WSM

WORKSHOP MANUAL
FRONT LOADER

LA1301,LA1301S-1, LA1601,LA1601S

Kubota

KiSC issued 05, 2006 A

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of KUBOTA Front Loaders LA1301, LA1301S-1, LA1601 and LA1601S. It is divided into two parts, “Mechanism” and “Servicing”.

As for the items which are not explained in these sections, refer to Workshop Manual for LA1001 · LA1251 (Code No. 9Y021-12210).

■ **Mechanism**

Information on the construction and function and 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 product information available at the time of publication.

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

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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.

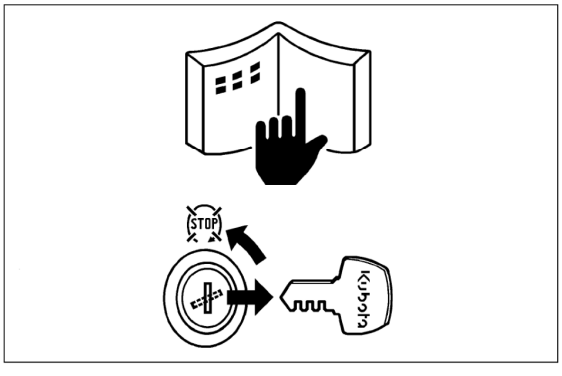
DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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.

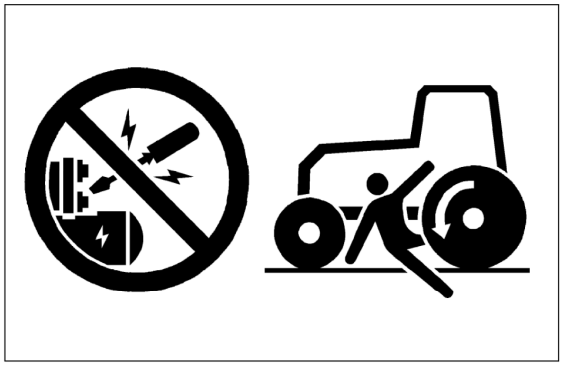
■ IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

■ NOTE : Gives helpful information.



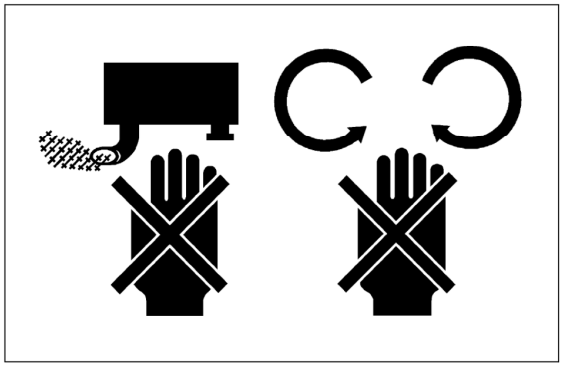
BEFORE SERVICING AND REPAIRING

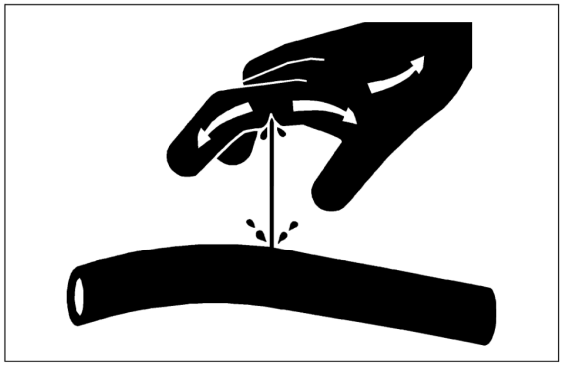
- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, and remove the key.
- Disconnect the battery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



SAFETY STARTING

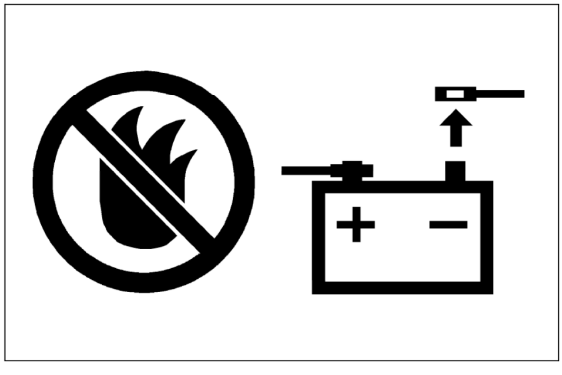
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine 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.

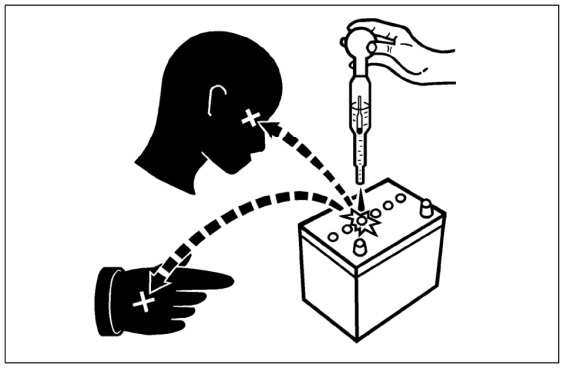


AVOID FIRES

- 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.

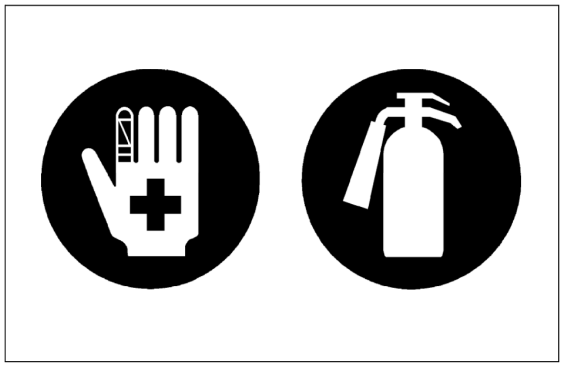


PREVENT ACID BURNS

- 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.



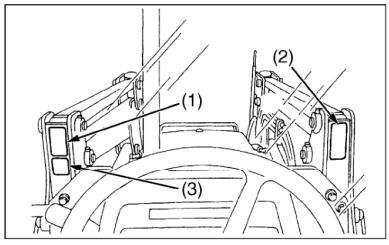
PREPARE FOR EMERGENCIES

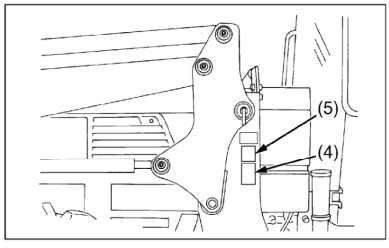
- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

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.

[LA1301, LA1601]





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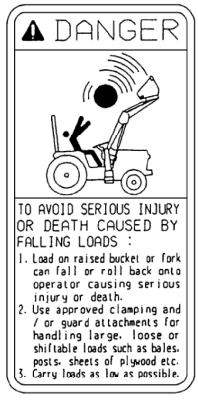
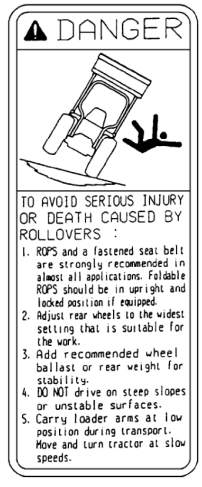
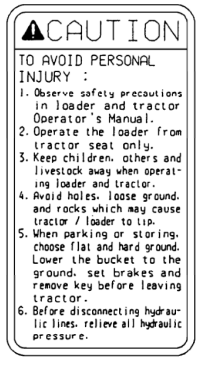


(2) Part No. 75546-5641-5

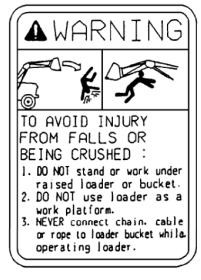


(3) Part No. 75546-5642-2

(4) Part No. 75546-5645-1



(5) Part No. 75567-5644-1
(Both sides)



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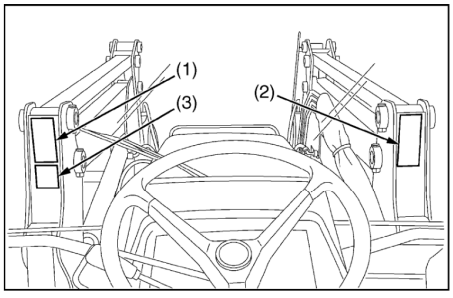
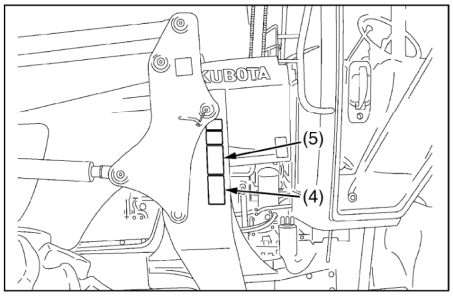
[LA1301S-1, LA1601S]





(1) Part No. 7J246-5643-1

(2) Part No. 7J246-5641-1

(3) Part No. 7J246-5642-1

(4) Part No. 7J246-5645-1

(5) Part No. 7J246-5644-2
(Both sides)

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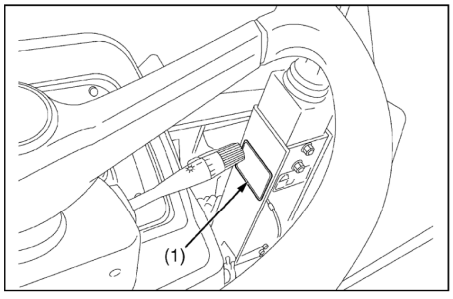
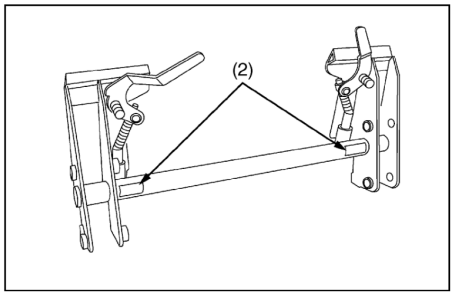
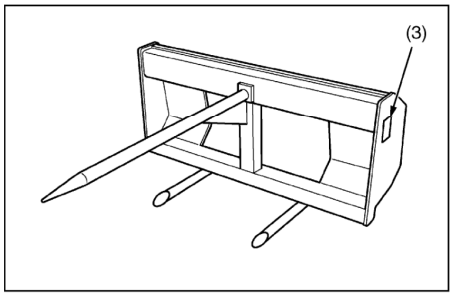
[LA1301S-1, LA1601S]

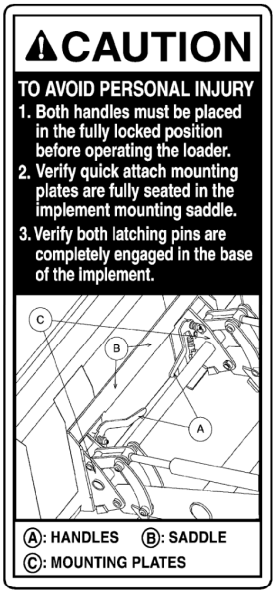






(1) Part No. 7J266-5649-1

(2) Part No. 75585-3619-3



(3) Part No. 7J246-5643-1

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 from your local KUBOTA Distributor.
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 locations (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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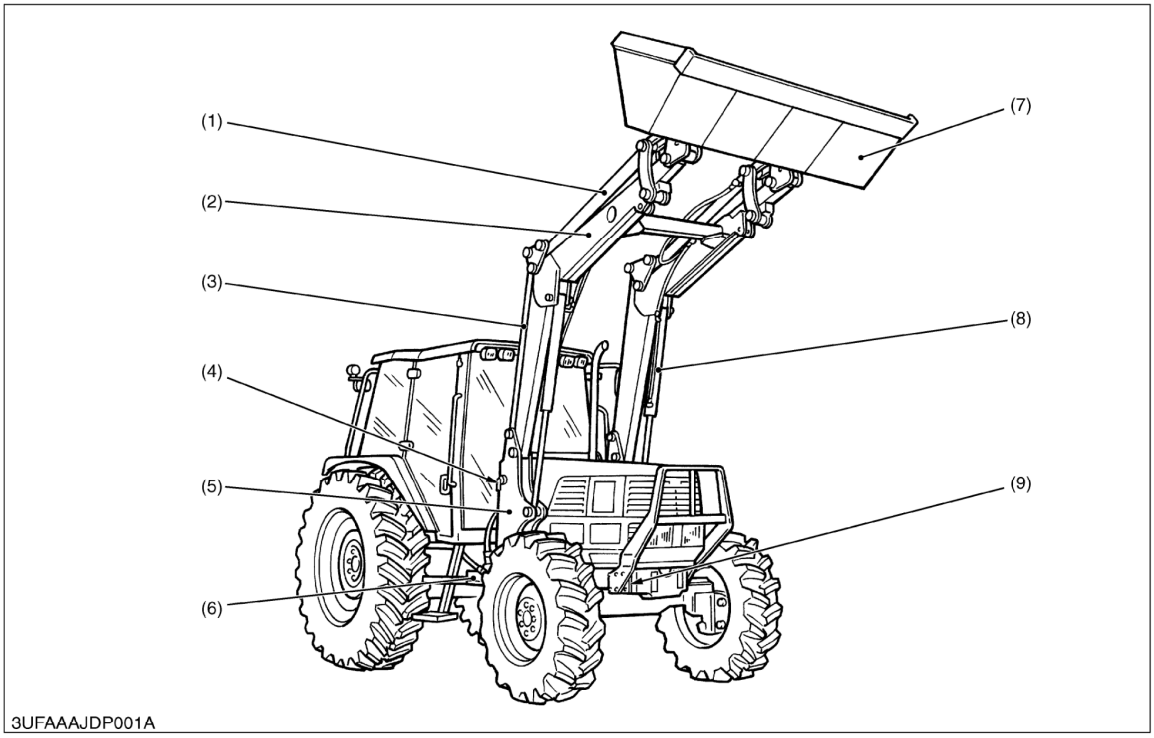
TERMINOLOGY



(1) Bucket Cylinder
(2) Boom
(3) Mechanical Self Leveling Linkage
(4) Mounting Pin
(5) Side Frame
(6) Hydraulic Control Valve
(7) Bucket
(8) Boom Cylinder
(9) Main Frame

SPECIFICATIONS

■ Suitable Tractor

LA1301 : M-110 (2WD), M-120 (2WD)
LA1601 : M-110 (4WD), M-120 (4WD)
LA1301S-1 : M95S, M105S, M95X, M105X
LA1601S : M-110 (4WD), M-120 (4WD), M125X

W1029088

LOADER SPECIFICATIONS

Model		LA1301	LA1601
ASAE Rated Lift Capacity		1300 kg (2865 lbs)	1600 kg (3525 lbs)
ASAE Rated Brakeout Force		17670 N (3975 lbs)	21890 N (4920 lbs)
Boom Cylinder	Bore	64.0 mm (2.50 in.)	70.0 mm (2.75 in.)
	Stroke	652 mm (25.67 in.)	
Bucket Cylinder	Bore	70.0 mm (2.75 in.)	76.0 mm (3.00 in.)
	Stroke	532 mm (20.94 in.)	
Control Valve	Remote valve type	One Detent Float Position, Regenerative Bucket Dump, Power Steering Circuit	
Net Weight (Approximate)		1030 kg (2270 lbs)	1060 kg (2337 lbs)

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LOADER SPECIFICATIONS

Model		LA1301S-1		LA1601S
Tractor Model		M95S, M105S	M95X, M105X	M125X
Wheel Base (WB)		2435 mm (95.9 in.)		2690 mm (105.9 in.)
Front Tires		13.6-24		14.9-24
Rear Tires		18.4R34		18.4R38
Boom Cylinder	Bore	65 mm (2.56 in.)		70 mm (2.76 in.)
	Stroke	652 mm (25.7 in.)		
Bucket Cylinder	Bore	70 mm (2.76 in.)		75 mm (3.00 in.)
	Stroke	532 mm (20.9 in.)		
Control Valve	Remote valve type	One Detent Float Position, Power Beyond Circuit		
Rated Flow		65 L/m (17.2 GPM)	68 L/m (18 GPM)	76 L/m (20 GPM)
Maximum Pressure		20.7 MPa (211 kgf/cm^2, 3002 psi)		
Net Weight (Approximate)		990 kg (2183 lbs)		1060 kg (2337 lbs)

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BUCKET SPECIFICATIONS

Model		LA1301, LA1601	
Type		84” Quick Bucket	96” Quick Bucket
Width		2135 mm (84.0 in.)	2440 mm (96.0 in.)
Length		685 mm (27.0 in.)	730 mm (28.8 in.)
Height		745 mm (29.4 in.)	770 mm (30.3 in.)
Capacity	Struck	0.58 m^3 (20.5 cu.ft.)	0.70 m^3 (24.7 cu.ft.)
	Heaped	0.72 m^3 (25.4 cu.ft.)	0.90 m^3 (31.7 cu.ft.)
Weight		226 kg (498 lbs)	276 kg (608 lbs)

W1013973

BUCKET SPECIFICATIONS

Loader Model		LA1301S-1, LA1601S		
Model		Square 84”	Square 96”	Light Material 96”
Type		Quick Attach		
Width		2135 mm (84 in.)	2440 mm (96 in.)	
Depth (L)		665 mm (26.2 In.)		800 mm (31.5 in.)
Height (M)		750 mm (29.5 in.)		764 mm (30.1 in.)
Length (N)		770 mm (30.3 in.)		910 mm (35.8 in.)
Capacity	Struck	0.57 m^3 (20.1 cu.ft.)	0.66 m^3 (23.3 cu.ft.)	0.80 m^3 (28.3 cu.ft.)
	Heaped	0.66 m^3 (23.3 cu.ft.)	0.75 m^3 (26.5 cu.ft.)	0.98 m^3 (34.6 cu.ft.)
Weight		250 kg (551 lbs)	275 kg (606 lbs)	316 kg (697 lbs)

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OPERATING DIMENSIONS [LA1301, LA1601]

Item \ Model	LA1301	LA1601
	M-110	M-120
Maximum Lifting Height (**A**)	3685 mm (145.1 in.)	
Clearance with Bucket Dumped (**B**)	2780 mm (109.4 in.)	
Reach at Maximum Height (**C**)	525 mm (20.7 in.)	
Maximum Dump Angle (**D**)	1.05 rad (60 °)	
Reach with Bucket on Ground (**E**)	2335 mm (91.9 in.)	2280 mm (89.8 in.)
Bucket Roll-back Angle (**F**)	0.70 rad (40 °)	
Digging Depth (**G**)	160 mm (6.3 in.)	
Overall Height in Carrying Position (**H**)	1960 mm (77.2 in.)	

M-120 (2WD) with 11.00 – 16 Front Tires and 18.4 – 38 Rear Tires.
M-120 (4WD) with 14.9 – 24 Front Tires and 18.4 – 38 Rear Tires.

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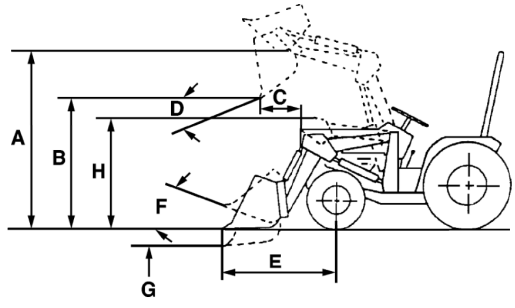

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PERFORMANCE RATINGS (NO LOAD) [LA1301, LA1601]

Item \ Model	LA1301	LA1601
Raise to Full Height	3.8 sec.	4.1 sec.
Lowering Time	2.8 sec.	3.5 sec.
Attachment Roll-back Time	2.1 sec.	2.5 sec.
Attachment Dump Time	1.7 sec.	2.1 sec.

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DIMENTIONAL SPECIFICATIONS [LA1301S-1, LA1601S]

Loader Model		LA1301S-1		LA1601S
Tractor model		M95S, M105S	M95X, M105X	M125X
A	Max. lift height (To bucket pivot pin)	3640 mm (143.3 in.)		3700 mm (145.7 in.)
B	Max. lift height under level bucket	3400 mm (133.9 in.)		3470 mm (136.6 in.)
C	Clearance with bucket dumped	2820 mm (111 in.)		2900 mm (114.2 in.)
D	Reach at max. lift height (Dumping reach)	800 mm (31.5 in.)	840 mm (33.1 in.)	805 mm (31.7 in.)
E	Max. dump angle	0.96 rad (55 °)		
F	Reach with bucket on ground	2400 mm (94.5 in.)		2285 mm (90 in.)
G	Bucket roll-back angle	0.70 rad (40 °)		
H	Digging depth	190 mm (7.5 in.)		110 mm (4.3 in.)
I	Overall height in carrying position	1950 mm (76.5 in.)		1970 mm (77.6 in.)

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OPERATIONAL SPECIFICATIONS [LA1301S-1, LA1601S]

Loader Model		LA1301S-1		LA1601S
Tractor model		M95S, M105S	M95X, M105X	M125X
Lift capacity (Bucket bottom mid point)		1300 kg (2866 lbs)		1600 kg (3527 lbs)
U	Lift capacity (Bucket pivot pin, max. height)	1400 kg (3086 lbs)		1750 kg (3858 lbs)
V	Lift capacity (800 mm forward, max. height)	1180 kg (2601 lbs)		1490 kg (3285 lbs)
W	Lift capacity (Bucket pivot pin, 1500 mm height)	1840 kg (4056 lbs)		2270 lbs)
X	Lift capacity (800 mm forward, 1500 mm height)	1765 kg (3891 lbs)		2176 kg (4797 lbs)
Y	Breakout force (Bucket pivot pin)	22163 N (4982 lbs)		27184 N (6111 lbs)
Z	Breakout force (800 mm forward)	19515 N (4387 lbs)		23732 N (5335 lbs)
VV	Bucket roll-back force at max. height	18500 N (4159 lbs)		23252 N (5227 lbs)
XX	Bucket roll-back force at 1.5M	26320 N (5917 lbs)		30283 N (6808 lbs)
ZZ	Bucket roll-back force at ground level	25240 N (5674 lbs)		30597 N (6878lbs)
Raising time		3.6 sec.	3.4 sec.	4.3 sec.
Lowering time		2.7 sec.	2.6 sec.	3.6 sec.
Bucket dumping time		1.8 sec.	1.7 sec.	2.6 sec.
Bucket rollback time		2.3 sec.	2.2 sec.	2.5 sec.

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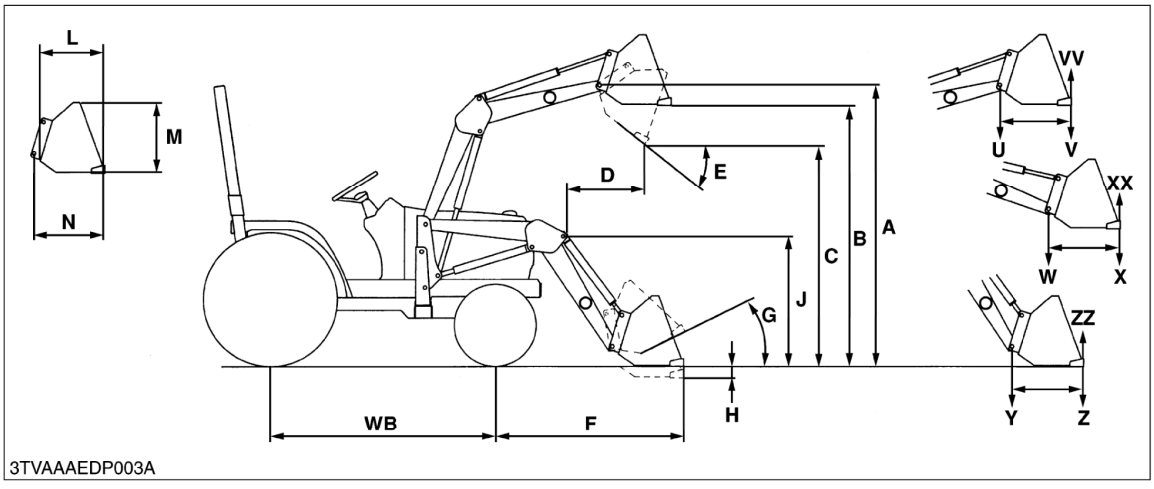

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MECHANISM

CONTENTS

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1. FEATURES

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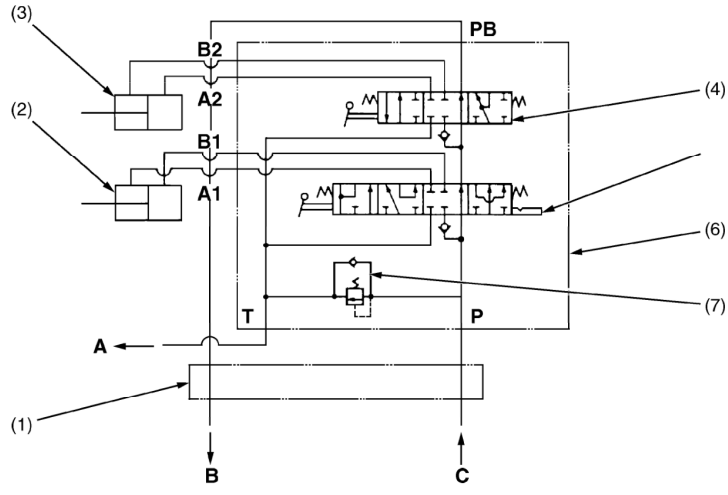
1. Parallel link mechanism for easy lifting and lowering.
2. Tiltable remote control stand for the easy-to-operate lever position in cabin.
3. Series circuit for simultaneous operation, and bucket confluence circuit for quick dumping.
4. Detachable pin and stand for easy mounting and dismounting.
5. Bucket link for greater scooping and dumping angles.
6. Readily attachable with front weight bracket.
7. Standard equipped with quick attachment hitch.
8. One-lever operation.

2. HYDRAULIC CIRCUIT

■ Serial Number Below 10218



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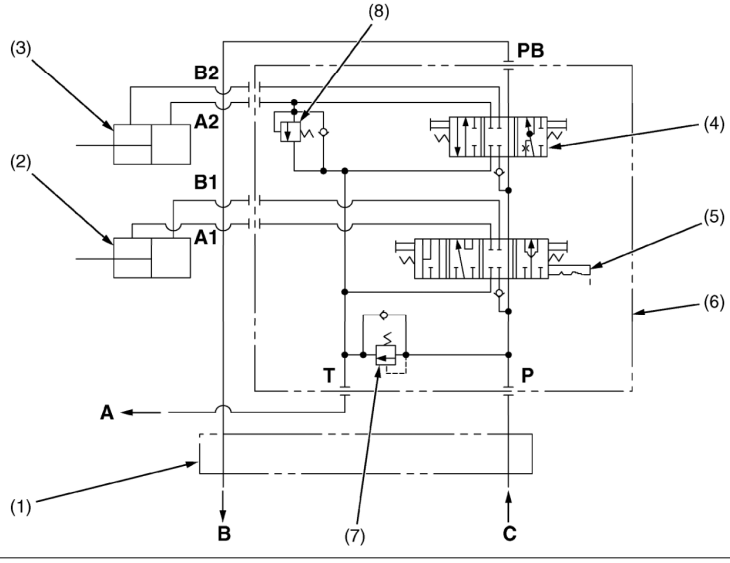
■ Serial Number Above 10219



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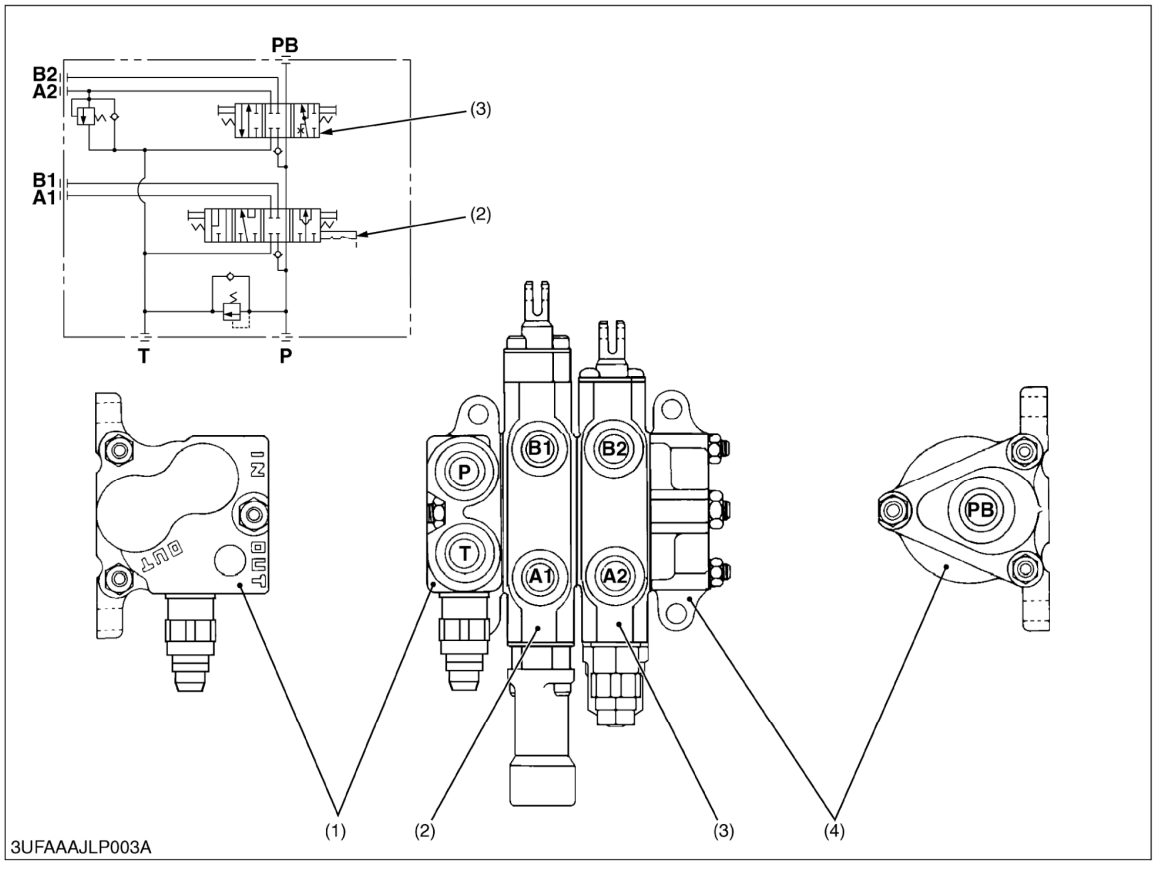
(1) Hydraulic Block
(2) Boom Cylinder
(3) Bucket Cylinder
(4) Bucket Control Valve
(5) Boom Control Valve
(6) Control Valve Assembly
(7) Relief Valve
(8) Port Relief Valve

A : To PTO Gear Case
B : To 3-point Hydraulic System
C : From Hydraulic Pump

3. CONTROL VALVE ASSEMBLY AND RELIEF VALVE



(1) Inlet Section
(2) Boom Control Valve
(3) Bucket Control Valve
(4) Outlet Section

P : P Port
T : T Port
A1 : A1 Port
A2 : A2 Port
B1 :B1 Port
B2 :B2 Port
PB :PB Port

The control valve assembly is composed of four major sections as shown above.

(1) Inlet Section

The section has **P** and **T** ports. And the relief valve is installed on this valve.

The **P** port is connected to the **OUTLET** port of hydraulic block by the hydraulic hose.

The **T** port is connected to the **TANK** port of PTO gear case by hydraulic hose.

(2) Boom Control Valve

The boom control valve is of 4-position, 6-connection, detent, spring center type, consisting of a valve housing, spool, load check valve, etc. This valve has **A1** and **B1** ports and controls oil flow to the boom cylinder.

(3) Bucket Control Valve

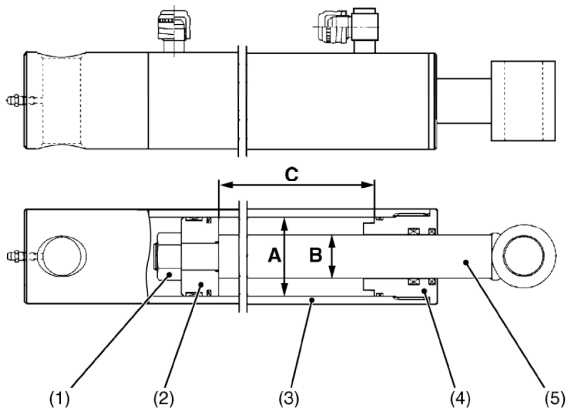
The bucket control valve is of 3-position, 6-connection, no detent, spring center type, consisting of a valve housing, spool, load check valve, etc. This valve has **A2** and **B2** ports and controls oil flow to the bucket cylinder.

(4) Outlet Section

This section has **PB** port which is connected to the **INLET** port of hydraulic block by the hydraulic hose, and feeds oil to the three point hydraulic control valve.

As for mechanism of the control valve and the relief valve, refer to Workshop Manual for LA1001, LA1251 (Code No. 9Y021-12210).

4. BOOM CYLINDER AND BUCKET CYLINDER



3UFAAACLP017B

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

A : Cylinder I.D.
B : Rod O.D.
C : Stroke

Both boom cylinder and bucket cylinder consists of a head (4), cylinder tube (3), piston rod (5), piston (2), and other parts as shown in the figure above. They are single-rod double acting cylinder in which the reciprocating motion, of the piston is controlled by hydraulic force applied to both of its ends.

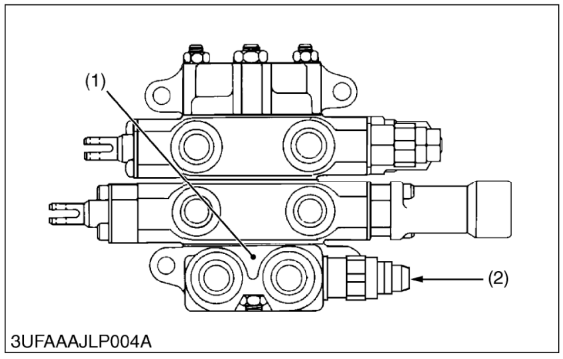
Cylinder Specifications

		LA1301, LA1301S-1	LA1601, LA1601S
Boom Cylinder	Cylinder I.D. (**A**)	64.0 mm (2.50 in.)	70.0 mm (2.75 in.)
	Rod O.D. (**B**)	34.9 mm (1.37 in.)	44.5 mm (1.75 in.)
	Stroke (**C**)	652.0 mm (25.67 in.)	
Bucket Cylinder	Cylinder I.D. (**A**)	70.0 mm (2.75 in.)	76.0 mm (3.00 in.)
	Rod O.D. (**B**)	38.1 mm (1.50 in.)	38.1 mm (1.50 in.)
	Stroke (**C**)	532.0 mm (20.94 in.)	

W1025274

5. RELIEF VALVE

[1] MAIN RELIEF VALVE



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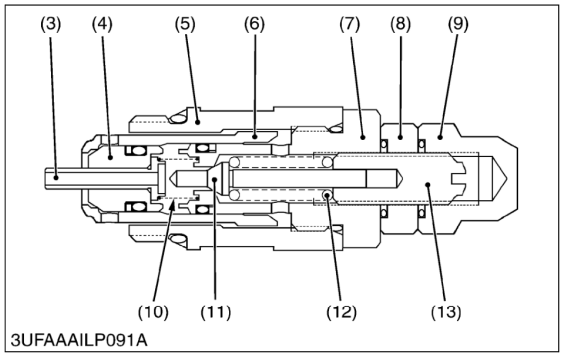

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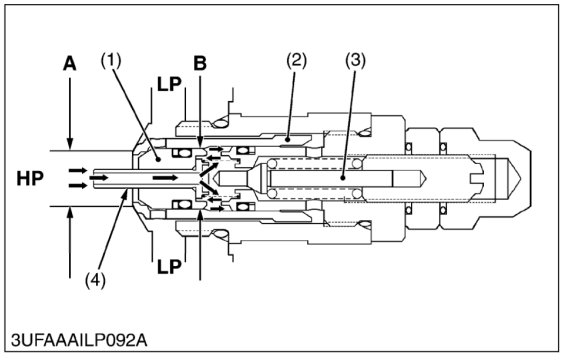
The relief valve is adopted in the loader control valve of LA1301, LA1301S-1, LA1601 and LA1601S. This relief valve is pilot operated type, it is suitable for a high pressure and large volumetric flow, and has better pressure override performance than direct acting relief valves.

This relief valve is a combination valve combining a relief operation and anti-cavitation operation.

(1) Inlet Section of Control Valve
(2) Main Relief Valve
(3) Piston Poppet
(4) Relief Valve Poppet
(5) Housing
(6) Check Valve Poppet
(7) Pilot Section
(8) Jam Nut
(9) Acorn Nut
(10) Piston Spring
(11) Pilot Poppet
(12) Pilot Spring
(13) Adjust Screw

W1020742



3UFAAAILP092A

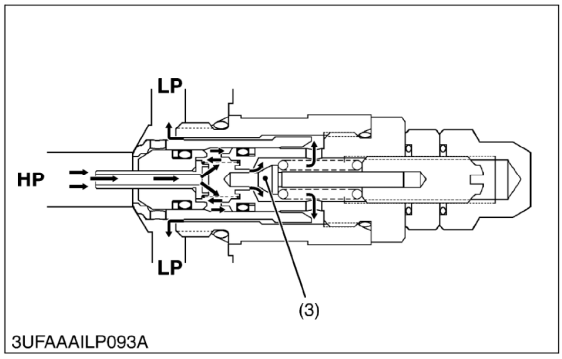
■ Relief Operation

[Step 1]

The relief valve is in communication between the high pressure port **HP** and low pressure chamber **LP**. Oil is admitted through the hole in piston poppet (4) and because of the differential area between diameter **A** and **B** relief valve poppet (1) and check valve poppet (2) are tightly seated as shown in the figure.

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

W1014486



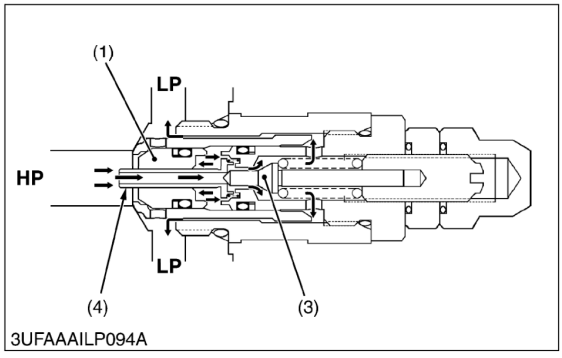
3UFAAAILP093A

[Step 2]

The oil pressure in the high pressure port **HP** has reached the setting of the pilot spring force and unseats the pilot poppet (3) and oil flows around the poppet- through the cross drilled holes and to the low pressure chamber **LP**.

(3) Pilot Poppet

W1015008



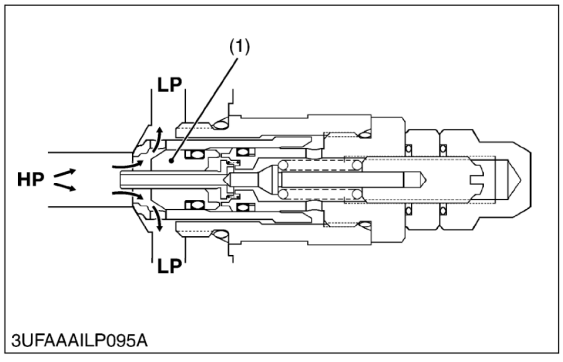
3UFAAAILP094A

[Step 3]

The loss of oil behind the piston poppet (4), effected by the opening of pilot poppet (3), causes piston poppet (4) to move back and seat against pilot poppet (3). This shuts off the oil flow to the area behind relief valve poppet (1), and causes a low pressure area internally.

(1) Relief Valve Poppet
(3) Pilot Poppet
(4) Piston Poppet

W1015129



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[Step 4]

The imbalance of pressure on the inside as compared to that of the high pressure port **HP**, force the relief valve poppet (1) to open and relief the oil directly to the low pressure chamber **LP** in the valve.

(Reference)

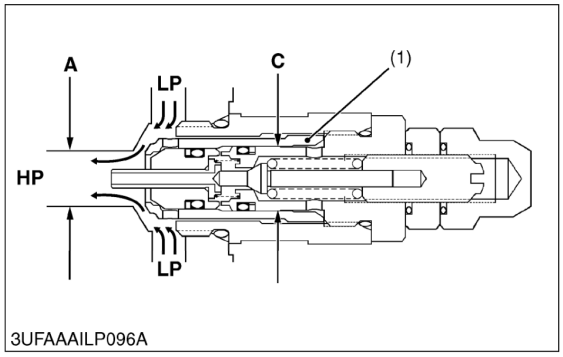
Relief valve setting pressure	Factory spec.	20.3 to 20.7 MPa 207 to 211 kgf/cm^2 2950 to 3000 psi

Condition

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

(1) Relief Valve Poppet

W1015248



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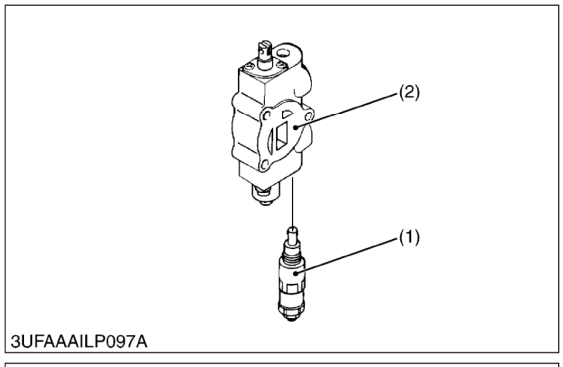
■ **Anti-cavitation Operation**

The anti-void unit supplies oil to the high pressure port **HP** when cavitation has occurred. A lower pressure exists in the port **HP** compared to the low pressure chamber **LP**. The difference between the effective area of diameter **A** and **C** causes imbalance of the check valve poppet (1) which unseats, thus allowing oil from the low pressure chamber **LP** to enter the port **HP** and fill the void.

(1) Check Valve Poppet

W1015539

[2] PORT RELIEF VALVE [SERIAL NUMBER ABOVE 10219]



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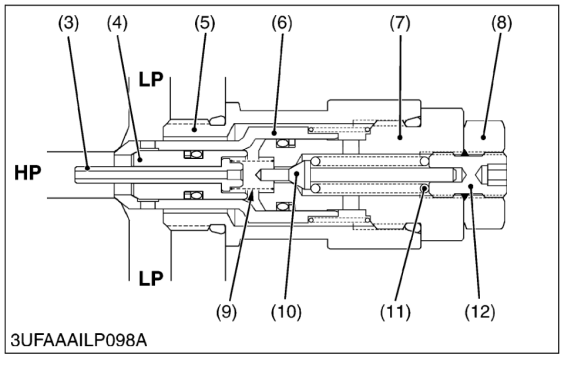

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This valve is installed on the bucket control valve (2) as shown in figure.

If an external load is imposed on the bucket cylinder, pressure builds in the circuit. When the pressure exceeds the set level, the relief valve opens and the oil returns to tank.

This relief valve is a type of combination valve which is combining a relief operation and anti-cavitation operation.

This valve is composed as shown in the left figure, and relief operation and anti-cavitation operation of this valve function same as main relief valve.

(Reference)

- Valve setting pressure : 16.7 to 17.1 MPa
  170 to 175 kgf/cm^2
  2415 to 2485 psi

Condition

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

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

LP : Low Pressure Chamber (Tank Port)
HP : High Pressure Port (A2 Port)

W1015725

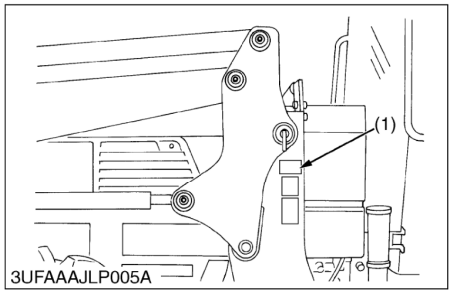
SERVICING

CONTENTS

KiSC issued 05, 2006 A

1. GENERAL

[1] IDENTIFICATION

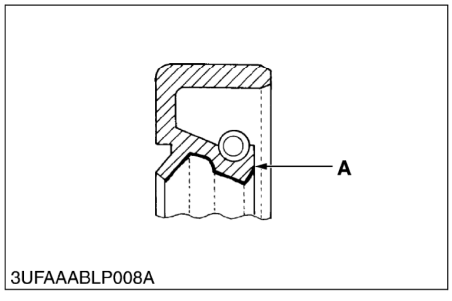


When contacting your local KUBOTA distributor, always specify front loader model and serial number.

(1) Model / Serial Number

W1010468

[2] GENERAL PRECAUTION



- 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 loader performance and to assure safety.
- O-ring and oil seals must be replaced during reassembly. Apply grease to new O-rings or oil seals before reassembling.

A : Grease

W1010531

[3] LUBRICANTS

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

Place	Capacities			Lubricants
	M-110	M-120	M95S, M105S, M95X, M105X, M125X	
Transmission case (Front loader is not attached)	55.0 L 58.1 U.S.qts 48.4 Imp.qts	58.0 L 61.3 U.S.qts 51.0 Imp.qts	60 L 63.4 U.S.qts 52.8 Imp.qts	KUBOTA UDT or SUPER UDT Fluid *
Grease fittings	Until grease overflows			Multi-purpose type grease

■ **NOTE**

- * **KUBOTA UDT or SUPER UDT Fluid .....** KUBOTA original transmission hydraulic fluid

W1010650