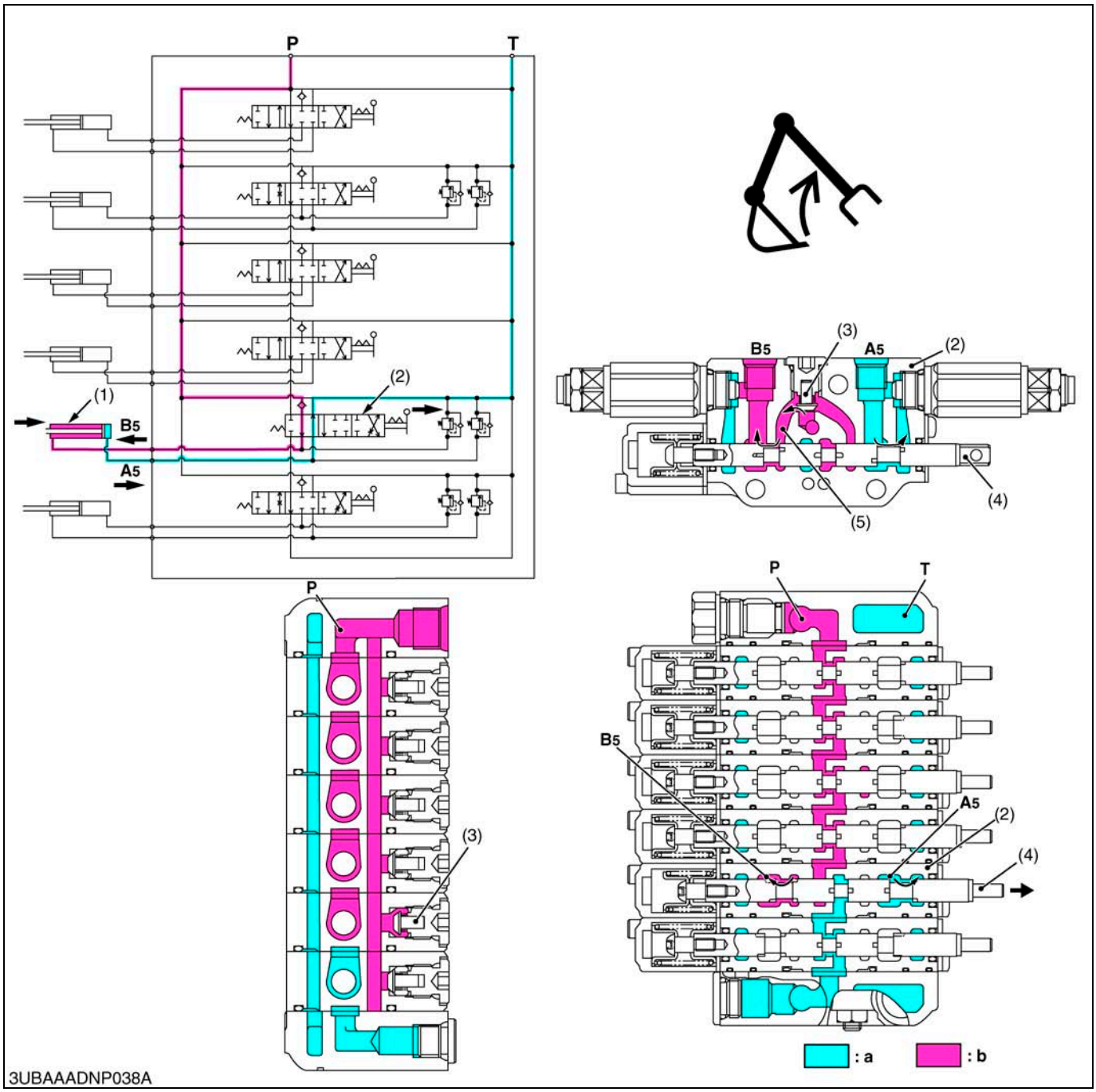
(1) Stabilizer Cylinder, L.H.
(2) Stabilizer Control Valve, L.H.
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure

A4 : A4 Port (From Stabilizer Cylinder, L.H.)
B4 : B4 Port (To Stabilizer Cylinder, L.H.)

1. When the left stabilizer control lever is pushed to the forward to set to the **"SHRINK"** position, the spool (4) of the stabilizer control valve, L.H. (2) moves to the right, which forms oil passage between bridge passage (5) and **B4** port, and between **A4** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (5), and flows to **B4** port to retract the left stabilizer cylinder (1).
3. Return oil from the left stabilizer cylinder (1) returns to the transmission case through the **A4** port, low pressure passage and **T** port.

■ Boom (Up)

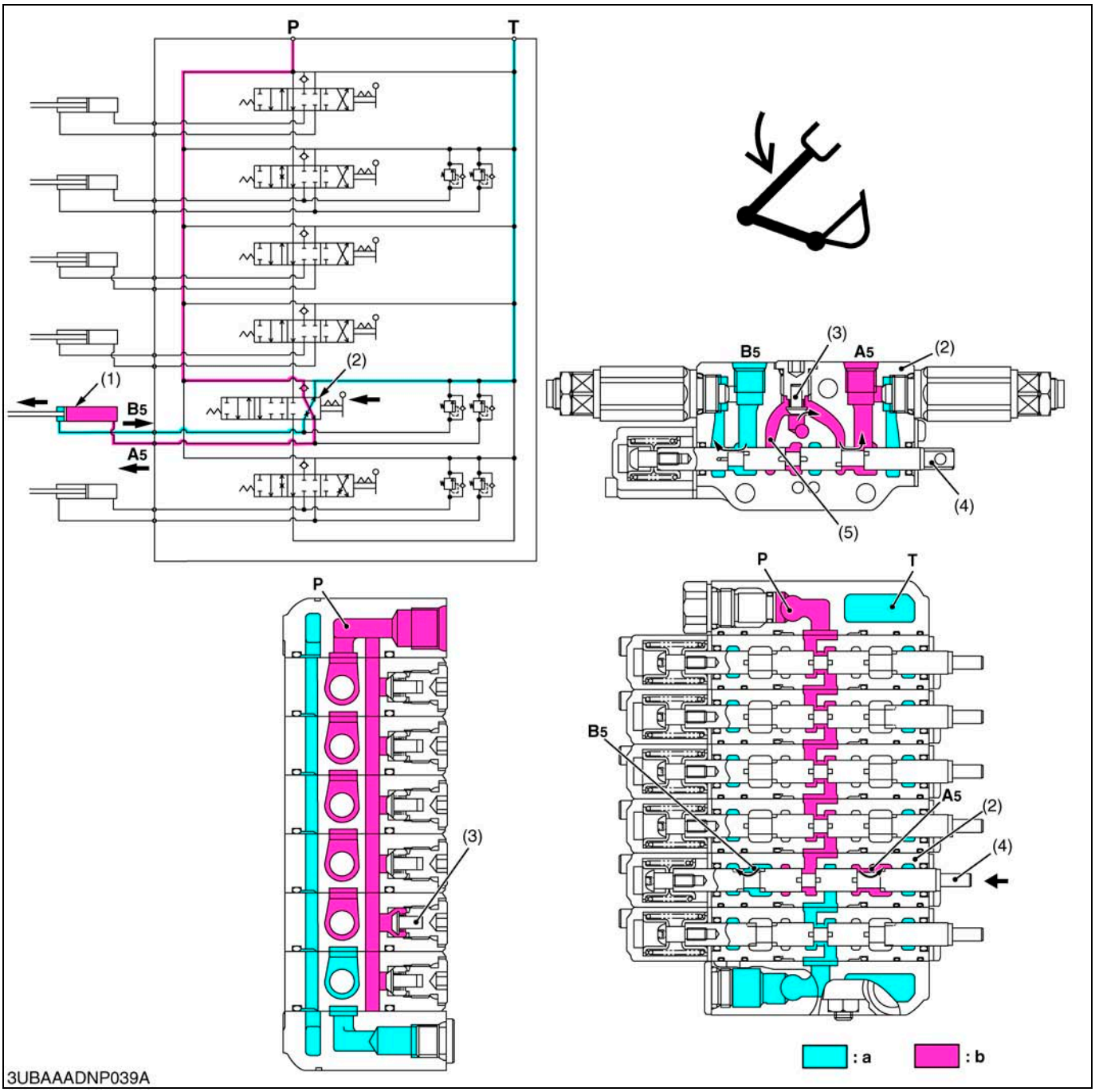


(1) Boom Cylinder
(2) Boom Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A5 : A5 Port (From Boom Cylinder)
B5 : B5 Port (To Boom Cylinder)

1. When the boom and swing lever is pulled to the backward to set to the **"UP"** position, the spool (4) of the boom control valve (2) moves to the right, which forms oil passage between bridge passage (5) and **B5** port, and between **A5** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **B5** port to retract the boom cylinder (1).
3. Return oil from the boom cylinder (1) returns to the transmission case through the **A5** port, low pressure passage and **T** port.

■ Boom (Down)

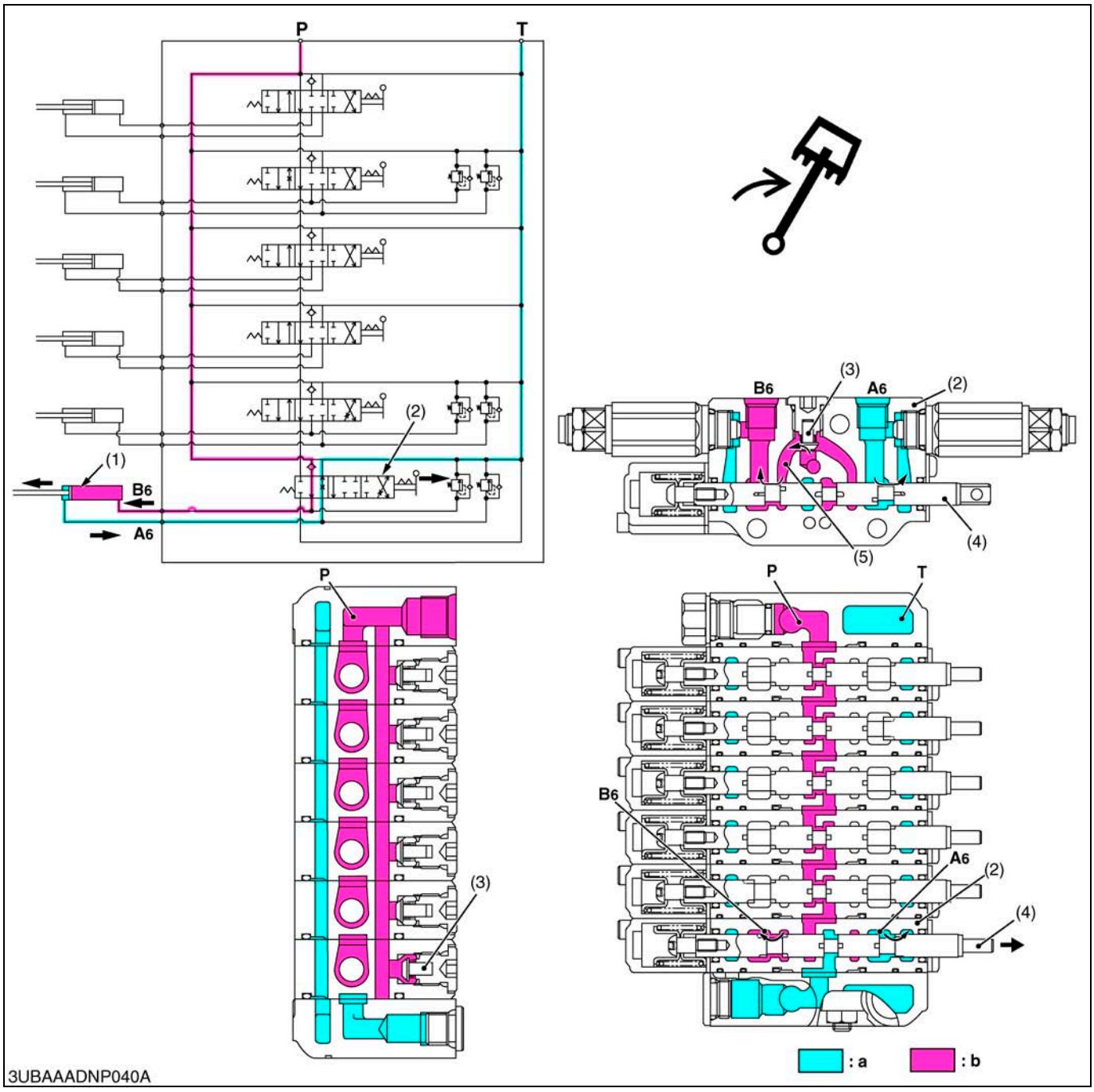


(1) Boom Cylinder
(2) Boom Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A5 : A5 Port (To Boom Cylinder)
B5 : B5 Port (From Boom Cylinder)

1. When the boom and swing lever is pushed to the forward to set to the **"DOWN"** position, the spool (4) of the boom control valve (2) moves to the left, which forms oil passage between bridge passage (5) and **A5** port, and between **B5** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **A5** port to extend the boom cylinder (1).
3. Return oil from the boom cylinder (1) returns to the transmission case through the **B5** port, low pressure passage and **T** port.

■ Boom Swing (Right)

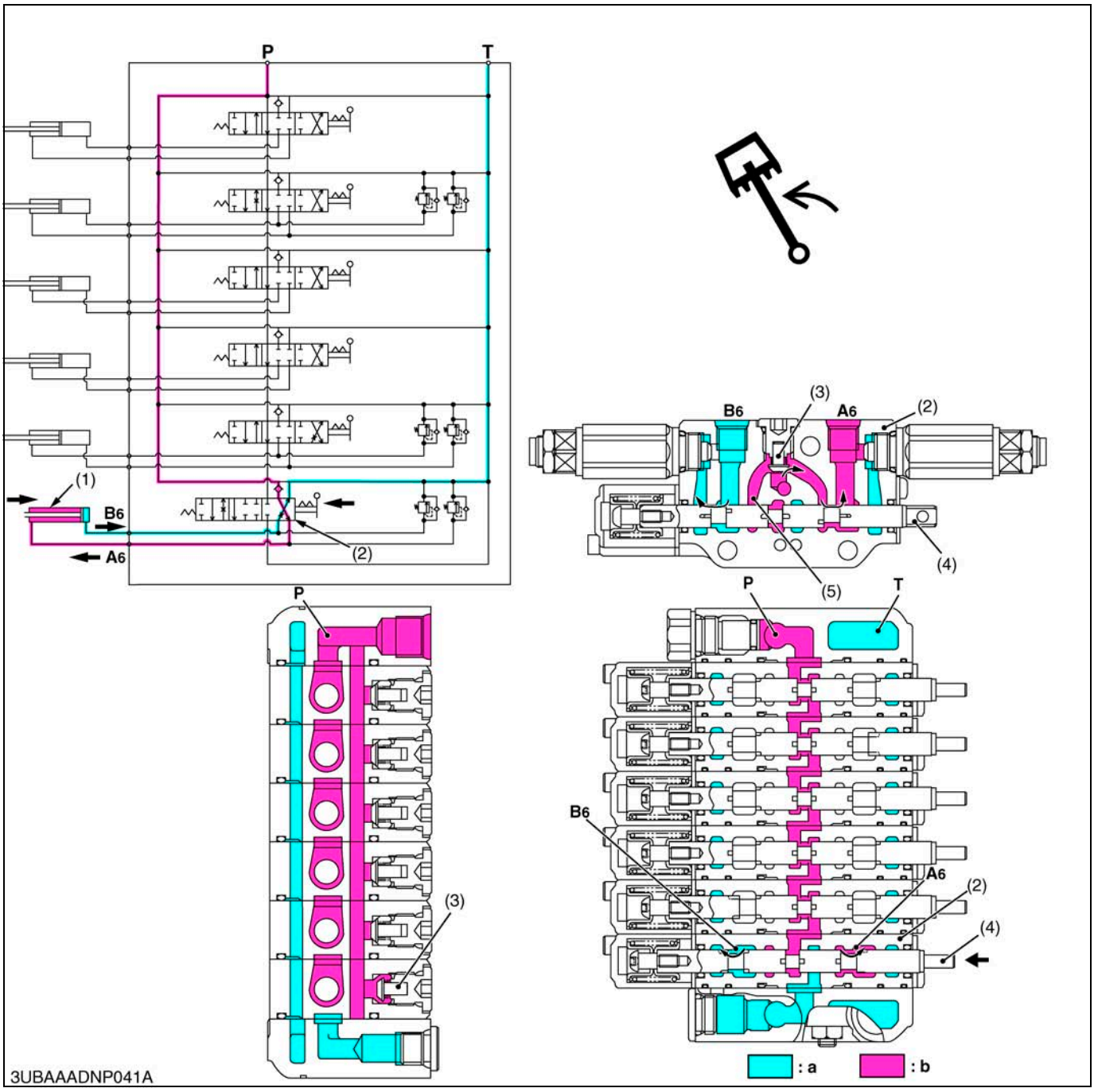


(1) Swing Cylinder
(2) Swing Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A6 : A6 Port (From Swing Cylinder)
B6 : B6 Port (To Swing Cylinder)

1. When the boom and swing lever is moved to the right to set to the **"RIGHT"** position, the spool (4) of the swing control valve (2) moves to the right, which forms oil passage between bridge passage (5) and **B6** port, and between **A6** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **B6** port to extend the swing cylinder (1).
3. Return oil from the swing cylinders (1) return to the transmission case through the **A6** port, low pressure passage and **T** port.

■ Boom Swing (Left)

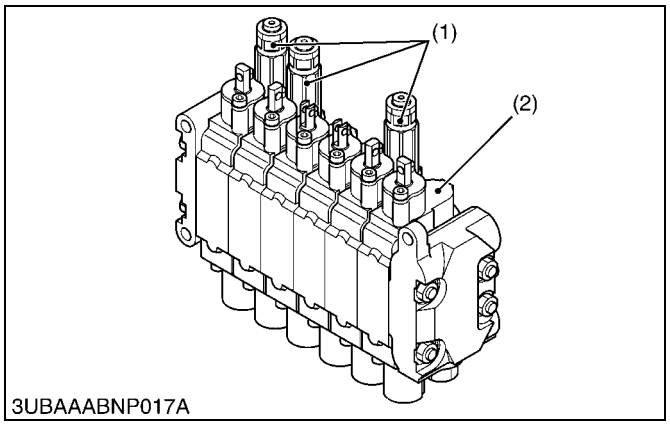


(1) Swing Cylinder
(2) Swing Control Valve
(3) Load Check Valve
(4) Spool
(5) Bridge Passage

P : P Port
T : T Port
a : Low Pressure
b : High Pressure
A6 : A6 Port (To Swing Cylinder)
B6 : B6 Port (From Swing Cylinder)

1. When the boom and swing lever is moved to the left to set to the **"LEFT"** position, the spool (4) of the swing control valve (2) moves to the left, which forms oil passage between bridge (5) and **A6** port, and between **B6** port and **T** port.
2. The pressure-fed oil from the **P** port opens the load check valve (3) and flows to **A6** port to retract the swing cylinder (1).
3. Return oil from the swing cylinders (1) return to the transmission case through the **B6** port, low pressure passage and **T** port.

(3) Overload Relief Valve



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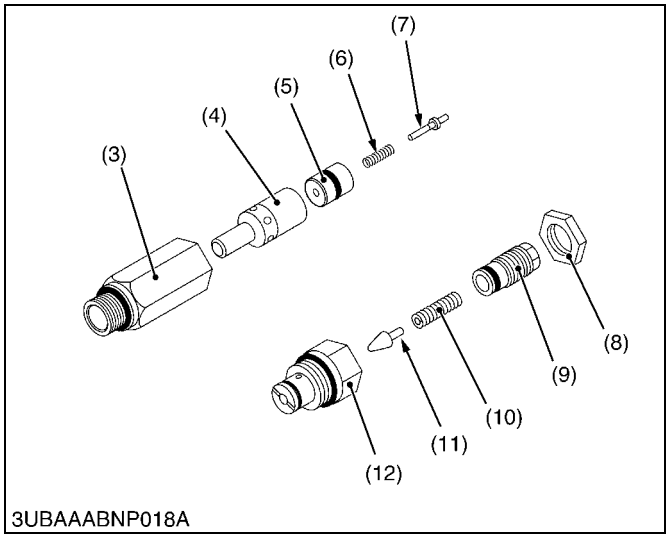

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Overload relief valve in this control valve is a combination valve combining a relief operation and anti-cavitation operation.

■ **Relief Operation**

When the control valve is in the neutral position, both cylinder ports of control valve are blocked by the spool. If an external load is imposed on the cylinder, pressure builds in the circuit.

When the pressure exceeds the set level of the overload relief vale, the relief valve opens and the oil returns to tank. In this way, the hydraulic circuit and actuator are protected from excessive pressures.

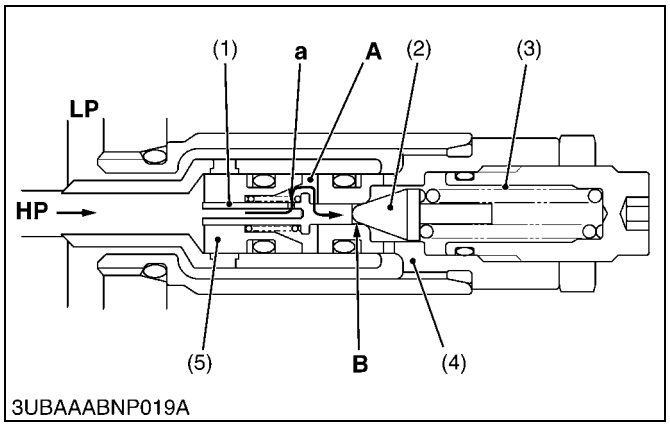
■ **Anti-cavitation Operation**

Overload relief valve also has anti-void function. If a negative pressure takes place in the circuit, the oil is fed from the tank to eliminate the negative pressure.

(1) Overload Relief Valve
(2) Control Valve
(3) Housing
(4) Check Valve Poppet
(5) Relief Valve Poppet
(6) Piston Spring
(7) Piston Poppet
(8) Lock Nut
(9) Adjusting Screw
(10) Pilot Spring
(11) Pilot Poppet
(12) Pilot Section

W1023498

■ **Relief Operation**



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[When the actuator port pressure is lower than the setting]

The cylinder port **HP** is applied to the seat **B** in the following route : first through the throttle **a** of the piston poppet (1) built in the relief valve poppet (5), second through the spring chamber **A**, and then through the circular clearance between the adjusting screw (9) and the piston poppet (1). This cylinder port **HP** works to open the pilot poppet (2). Because the piston spring (3) has not reached the set pressure, however, the valve stays shut. In this way the seat remains intact and the relief valve poppet (5) stays shut.

(1) Piston Poppet
(2) Pilot Poppet
(3) Piston Spring
(4) Adjusting Screw
(5) Relief Valve Poppet

HP :High Pressure
LP :Low Pressure
A : Chamber
B : Seat
a : Throttle

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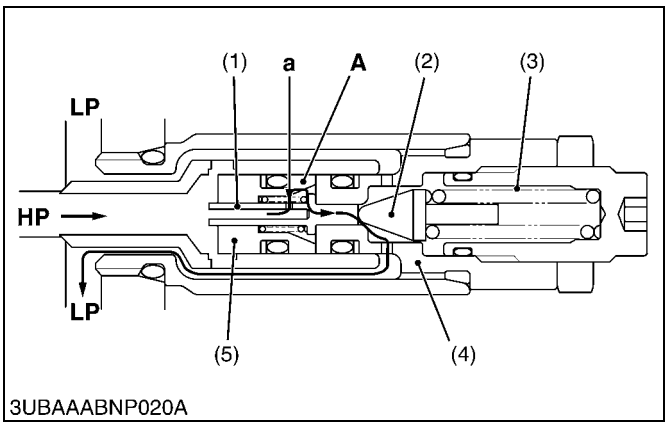

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[When the actuator port pressure is higher than the setting]

When the cylinder port **HP** has reached the set pressure of the piston spring (5), the pressure oil in the spring chamber **A** opens the pilot poppet (4) and flows through the drain passage into the tank passage. This lowers the pressure in the spring chamber **A**, and the pressure difference across the throttle **a** moves the relief valve poppet (1) to the right. Now the seat of the relief valve poppet (1) gets open. The pressure oil flows then from this seat into the tank, and the circuit pressure is kept at the pressure level set by the overload relief valve.

	Relief valve setting pressure
Dipperstick, Boom	15.70 to 16.19 MPa 160.1 to 165.0 kgf/cm^2 2277 to 2348 psi
Swing	13.70 to 14.19 MPa 139.7 to 144.6 kgf/cm^2 1987 to 2058 psi

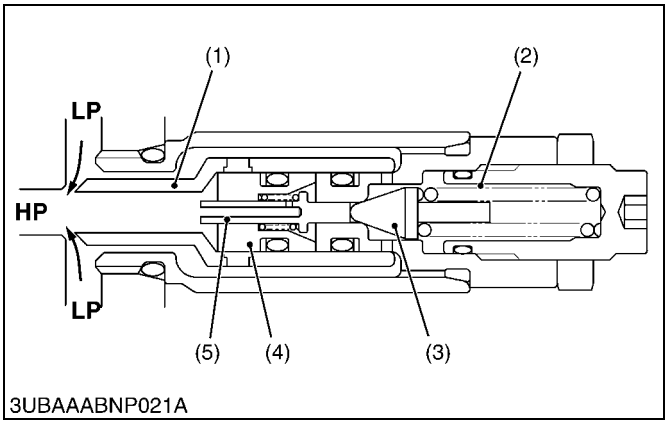
- Oil temperature : 45 to 55 °C
  113 to 131 °F

(1) Piston Poppet
(2) Pilot Poppet
(3) Piston Spring
(4) Adjusting Screw
(5) Relief Valve Poppet

HP :High Pressure
LP :Low Pressure
A : Chamber
a : Throttle

W1024163

■ Anti-cavitation Operation



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This valve, in operation, prevents a condition – so called cavitation – that arises in the cylinder port **HP** where fluid is not entirely filling out.

That is, this relief valve is combined an anti-cavitation functions supplying oil.

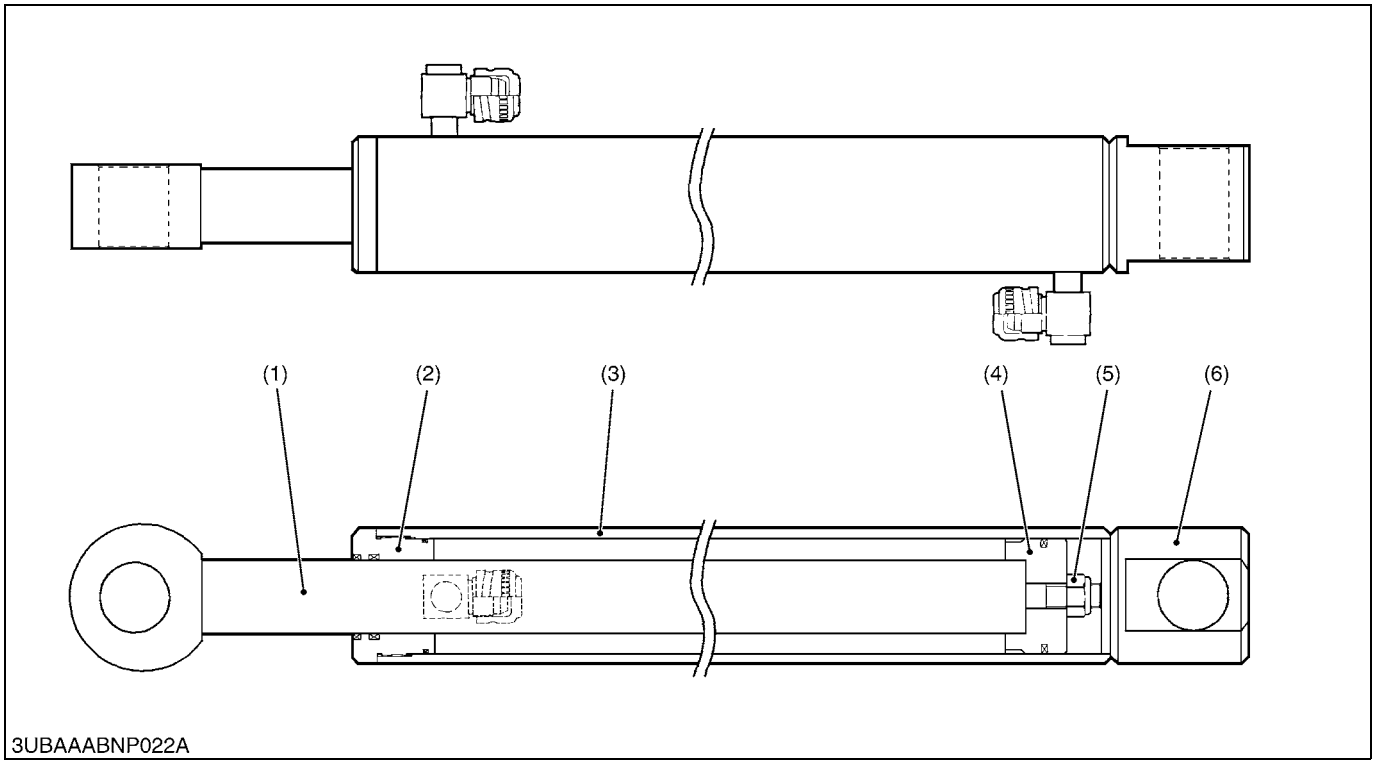
The pressure oil at the tank port **LP** opens the check valve poppet, allowing oil to flow through the tank port to prevent negative pressure from being generated in the cylinder.

(1) Check Valve Poppet
(2) Piston Spring
(3) Pilot Poppet
(4) Relief Valve Poppet
(5) Piston Poppet

HP :High Pressure
LP :Low Pressure

W1024467

[3] HYDRAULIC CYLINDER



(1) Rod
(2) Head
(3) Cylinder Tube
(4) Piston
(5) Nut
(6) Tube End

Bucket, dipperstick, boom, swing, and stabilizer cylinder consists of cylinder head (2), piston rod (1), cylinder tube (3), piston (4) and other parts as shown in the figure above.

They are single-rod double acting cylinders in which the reciprocating motion of the piston is controlled by hydraulic force applied to both of its ends.

Cylinder Specifications

	Boom Cylinder mm (in.)	Dipperstick Cylinder mm (in.)	Bucket Cylinder mm (in.)	Stabilizer Cylinder mm (in.)	Swing Cylinder mm (in.)
Rod O.D.	30 (1.18)	30 (1.18)	30 (1.18)	25 (0.98)	30 (1.18)
Cylinder I.D.	60 (2.36)	60 (2.36)	50 (1.97)	60 (2.36)	60 (2.36)
Stroke	452.5 to 455.5 (17.82 to 17.93)	476.5 to 479.5 (18.76 to 18.87)	436.5 to 439.5 (17.19 to 17.30)	293.5 to 296.5 (11.56 to 11.67)	178 to 180 (7.01 to 7.08)

W1025274

SERVICING

CONTENTS

1. TROUBLESHOOTING S-1
2. SERVICING SPECIFICATIONS S-2
3. DISMOUNTING AND MOUNTING S-4
   [1] DISMOUNTING THE BACKHOE S-4
   [2] MOUNTING THE BACKHOE TO TRACTOR S-6
4. CHECKING, DISASSEMBLING AND SERVICING S-8
   [1] CHECK AND ADJUSTING S-8
      (1) Control Valve S-8
   [2] DISASSEMBLING THE BACKHOE S-9
      (1) Backhoe S-9
      (2) Control Valve S-14
      (3) Boom, Dipperstick, Bucket, Swing and Stabilizer Cylinder S-15
      (4) Sub Frame S-16
   [3] SERVICING S-18
      (1) Bush, Pin and Cylinder S-18

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Functions Inoperative (Front Loader Is OK)	Quick coupler disconnected	Reconnect	–
All Functions Including Front Loader, Are Inoperative	Insufficient transmission fluid	Replenish	G-7
	Relief valve spring damaged	Replace	S-8
	Hydraulic pump malfunctioning	Repair or replace	–
	Oil filter clogged	Replace	–
Hydraulic Oil Overheats	Continuous operation against relief	Operate properly	–
	Transmission fluid improper brand and viscosity	Use proper fluid	G-3
	Relief valve mis-adjusted	Readjust	S-8
	Insufficient transmission fluid	Replenish	G-7
	Oil filter clogged	Replace	–
Individual Cylinder Circuit Weak or Inoperative (Others OK)	Valve spool not moving fully	Adjust linkage	–
	Valve spool stick (especially when warm)	Repair or replace	–
	Overload relief valve mis-adjusted	Readjust	–
	Piston seal ring worn or damaged	Replace	S-18
	Cylinder tube worn or damaged	Replace	S-15
	Oil leaks from joint	Repair or replace	–
	Hydraulic hose damaged	Replace	–
	Dust in overload relief valve	Flush hydraulic line	–
Excessive Cylinder Movement	Piston seal ring worn or damage	Replace	S-18
	Excessive valve spool to bore tolerance	Replace	–
	Hydraulic hose or fitting damaged	Replace	–
	Hydraulic hose or fitting loose	Retighten	–
	Cylinder tube worn or damaged	Replace	S-15
Insufficient Cylinder Speed	Engine rpm too low	Adjust rpm	–
	Hydraulic pump malfunctioning	Repair or replace	–
	Relief valve pressure too low	Readjust	S-8
	Insufficient transmission fluid	Replenish	G-7

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure Condition : Engine Speed ; Approx.2800 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	13.7 to 14.4 MPa 140 to 146 kgf/cm^2 1990 to 2080 psi	–
Dipperstick Fulcrum Pin and Bushing	Clearance	0.15 to 0.19 mm 0.0059 to 0.0074 in.	1.0 mm 0.039 in.
	O.D.	29.820 to 29.850 mm 1.1740 to 1.1752 in.	–
	I.D.	30.000 to 30.010 mm 1.1811 to 1.1814 in.	–
Dipperstick Cylinder Rod Pin and Bushing	Clearance	0.18 to 0.32 mm 0.071 to 0.12 in.	1.0 mm 0.039 in.
	O.D.	24.90 to 24.93 mm 0.9804 to 0.9814 in.	–
	I.D.	25.108 to 25.209 mm 0.98851 to 0.99248 in.	–
Bucket Cylinder Rod Pin, Guide Link Pin Bucket Link Pin and Bushing	Clearance	0.15 to 0.18 mm 0.0059 to 0.0070 in.	1.0 mm 0.039 in.
	O.D.	24.82 to 24.84 mm 0.9770 to 0.9782 in.	–
	I.D.	24.990 to 25.000 mm 0.98386 to 0.98425 in.	–
Bucket Fulcrum Pin and Bushing	Clearance	0.15 to 0.18 mm 0.0059 to 0.0070 in.	1.5 mm 0.059 in.
	O.D.	24.82 to 24.84 mm 0.9770 to 0.9782 in.	–
	I.D.	24.990 to 25.000 mm 0.98386 to 0.98425 in.	–
Boom Cylinder Bottom Pin and Bushing	Clearance	0.289 to 0.431 mm 0.0114 to 0.0169 in.	1.0 mm 0.039 in.
	O.D.	29.820 to 29.850 mm 1.1740 to 1.1752 in.	–
	I.D.	30.139 to 30.251 mm 1.1866 to 1.1909 in.	–

W1013874

Item		Factory Specification	Allowable Limit
Boom Cylinder Rod Pin and Bushing	Clearance	0.139 to 0.281 mm 0.00548 to 0.0110 in.	1.0 mm 0.039 in.
	O.D.	29.97 to 30.00 mm 1.180 to 1.181 in.	–
	I.D.	30.139 to 30.251 mm 1.1866 to 1.1909 in.	–
Boom Fulcrum Pin and Bushing	Clearance	0.15 to 0.19 mm 0.0059 to 0.0074 in.	1.0 mm 0.039 in.
	O.D.	29.820 to 29.850 mm 1.1740 to 1.1752 in.	–
	I.D.	30.000 to 30.010 mm 1.1811 to 1.1814 in.	–
Main Frame Fulcrum Pin and Bushing	Clearance	0.070 to 0.13 mm 0.0028 to 0.005 in.	0.5 mm 0.02 in.
	O.D.	34.970 to 35.000 mm 1.3768 to 1.3779 in.	–
	I.D.	35.070 to 35.100 mm 1.3807 to 1.3818 in.	–
Thrust Washer	Thickness	2.66 mm 0.105 in.	1.8 mm 0.071 in.
Piston Rod	Bend	–	0.25 mm 0.0098 in.

W1013089

3. DISMOUNTING AND MOUNTING

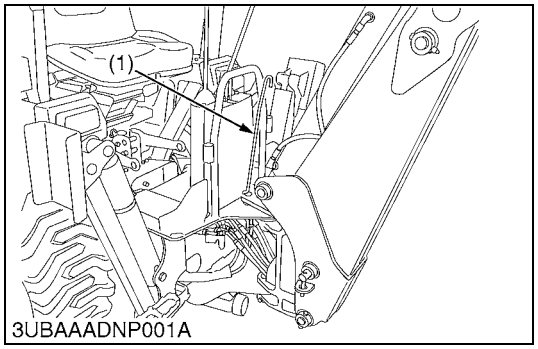
[1] DISMOUNTING THE BACKHOE

CAUTION

- **When starting the engine, always sit in the operator's seat.**
- **When getting off the tractor, make sure that PTO lever is off and range gear shift lever is in neutral. Then set the parking brake.**
- **Keep hands, feet and body from between tractor and backhoe. Never allow any part of body under the machine.**
- **When leaving the operator's seat, fully lower the boom to the ground.**
- **When removing the backhoe set the swing lock pin.**

■ **IMPORTANT**

- **When removing the backhoe, set the engine speed slightly above low idle.**
- **For removing the backhoe, locate the tractor / loader / backhoe on a flat and hard surface, preferably concrete. If the ground surface is soft, place a board on the ground for the bucket and stabilizers.**



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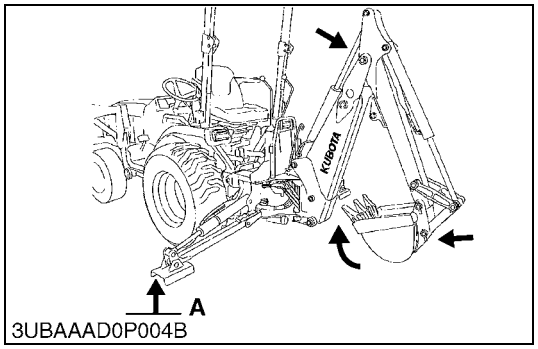

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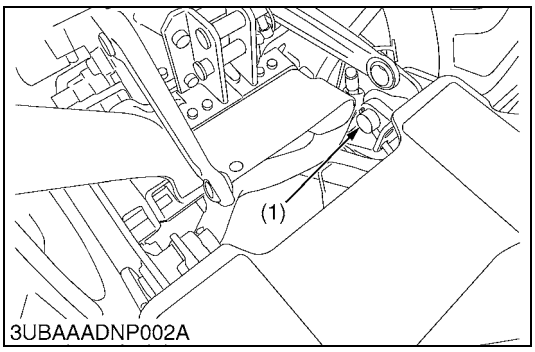
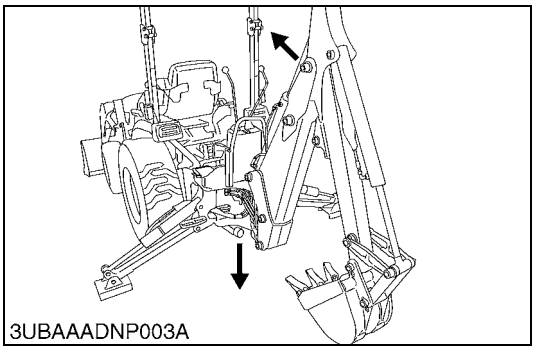
Preparation

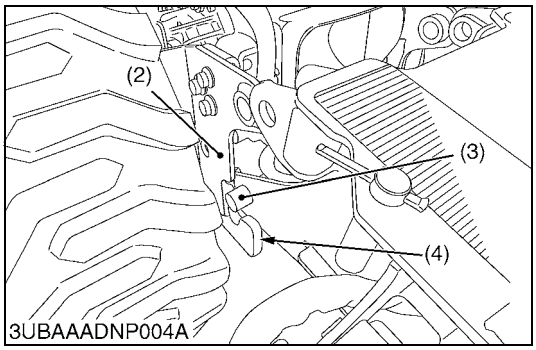
1. Start the engine and lower the front loader to the ground.
2. Set the swing lock pin to prevent the pivoting of the boom before removing the backhoe.
3. Stand beside the rear tire, fully close the dipperstick, curl the bucket and lower the boom until the back of bucket contacts the ground.
4. Keep the stabilizer pads at about 380 mm (15 in.) high.

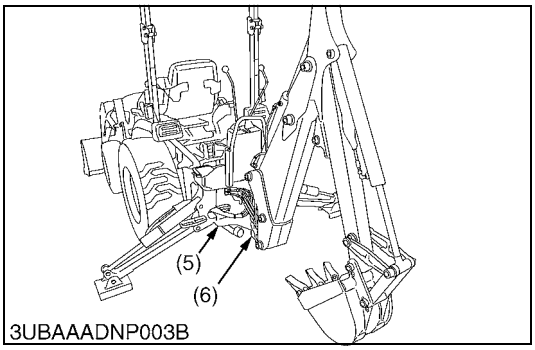
(1) Swing Lock Pin **A : 380 mm (15 in.)**

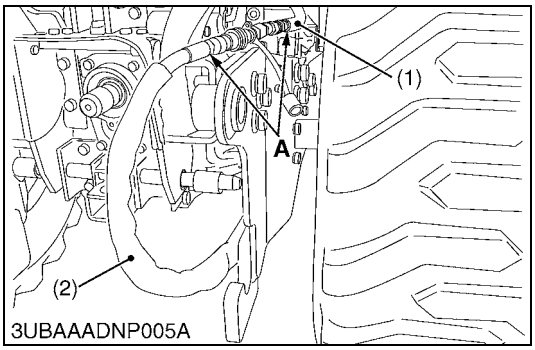
W1014290











Mounting Pin

1. Raise the rear wheels slightly with the boom and remove the mounting pins (1).
2. Put the mounting pins (1) in the holes on the step of the backhoe.
3. Slowly raise the boom to disengage the backhoe from the tractor.
4. Raise the backhoe by operating the stabilizers to the lowering direction until the mount bars (3) hit to the guide stopper (2) on the support hooks (4).
5. Move the tractor forward from the backhoe about 200 mm (8 in.).

■ **IMPORTANT**

- **Be careful not to damage or break the hoses when moving the tractor.**

6. Lower the main frame (5) and swing frame (6) onto the ground by operating the boom and stabilizer control levers.
7. Shut off the engine and set the parking brake.

(1) Mounting Pin
(2) Guide Stopper
(3) Mount Bar
(4) Support Hook
(5) Main Frame
(6) Swing Frame

W1013187

Hydraulic Hoses

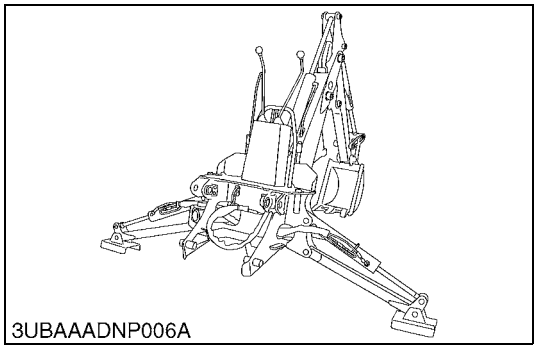
1. Slowly release all hydraulic pressure by moving the backhoe hydraulic control levers in all directions.
2. Disconnect the hydraulic hoses in the following manner.
3. Disconnect the return hose from the tractor.
4. Connect the tractor's outlet hose (2) to the coupler of inlet tube (1).

■ **IMPORTANT**

- **Install the dust plugs and the dust cap onto the tractor's hydraulic couplers and nipple to prevent contamination.**

(1) Inlet Tube (Tractor)
(2) Outlet Hose (Tractor)
(A) To be connected

W1013581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Separation

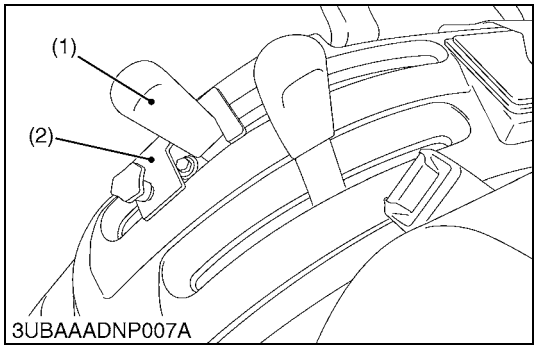
1. Start the engine.
   Then drive the tractor / loader slowly from the backhoe.
2. Shut off the engine and remove the key from the tractor. Set the parking brake.

■ **NOTE**
- **The entire three point hitch can now be reinstalled on the tractor for use with other rear mount implements.**
- **Be sure that there is sufficient ballast in the rear tires and an implement is attached to the three point hitch before using the loader with backhoe removed.**

W1013720

[2] MOUNTING THE BACKHOE TO TRACTOR

CAUTION
- **When starting the engine, always sit in the proper operator's seat of the tractor.**
- **Keep hands, feet and body from between the tractor and the backhoe. Never allow any part of body under the machine**
- **When getting off the tractor, make sure that range gear shift lever and PTO lever is in neutral, them set the parking brake.**



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Preparation

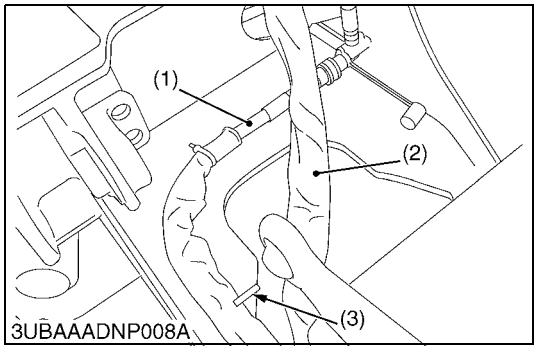
CAUTION
- **Make sure the tractor PTO is disengaged.**

■ **IMPORTANT**
- **When installing the backhoe, set the engine speed to low idle.**

1. Remove the three-point hitch and / or drawbar. (If equipped.)
2. Fix the hydraulic control lever (1) to the "DOWN" position by the lever stopper (2).
3. Make sure the swing lock pin is installed.
4. Slowly back the tractor / loader, centering to the backhoe main frame.
   Stop the tractor 250 to 300 mm (10 to 12 in.) away from the backhoe.
5. Shut the engine off and set the parking brake.

(1) Hydraulic Control Lever (2) Lever Stopper

W1015093



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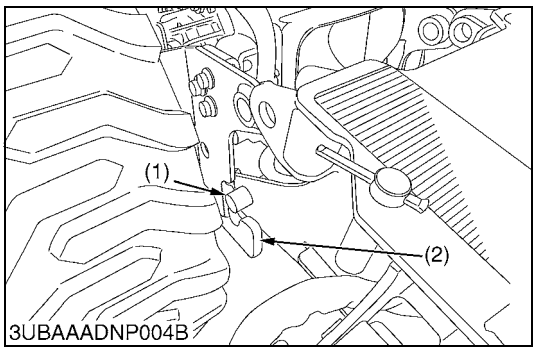
Hydraulic Hoses

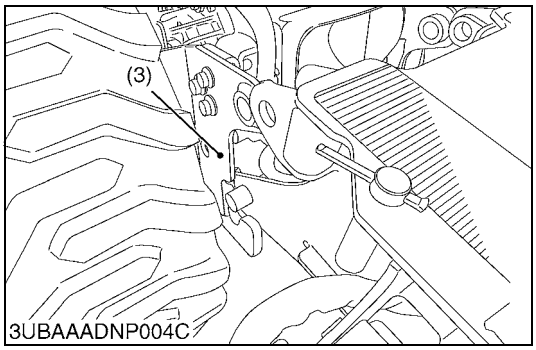
1. Connect the outlet hose (1) with the backhoe and then connect the return hose (2) of the backhoe with the coupler joint of the tractor.

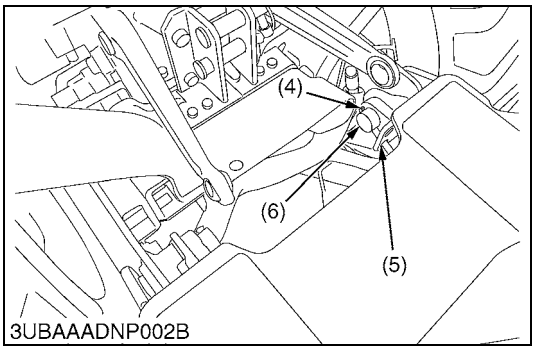
■ **IMPORTANT**
- **Pass the outlet hose through the hose guide.**
- **Make sure base hoses are firmly connected before starting the engine.**

(1) Outlet Hose (3) Hose Guide
(2) Return Hose

W1018806







Mounting Pin and Mounting Backhoe

■ **IMPORTANT**

- **Make sure both hoses are firmly connected before starting the engine.**

WARNING

- **Do not move the joystick control lever to the swing position.**

1. Start the engine.
2. Stand beside the rear wheel. Move the boom to fully raising position and raise the backhoe by operating the stabilizers until the mount bar on the backhoe main frame are slightly higher than the tractor main frame support hooks.

■ **NOTE**

- **If the support hooks are not parallel to the mount bars, adjust with the stabilizers.**

3. Move the tractor backward until the support hooks (2) on the tractor main frame are just beneath the mount bar (1) on the backhoe main frame.
4. Lower the mount bar (1) onto the support hooks (2) by operating the stabilizer and boom control levers.
5. Move the boom slowly to the lowering position, and engage the guide plates of the main frame to the bosses of sub frame. Then raise the rear wheels slightly by operating the boom to the lowering direction.
6. Shut off the engine. Reinstall the mounting pins (6), and insert the slide bar (4) of the mounting pins (6) to the lower hole (5) of the main frame.

■ **IMPORTANT**

- **Be careful not to catch the hydraulic hoses between backhoe frame and tractor while mounting the backhoe.**

■ **NOTE**

- **Move the tractor / loader / backhoe to an open area and cycle all backhoe functions. This will check their operation and flow oil back through the system, filtering it and refilling each circuit. Check the hydraulic oil level before putting the backhoe into full operation. See "GENERAL" section for oil type and correct level.**

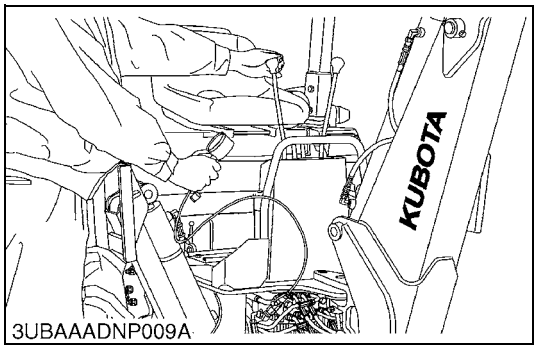
(1) Mount Bar
(2) Support Hook
(3) Guide Stop
(4) Slide Bar
(5) Lower Hole
(6) Mounting Pin

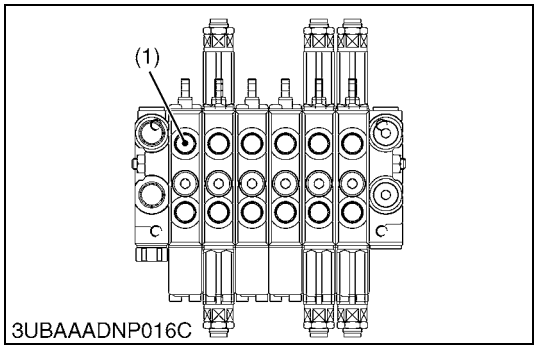
W1014341

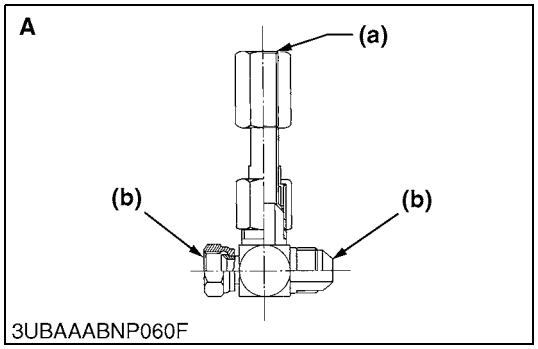
4. CHECKING, DISASSEMBLING AND SERVICING

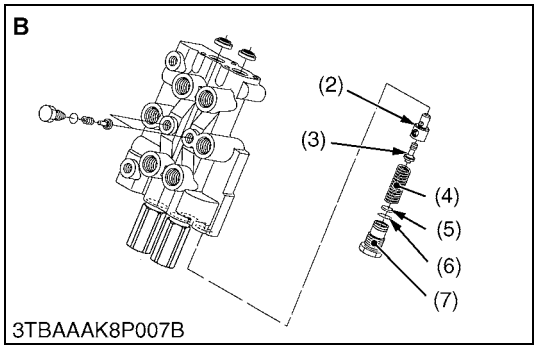
[1] CHECK AND ADJUSTING

(1) Control Valve









Relief Valve Setting Pressure

1. Remove the control cover.
2. Disconnect the hydraulic hose from **A1** port (1) of the control valve.
3. Install the adaptor **A** between control valve and hydraulic hose.
4. Set the relief valve setting pressure tester (Code No.: 07916-50045) to the adaptor **A**.
5. Start the engine, warm it up and idle, and then set the engine speed at approx.2800 min^{-1} (rpm).
6. Move the bucket and dipperstick lever to "**BUCKET-DUMP**" position and read the pressure gauge indication when a sound indicating the relief valve operation is heard.
7. If the pressure is not factory specifications, adjust the relief valve setting pressure with the adjusting shim (5).

■ **IMPORTANT**

- **Measure quickly to avoid the damage of hydraulic line.**

Relief valve pressure	Factory spec.	13.7 to 14.4 MPa 140 to 146 kgf/cm^2 1990 to 2080 psi

Condition

- Engine speed ····· Approx. 2800 min^{-1} (rpm)
- Oil temperature ····· 50 °C, 122 °F

(Reference)

Thickness of shims (5) : 0.10 mm (0.0039 in.)
0.20 mm (0.0079 in.)
0.40 mm (0.016 in.)
0.60 mm (0.024 in.)

(1) A1 Port
(2) Valve Seat
(3) Poppet
(4) Spring
(5) Shim
(6) Plain Washer
(7) Plug

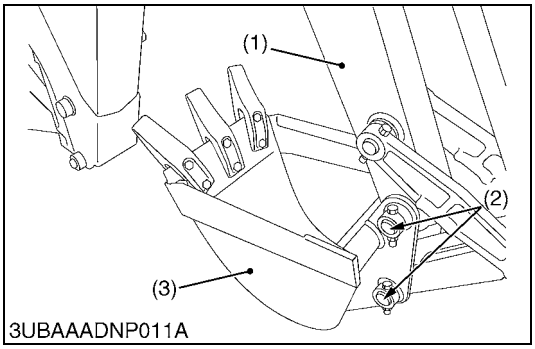
A : Backhoe Adaptor A
B : Front Loader Valve
(a) Connect Pressure Gauge
(b) Size 9/16-18

W1019092

[2] DISASSEMBLING THE BACKHOE

(1) Backhoe

■ **IMPORTANT**
- **When reassembling the pins, bushings and inner rings, apply slight coat of grease to them.**
- **When tightening the hydraulic hoses, refer to "HYDRAULIC HOSES FITTING AND FLARE PIPES" (Page G-4.)**

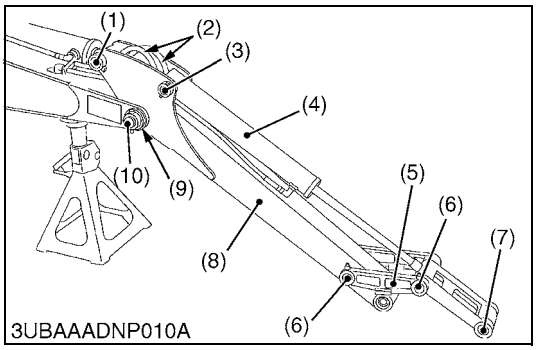


Bucket

1. Remove the bucket (3) from the dipperstick (1).

(1) Dipperstick
(2) Pin (0.98 x 6.17 mm)
(3) Bucket

W1015866

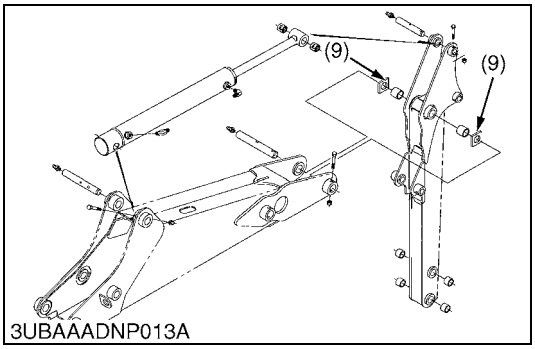


Dipperstick and Bucket Cylinder

1. Remove the pins (6) and remove the bucket link (7) and guide link (5).
2. Disconnect the hydraulic hoses (2) and remove the bucket cylinder (4).
3. Remove the pins (1), (10) and remove the dipperstick (8).

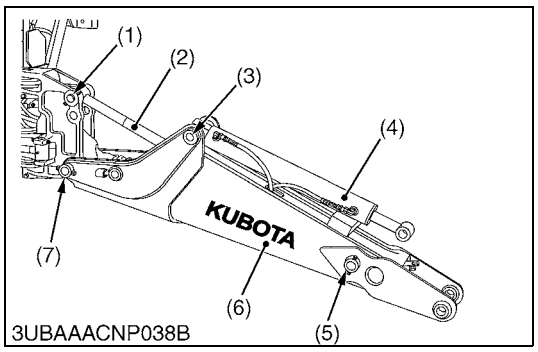
■ **NOTE**
- **To prevent from the damage of hydraulic hoses, set the wooden block etc. between dipperstick cylinder and boom.**

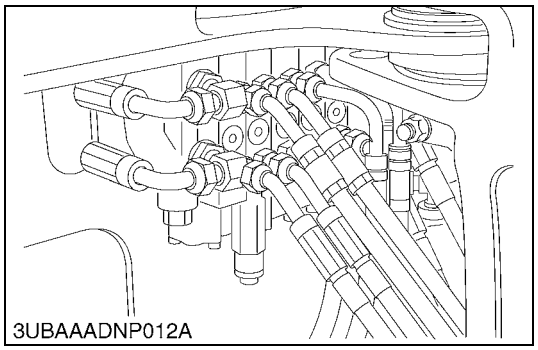
(When reassembling)
- Lock the locking nuts to setting bolts at position where the setting bolt may still be rotated.
- Replace the spacers (9) at their original position.

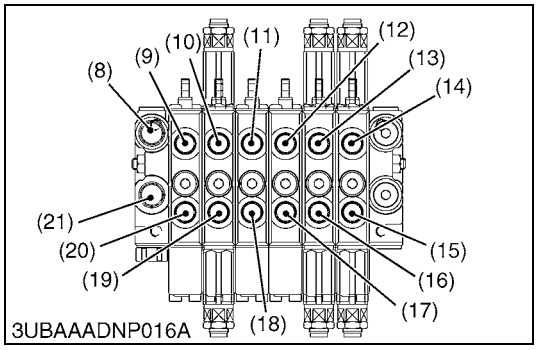


(1) Pin (25 × 137 mm)
(2) Hydraulic Hose
(3) Pin (25 × 137 mm)
(4) Bucket Cylinder
(5) Guide Link
(6) Pin (0.98 × 6.68 in.)
(7) Bucket Link
(8) Dipperstick
(9) Spacer
(10) Pin (1.18 × 7.96 in.)

W1016036







Dipperstick Cylinder, Boom, Boom Cylinder and Hoses

1. Disconnect the hydraulic hoses and remove the dipperstick cylinder (4).
2. Remove the pins (1), (5) and remove the boom cylinder (2).
3. Remove the pin (7) and remove the boom (6).
4. Remove the hydraulic hoses from the control valve.

(When reassembling)

- Lock the locking nuts to setting bolts at position where the mounting bolt may still be rotated.
- Connect the hydraulic hoses at their original positions and be sure to connect the hose angle as indicated table below.

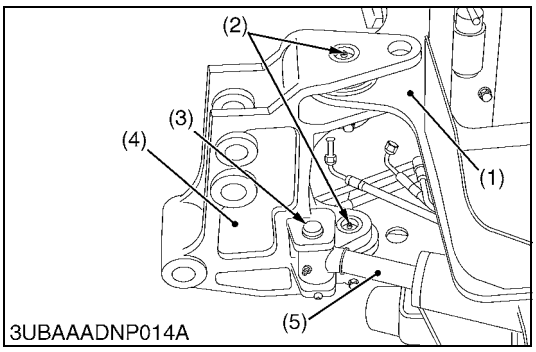
Port	Angle of Bent Tube
T, **P**	L 1.6 rad (L 90 °)
A6, **B6**	R 1.6 rad (R 90 °)
A1, **A2**, **B1**, **B2**	R 0.17 rad (R 10 °)

(Reference)

Port	Color
A1, **B1**	Red
A2, **B2**	Orange
A3, **B3**	Green
A4, **B4**	White
A5, **B5**	Yellow

(1) Pin (30 × 116 mm)
(2) Boom Cylinder
(3) Pin (1.18 × 7.96 in.)
(4) Dipperstick Cylinder
(5) Pin (1.18 × 7.96 in.)
(6) Boom
(7) Pin (1.18 × 7.96 in.)
(8) **T** Port (Tank)
(9) **A1** Port (Rod Side of Bucket Cylinder)
(10) **A2** Port (Rod Side of Dipperstick Cylinder)
(11) **A3** Port (Rod Side of Stabilizer Cylinder, R.H.)
(12) **A4** Port (Rod Side of Stabilizer Cylinder, L.H.)
(13) **A5** Port (Rod Side of Boom Cylinder)
(14) **A6** Port (Rod Side of Swing Cylinder)
(15) **B6** Port (Bottom Side of Swing Cylinder)
(16) **B5** Port (Bottom Side of Boom Cylinder)
(17) **B4** Port (Bottom Side of Stabilizer Cylinder, L.H.)
(18) **B3** Port (Bottom Side of Stabilizer Cylinder, R.H.)
(19) **B2** Port (Bottom Side of Dipperstick Cylinder)
(20) **B1** Port (Bottom Side of Bucket Cylinder)
(21) **P** Port (Pump)

W1016286



Swing Frame

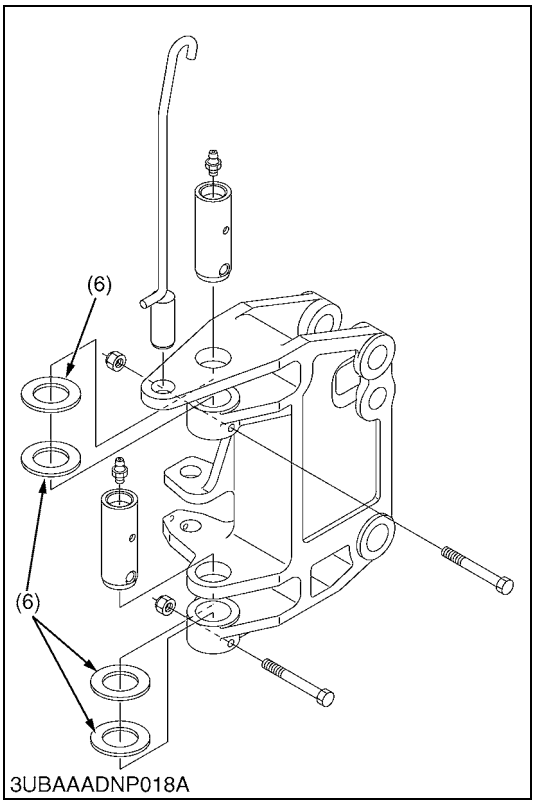
1. Disconnect the swing cylinder rod (5) from swing frame (4).
2. Remove the swing frame (4) from main frame (1).

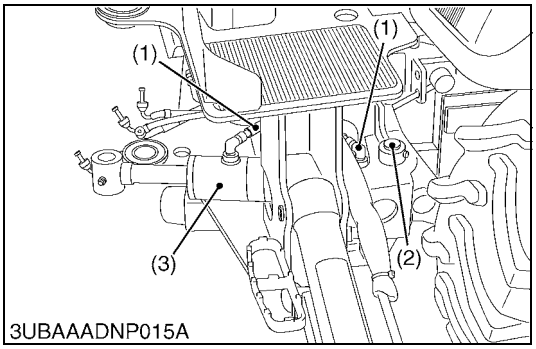
(When reassembling)

- Lock the locking nuts to setting bolts at position where the setting bolt may still be rotated.
- Reinstall the thrust washers (6) at their original positions.

(1) Main Frame
(2) Pin (35 × 98 mm)
(3) Pin (25 × 107 mm)
(4) Swing Frame
(5) Swing Cylinder Rod
(6) Thrust Washer

W1017110



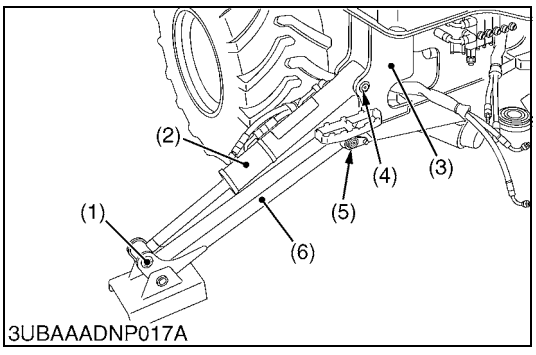


Swing Cylinder

1. Remove the swing cylinder bottom pin (2).
2. Disconnect the hydraulic hoses (1).
3. Remove the swing cylinder (3).

(1) Hydraulic Hose
(2) Pin (25 × 157 mm)
(3) Swing Cylinder

W1017745



Stabilizers and Stabilizer Cylinder

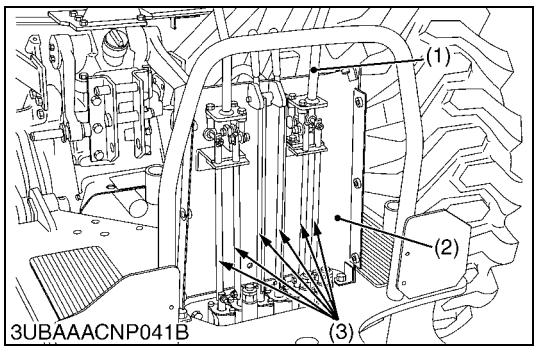
1. Remove the pins (1), (4) and remove the stabilizer cylinder (2) with hydraulic hoses.
2. Remove the pin (5) and remove the stabilizer (6).

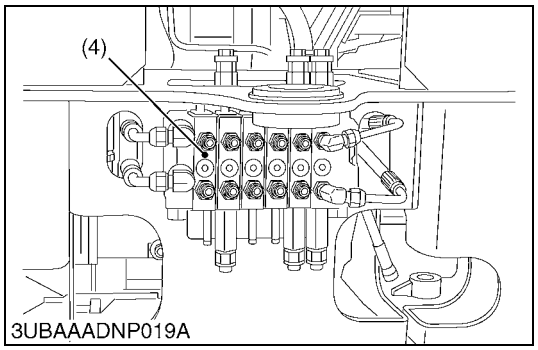
(When reassembling)

- Lock the locking nuts to setting bolts at position where the setting bolt may still be rotated.

(1) Pin (25.4 × 75 mm)
(2) Stabilizer Cylinder
(3) Main Frame
(4) Pin (25.4 × 101 mm)
(5) Pin (25.4 × 101 mm)
(6) Stabilizer

W1017254





Lever Support and Valve

1. Remove the cover.
2. Disconnect the control lever rods (3) of valve side.
3. Remove the lever support (2) with control valve levers (1).
4. Disconnect the hydraulic hoses.
5. Remove the control valve (4).

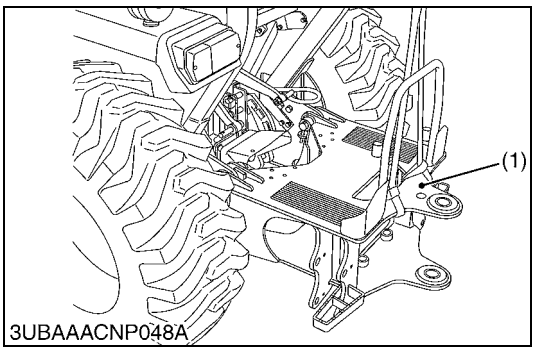
(When reassembling)

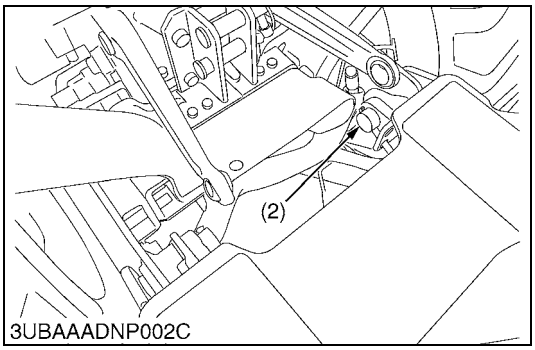
- Connect the hydraulic hoses at their original portions and be sure to connect the hose angle as indicated table below.

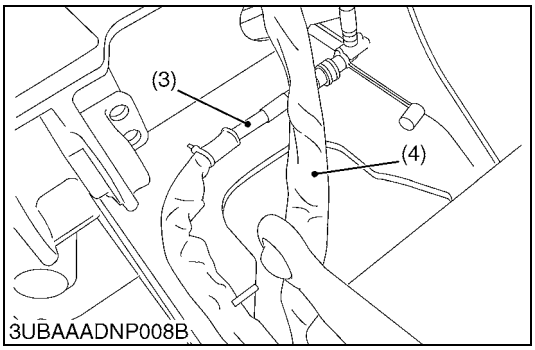
Port	Angle of Bent Tube
T, **P**	L 1.6 rad (L 90 °)
A6, **B6**	R 1.6 rad (R 90 °)

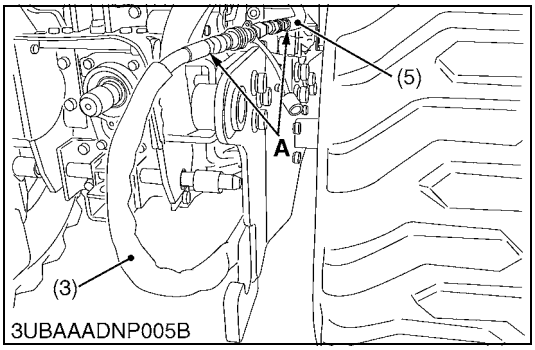
(1) Control Valve Lever
(2) Lever Support
(3) Control Lever Rod
(4) Control Valve

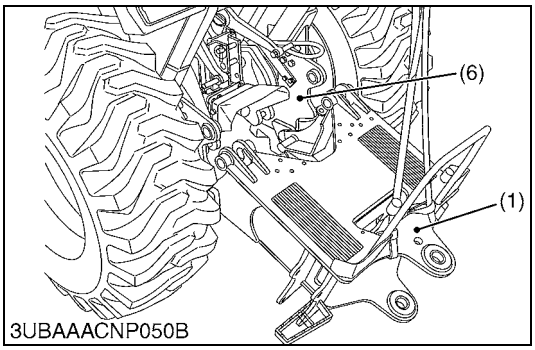
W1024374











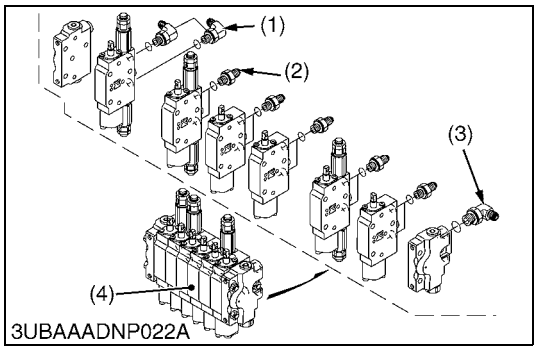
Backhoe Main Frame and Hydraulic Hose

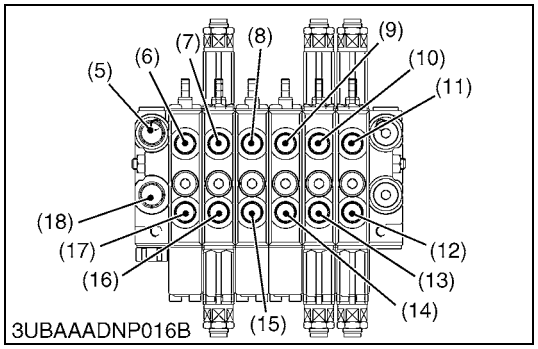
1. Hoist the backhoe main frame (1) and remove the mount pin (2).
2. Remove the tractor outlet hose (3) from backhoe side and return hose (4) from the tractor inlet tube (5).
3. Connect the tractor outlet hose (3) to the couple of tractor inlet tube (5).
4. Separate the backhoe main frame (1) from the tractor sub frame.

(1) Backhoe Main Frame
(2) Mount Pin
(3) Tractor Outlet Hose
(4) Return Hose
(5) Tractor Inlet Tube
(6) Tractor Sub Frame

W1017875

(2) Control Valve





Adapter and Elbow

1. Remove the adaptors and elbows from the control valve (4).

(When reassembling)

- Use care not to damage the O-ring.

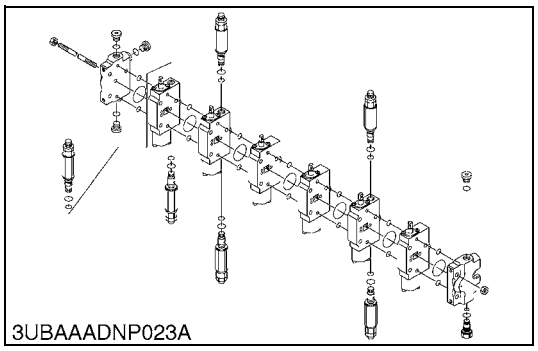
Tightening torque	Adaptor elbow (G 1/4)	25 to 29 N·m 2.6 to 2.9 kgf·m 19 to 21 lbf·ft
	Elbow (G 3/8)	49 to 54 N·m 5.0 to 5.5 kgf·m 37 to 39 lbf·ft

- Install the elbow angles as indicated table below.

Port	Angle of Elbow
P1, P2	L 1.6 rad (L 90 °)
A6	R 1.6 rad (R 90 °)
B6	R 1.75 rad (R 100 °)

(1) Adjustable Elbow (G 1/4)
(2) Straight Adaptor (G 1/4)
(3) Adjustable Elbow (G 3/8)
(4) Control Valve
(5) **T** Port (Tank)
(6) **A1** Port (Rod Side of Bucket Cylinder)
(7) **A2** Port (Rod Side of Dipperstick Cylinder)
(8) **A3** Port (Rod Side of Stabilizer Cylinder R.H.)
(9) **A4** Port (Rod Side of Stabilizer Cylinder L.H.)
(10) **A5** Port (Rod Side of Boom Cylinder)
(11) **A6** Port (Rod Side of Swing Cylinder)
(12) **B6** Port (Bottom Side of Swing Cylinder)
(13) **B5** Port (Bottom Side of Boom Cylinder)
(14) **B4** Port (Bottom Side of Stabilizer Cylinder L.H.)
(15) **B3** Port (Bottom Side of Stabilizer Cylinder R.H.)
(16) **B2** Port (Bottom Side of Dipperstick Cylinder)
(17) **B1** Port (Bottom Side of Bucket Cylinder)
(18) **P** Port (Pump)

W1032061



Separation of Section

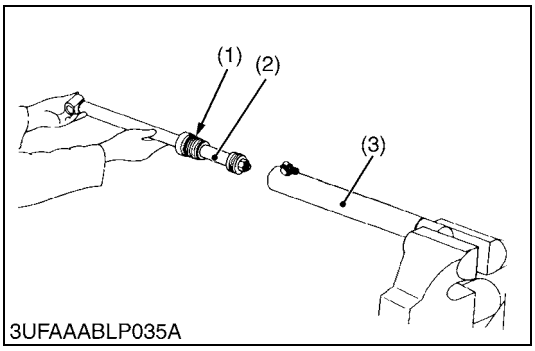
1. Unscrew the nuts, and separate each section.

(When reassembling)

- Use care not to damage the O-ring.

W1033008

(3) Boom, Dipperstick, Bucket, Swing and Stabilizer Cylinder



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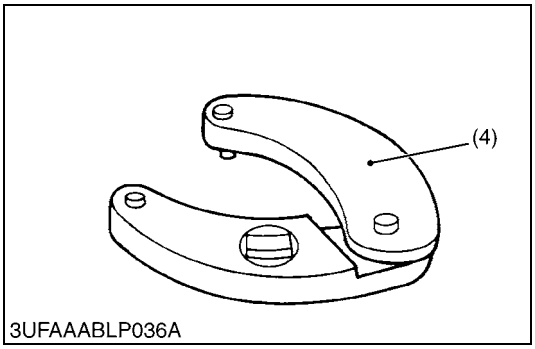

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Cylinder Rod Assembly

1. Drain hydraulic oil from the cylinder, and secure the tube end of the cylinder in a vise.
2. Unscrew the cylinder head (1) with the adjustable gland nut wrench (4).
3. Pull out the piston rod assembly (2) from the cylinder tube (3).

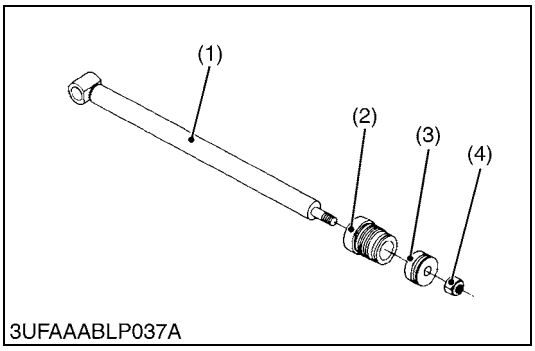
(When reassembling)

- Visually inspect the cylinder tube for signs of scoring or damage.
- Insert the piston rod assembly to the cylinder tube, using care not to damage the piston seal on the piston.
- Install the cylinder head to the cylinder tube, using care not to damage the O-ring on the cylinder head.

Tightening torque	Boom cylinder and dipperstick cylinder head	250 to 300 N·m 25.5 to 30.5 kgf·m 185 to 221 lbf·ft
	Bucket cylinder head	380 to 400 N·m 38.8 to 40.7 kgf·m 281 to 295 lbf·ft
	Swing cylinder head	440 to 460 N·m 44.9 to 46.9 kgf·m 325 to 339 lbf·ft
	Stabilizer cylinder head	250 to 280 N·m 25.5 to 28.5 kgf·m 185 to 206 lbf·ft

(1) Cylinder Head
(2) Piston Rod Assembly
(3) Cylinder Tube
(4) Adjustable Gland Nut Wrench

W1021758



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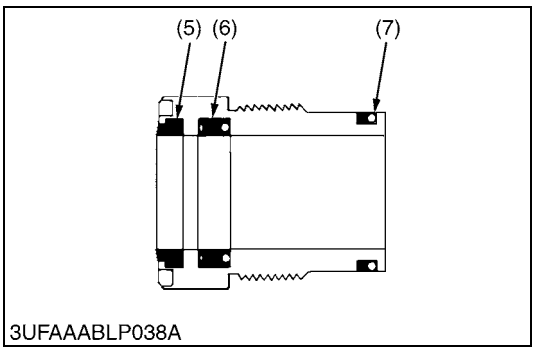

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Cylinder Head, Piston and Nut

1. Secure the rod end in a vise.
2. Unscrew the nut (4), and remove the piston (3) and cylinder head (2) from the piston rod (1).

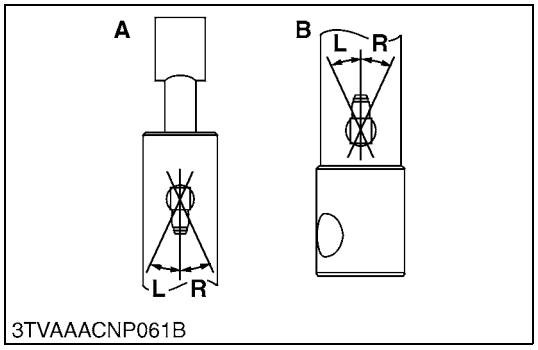
(When reassembling)

- Visually inspect all parts for signs of scoring or damage.
- Insert the piston rod to the cylinder head, using care not to damage the wiper seal (5) and oil seal (6).

Tightening torque	Boom cylinder piston and dipperstick cylinder piston mounting nut	200 to 230 N·m 20.4 to 23.4 kgf·m 148 to 169 lbf·ft
	Bucket cylinder piston mounting nut	300 to 320 N·m 30.6 to 32.6 kgf·m 222 to 236 lbf·ft
	Swing cylinder piston mounting nut	216 to 245 N·m 22.0 to 25.0 kgf·m 160 to 180 lbf·ft
	Stabilizer cylinder piston mounting nut	150 to 180 N·m 15.3 to 18.3 kgf·m 111 to 132 lbf·ft

(1) Piston Rod
(2) Cylinder Head
(3) Piston
(4) Nut
(5) Wiper Seal
(6) Oil Seal
(7) O-ring

W1021908



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Cylinder Adaptor Angle

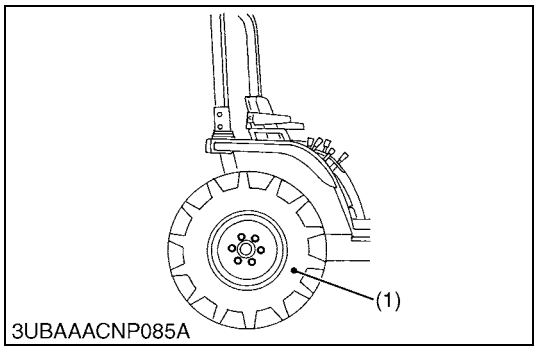
- Connect the cylinder adaptor at their original positions and be sure to connect the adaptor angle as indicated table below.

Cylinder	Rod Side	Bottom Side
Swing	R45 $^{\pm 1}$ (deg.)	R45 $^{\pm 1}$ (deg.)
Boom	0 $^{\pm 1}$	0 $^{\pm 1}$
Dipperstick	0 $^{\pm 1}$	0 $^{\pm 1}$
Bucket	0 $^{\pm 1}$	0 $^{\pm 1}$
Stabilizer (L.H.)	R20 $^{\pm 1}$	0 $^{\pm 1}$
Stabilizer (R.H.)	L20 $^{\pm 1}$	0 $^{\pm 1}$

A : Rod Side **B : Bottom Side**

W1022523

(4) Sub Frame



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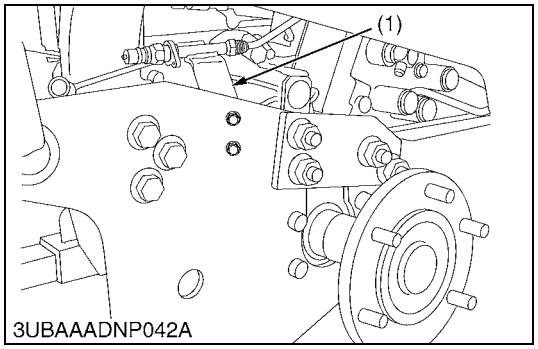
Rear Wheel

1. Place disassembling stand under the tractor frame, and support it with a jack.
2. Remove the rear wheels (1).
3. After removing the rear wheels, support it at both sides of rear axle by stand.

(When reassembling)

Tightening torque	Rear wheel mounting nut	145 to 150 N·m 14.8 to 15.3 kgf·m 107 to 111 lbf·ft

(1) Rear Wheel



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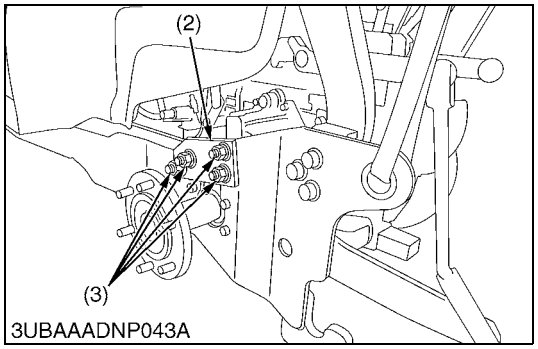
Connecting Plate

1. Disconnect the couple joint (1).
2. Remove the connecting plate (2).

(When reassembling)

Tightening torque	Couple joint mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Connecting plate mounting bolt and nut	196 to 236 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft

(1) Couple Joint
(2) Connecting Plate
(3) Bolt and Nut (M16)



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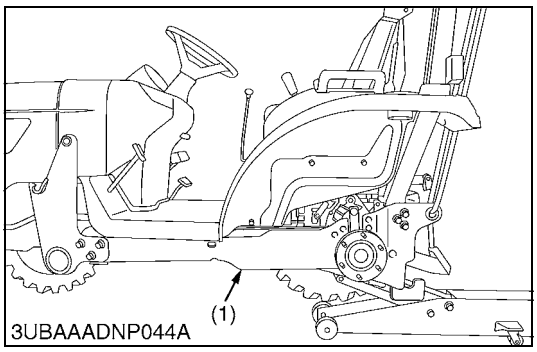
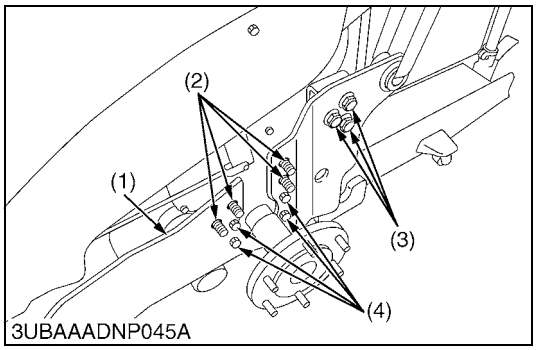
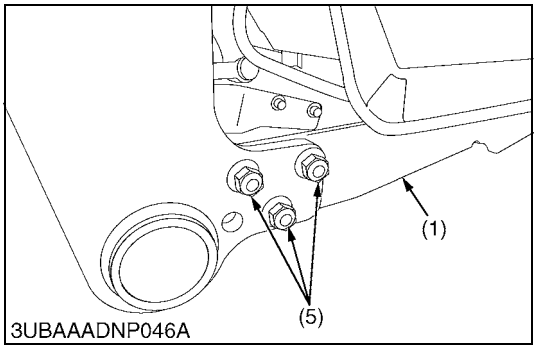






Sub Frame

1. Lift the sub frame (1) by jack and place hydraulic jack as shown figure.
2. Remove the sub frame mounting bolt and nut.
3. Slowly lower the sub frame by jack and hoist to separate the sub frame (1).

(When reassembling)

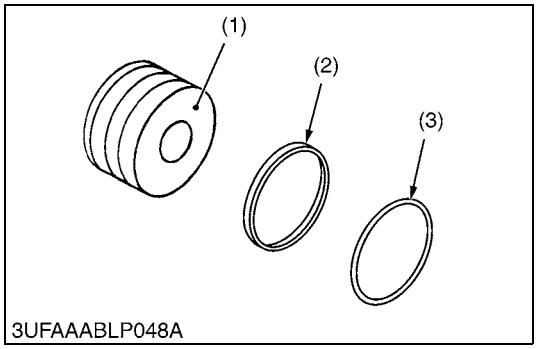
Tightening torque	Sub frame mounting bolt	80.0 N·m 8.2 kgf·m 59.0 lbf·ft
	Sub frame mounting bolt and nut	196 to 236 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft

(1) Sub Frame
(2) Bolt (M16)
(3) Bolt (M12)
(4) Bolt (M16)
(5) Bolt and Nut (M16)

W1044163

[3] SERVICING

(1) Bush, Pin and Cylinder



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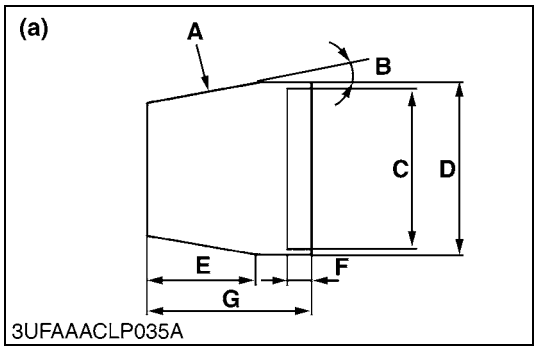

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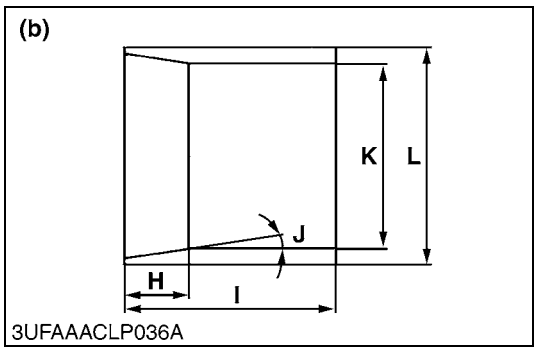

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Piston Seal and O-ring

1. Remove the piston seal (2) and O-ring (3) from the piston (1).

■ **IMPORTANT**

- **When installing the O-ring (3) and piston seal (2) to the piston (1), use the slide jig and correcting jig as shown in the figure.**

	Bucket Cylinder	Dipperstick, Swing, Stabilizer Cylinder
A	80 µm 0.0031 in.	80 µm 0.0031 in.
B	0.157 rad. 9.00 °	0.157 rad. 9.00 °
C	50.18 mm 1.976 in.	60.18 mm 2.369 in.
D	51.18 mm 2.015 in.	61.18 mm 2.409 in.
E	42 mm 1.7 in.	42 mm 1.7 in.
F	10 mm 0.39 in.	10 mm 0.39 in.
G	58.5 mm 2.30 in.	58.5 mm 2.30 in.
H	14 mm 0.55 in.	14 mm 0.55 in.
I	35 mm 1.4 in.	35 mm 1.4 in.
J	0.122 rad. 7.00 °	0.122 rad. 7.00 °
K	50.20 mm 1.976 in.	60.20 mm 2.370 in.
L	58.9 mm 2.32 in.	68.9 mm 2.71 in.

(1) Piston
(2) Piston Seal
(3) O-ring

(a) Slide Jig
(b) Correcting Jig

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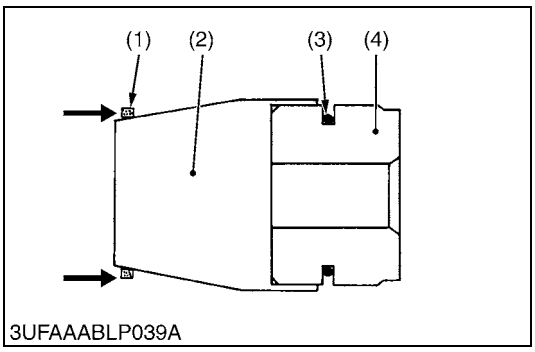

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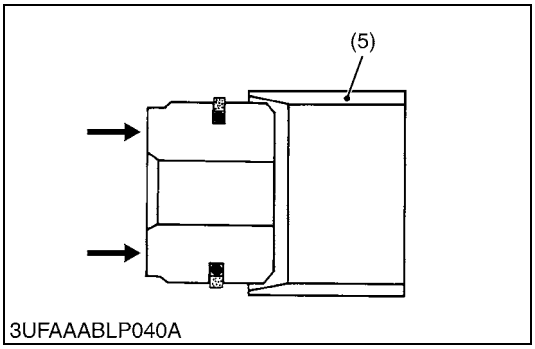

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Installing O-ring and Piston Seal

1. Place the slide jig (2) on the piston (4).
2. Install the O-ring (3) on the piston using the slide jig (2).
3. Install the piston seal (1) over the O-ring using the slide jig (2).
4. Compress the piston seal (1) to the correct size by installing the piston (4) into the correcting jig (5).

■ **NOTE**

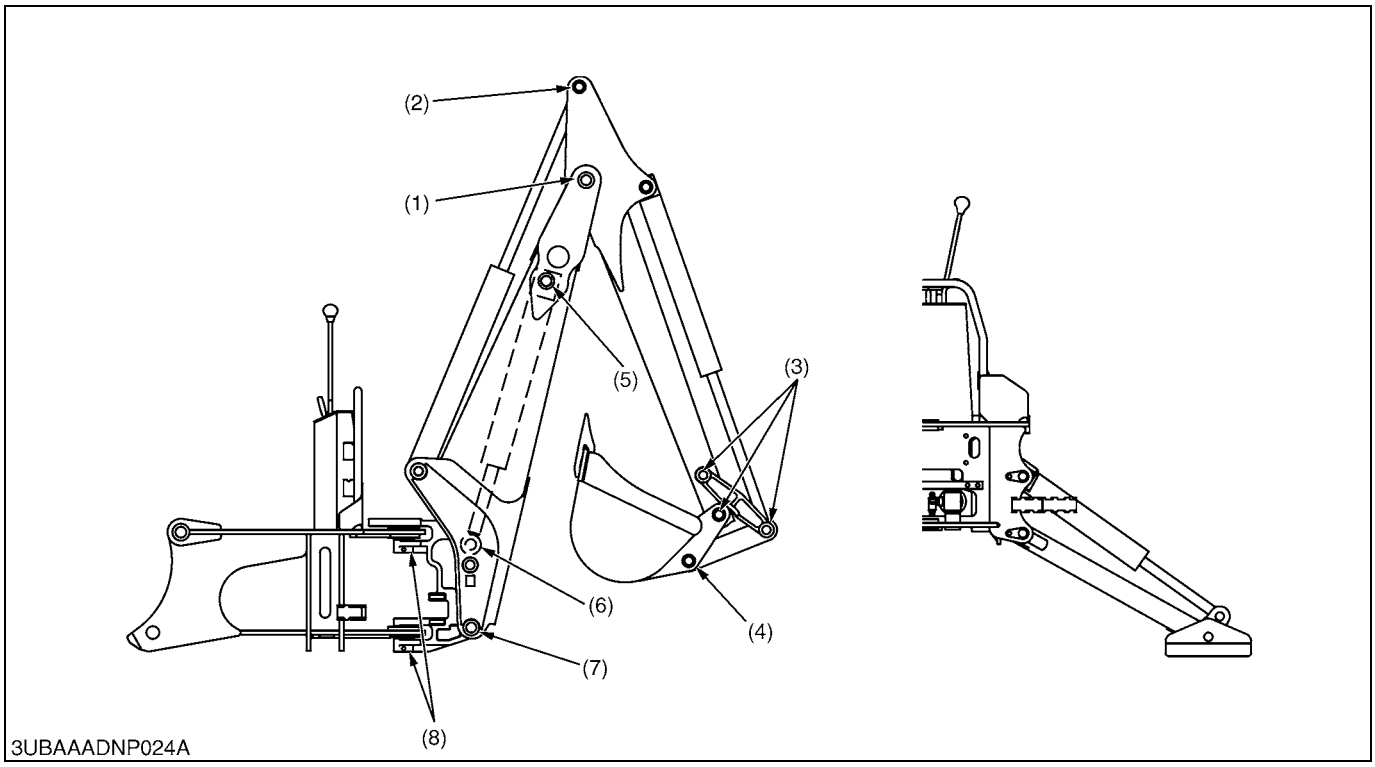
- **Do not turn (roll) the piston seal as you install it.**

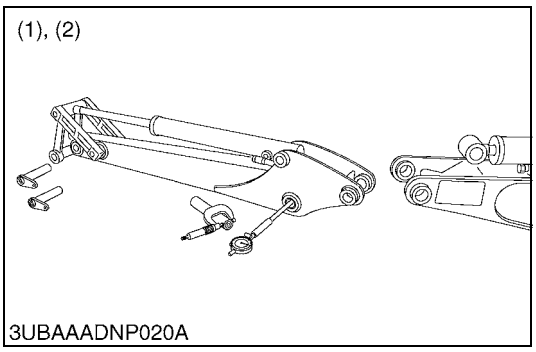
(1) Piston Seal
(2) Slide Jig
(3) O-ring
(4) Piston
(5) Correcting Jig

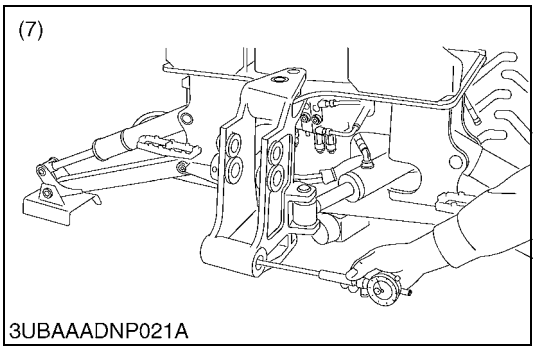
W1022984

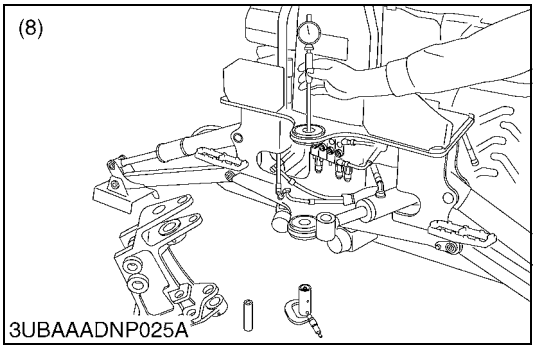
Clearance between Pin and Bushing

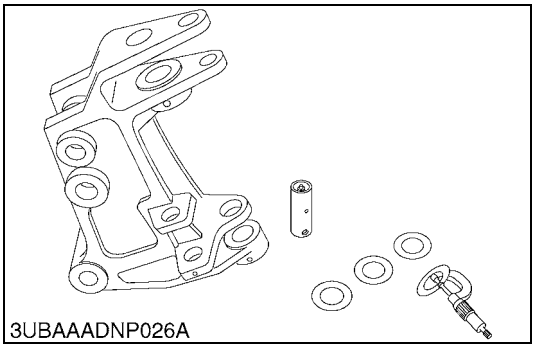
1. Measure the pins O.D. with an outside micrometer.
2. Measure the bushings I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace pin or bushing.

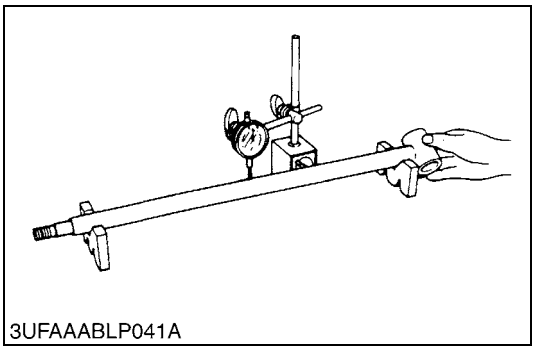












Clearance between Pin and Bushing

	Clearance	Factory spec.	Allowable limit
(1)	Dipperstick fulcrum pin and bushing	0.15 to 0.19 mm 0.0059 to 0.0074 in.	1.0 mm 0.039 in.
(2)	Dipperstick cylinder rod pin and bushing	0.18 to 0.32 mm 0.071 to 0.12 in.	1.0 mm 0.039 in.
(3)	Bucket cylinder rod pin / Guide link pin / Bucket fulcrum pin / Bucket link pin and bushing	0.15 to 0.18 mm 0.0059 to 0.0070 in.	1.0 mm 0.039 in.
(4)	Bucket fulcrum pin and bushing	0.15 to 0.18 mm 0.0059 to 0.0070 in.	1.5 mm 0.059 in.
(5)	Boom cylinder bottom pin and bushing	0.289 to 0.431 mm 0.0114 to 0.0169 in.	1.0 mm 0.039 in.
(6)	Boom cylinder rod pin and bushing	0.139 to 0.281 mm 0.00548 to 0.0110 in.	1.0 mm 0.039 in.
(7)	Boom support pin and bushing	0.15 to 0.19 mm 0.0059 to 0.0074 in.	1.0 mm 0.039 in.
(8)	Main frame fulcrum pin and bushing	0.070 to 0.13 mm 0.0028 to 0.005 in.	0.5 mm 0.02 in.

W1024653

Thrust Washer Wear

1. Measure the thickness of thrust washer with an outside micrometer.
2. If the wear exceeds the allowable limit, replace it.

■ **NOTE**

- **Visually inspect the thrust washer for signs of scoring or damage not only on the thrust washer but also on the main frame and swing frame contact surface.**

Thrust washer thickness	Factory spec.	2.66 mm 0.105 in.
	Allowable limit	1.8 mm 0.071 in.

W1025818

Piston Rod Bend

1. Place piston rod on V blocks.
2. Set a dial indicator on the center of the rod.
3. Turn the piston rod and read the dial indicator.
4. If the measurement exceeds the allowable limit, replace it.

Piston rod bend	Allowable limit	0.25 mm 0.0098 in.

W1026026

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