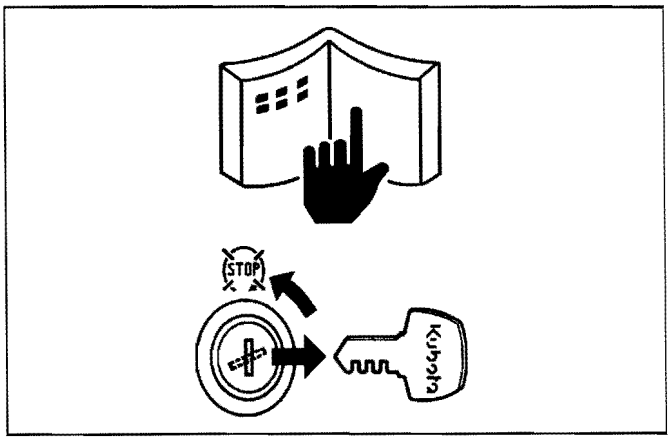
⚠ SAFETY FIRST

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.

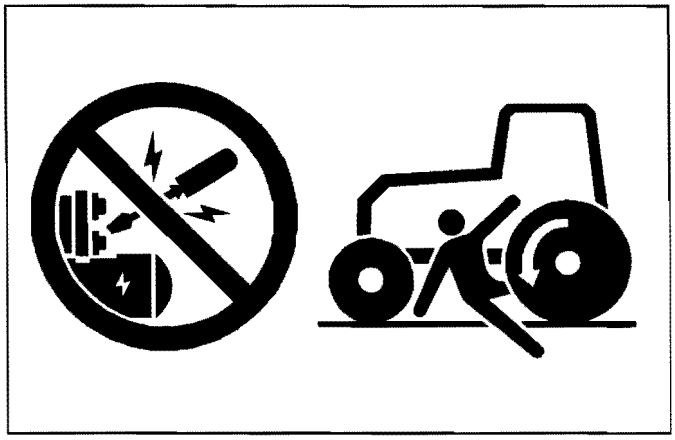
It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.

⚠ **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.**



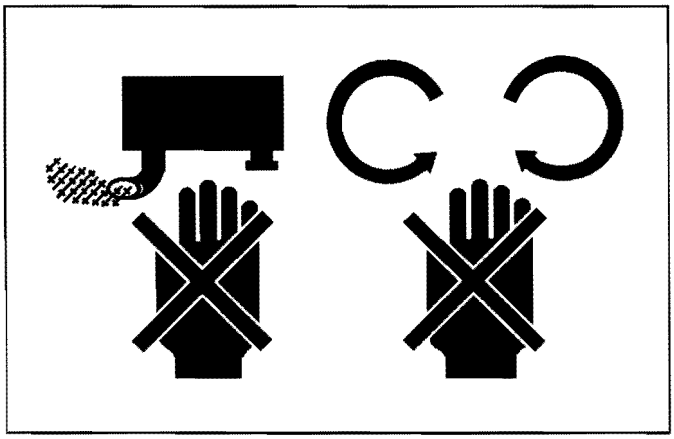
BEFORE SERVICING AND REPAIRING

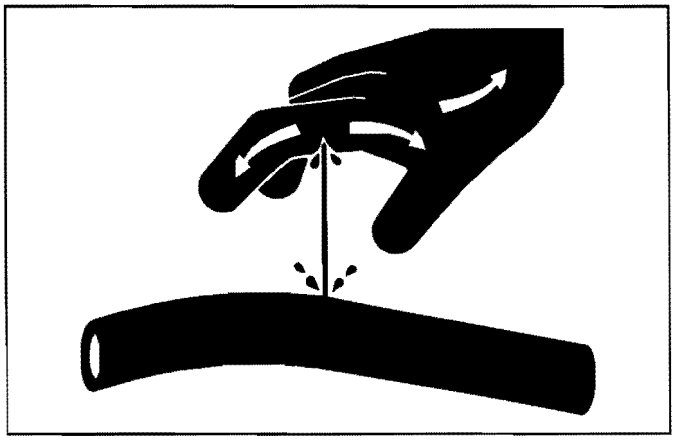
- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, and remove the key.
- Disconnect the battery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

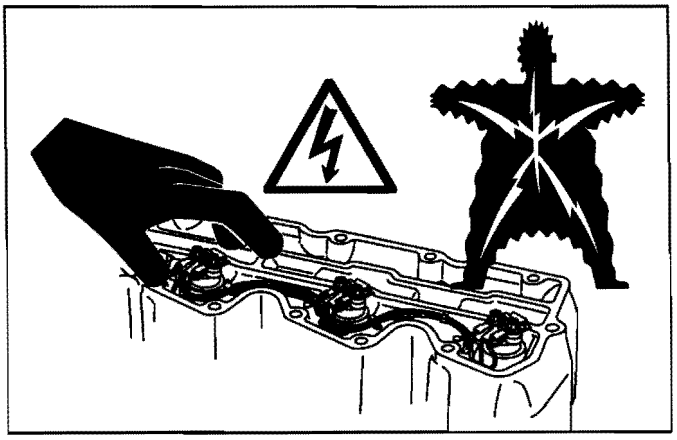


SAFETY STARTING

- 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.

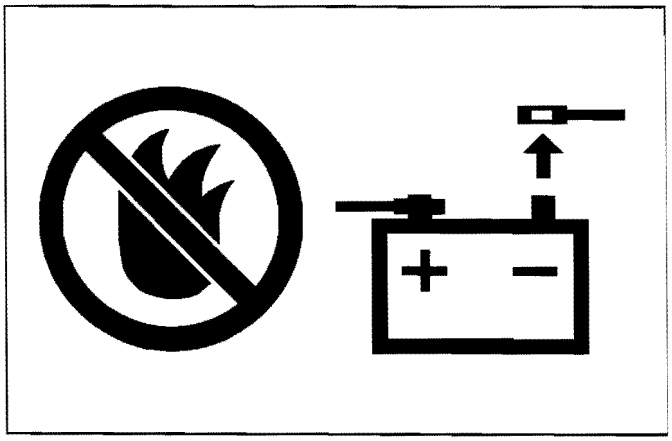






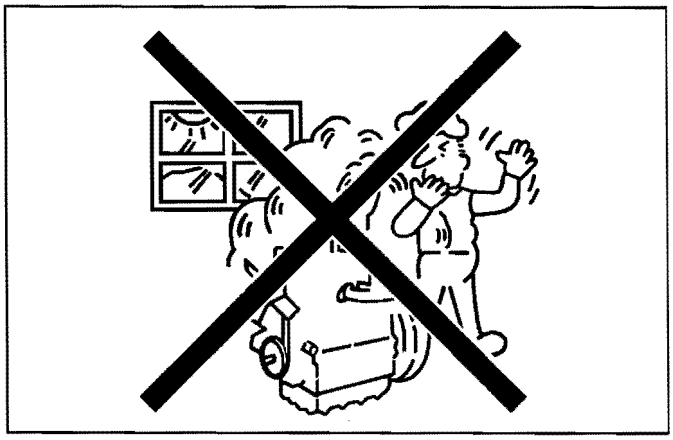
SAFETY WORKING

- 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.



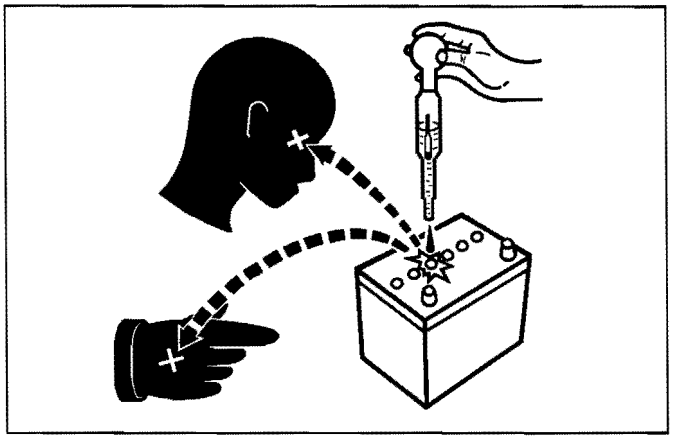
AVOID FIRES

- 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.



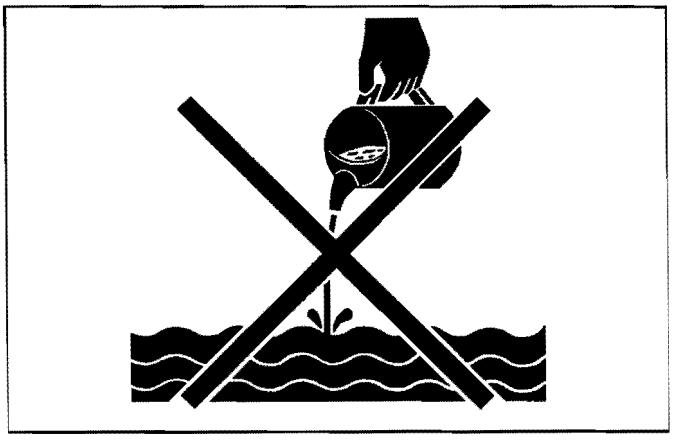
VENTILATE WORK AREA

- 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.



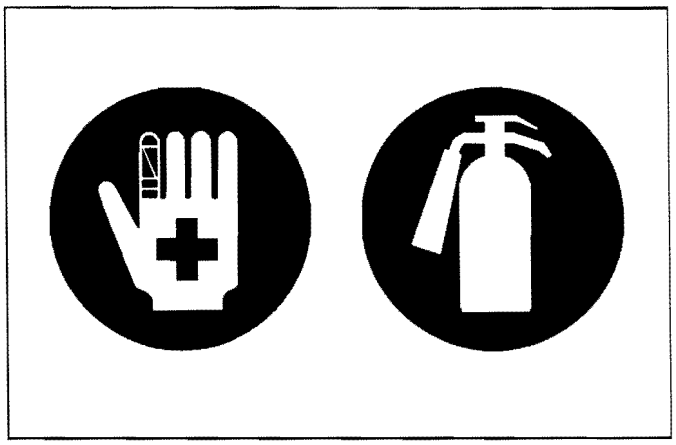
PREVENT ACID BURNS

- 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.



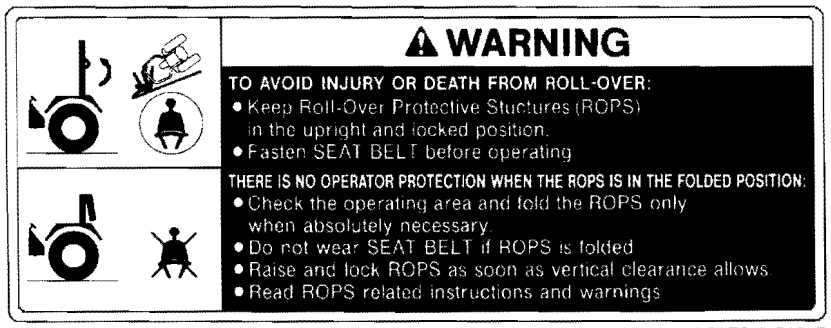
PREPARE FOR EMERGENCIES

- 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.

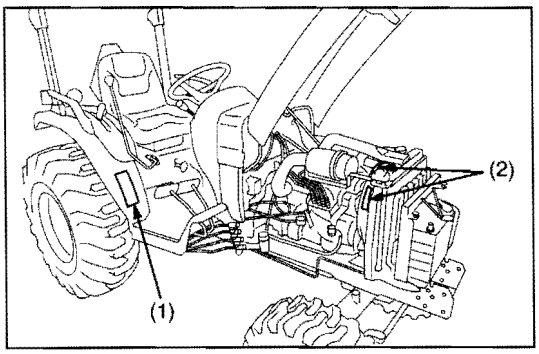
(1) Part No. TA240-9848-1



1AGAEBMAP071E

(2) Part No. 6C090-4958-2
Do not get your hands close to engine fan and fan belt.

1AGAECDAP0310

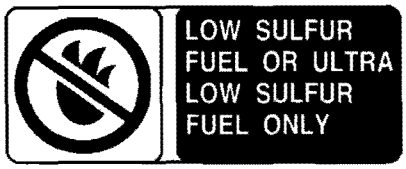


3TBAAALCP001A

(1) Part No. 6C150-4743-1

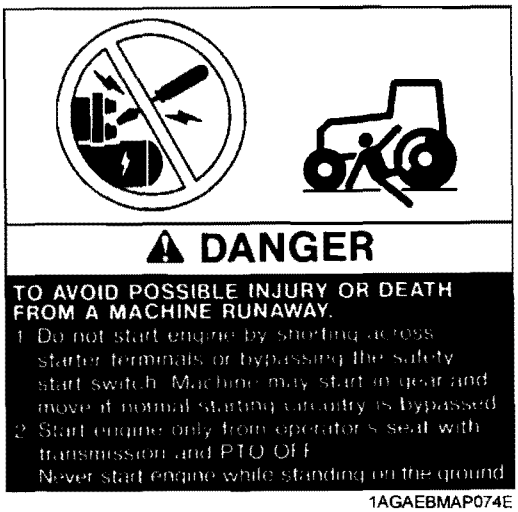
1AGAEBMAP069E

(2) Part No. 6C300-4741-3
No fire



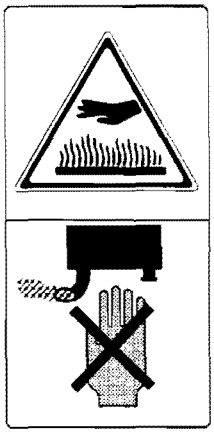
1AGAECDAP058E

(3) Part No. 6C090-4965-1



1AGAEBMAP074E

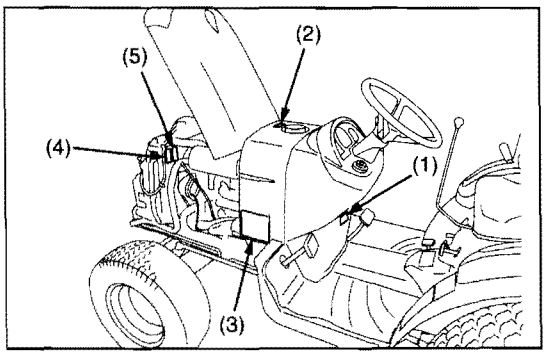
(4) Part No. 6C090-4959-1
Do not touch hot surface like muffler, etc.



1AGAECDAP0320

(5) Part No. 6C090-4958-2
Do not get your hands close to engine fan and fan belt.

1AGAECDAP0310



3TBAAALCP002A

(1) Part No. 6C070-4742-2

⚠CAUTION

TO AVOID PERSONAL INJURY:

1. Read and understand the operator's manual before operation.
2. Before starting the engine, make sure that everyone is at a safe distance from the tractor and that the PTO is OFF.
3. Do not allow passengers on the tractor at any time.
4. Before allowing other people to use the tractor, have them read the operator's manual.
5. Check the tightness of all nuts and bolts regularly.
6. Keep all shields in place and stay away from all moving parts.
7. Lock the two brake pedals together before driving on the road.
8. Slow down for turns, on rough roads, or when applying individual brakes.
9. On public roads use SMV emblem and hazard lights, if required by local traffic and safety regulations.
10. Pull only from the drawbar.
11. Before dismounting, lower the implement to the ground, set the parking brake, stop the engine and remove the key.
12. Securely support tractor and implements before working underneath.

1AGAEBMAP068E

(2) Part No. 6C120-4745-1

⚠ WARNING

TO AVOID PERSONAL INJURY:

1. Do not use the 2nd PTO speed with implements designed for 540rpm.
2. Use the 2nd PTO speed only when mid PTO or higher rpms are specifically recommended by the implement manufacturer.

1AGAECDAP0330

(3) Part No. 6C300-3012-1

55B24LS
(51R-430)

HYDROMETER

OK | CHARGE BATTERY | REPLACE BATTERY

DK 83324

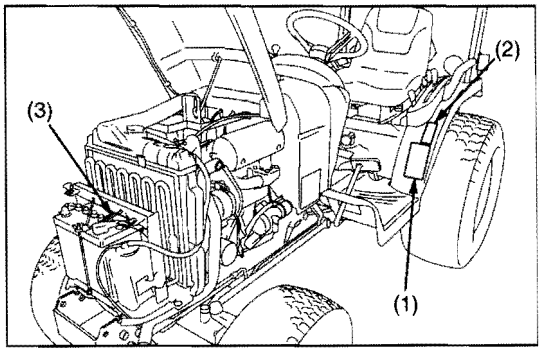
LEAD RETURN RECYCLE

FLAMMABLES | SHIELD EYES | KEEP OUT OF THE REACH OF CHILDREN | CAUTIOUS OF SULFURIC ACID | READ INSTRUCTION MANUAL CAREFULLY | EXPLOSIVE

⚠ DANGER

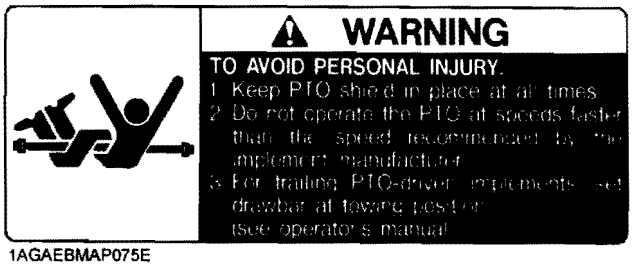
- DUE TO HYDROGEN GAS GENERATED FROM BATTERY, HANDLING WITHOUT CARE CAN CAUSE FIRE AND EXPLOSION.
- THIS 12V BATTERY IS ONLY FOR STARTING ENGINE. DO NOT APPLY THIS PRODUCT FOR OTHER USES.
- CHARGE THIS BATTERY ONLY AT WELL VENTILATED PLACES, AND AVOID SHORTS OR SPARKS.
- REFER TO THE INSTRUCTION MANUAL OF VEHICLE OR BATTERY BEFORE USING BOOSTER CABLE.
- SULFURIC ACID MAY CAUSE BLINDNESS OR SEVERE BURN. IN CASE EYES, SKIN, CLOTHES OR ANY ARTICLES ARE STAINED WITH ACID, FLUSH OBJECTS IMMEDIATELY WITH WATER. IF ACID BEING SWALLOWED, DRINK PLENTY OF WATER PROMPTLY. IN CASE OF ACCIDENTAL CONTACT, CONSULT A DOCTOR IMMEDIATELY.
- BATTERY FILLED WITH ACID (DO NOT TILT OR SPILL) - FLAMMABLE, DO NOT CHARGE NEAR FIRE OR SPARKS
- DO NOT CHARGE RAPIDLY - DO NOT DISASSEMBLE THE BATTERY (SEALED TYPE)

1AGAECDAP059E



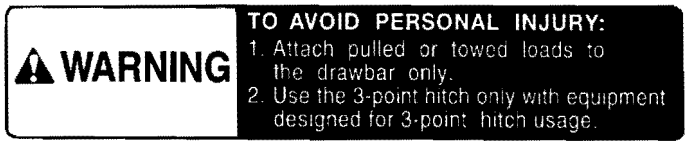
3TBAAALCP003A

(1) Part No. TA040-4959-3



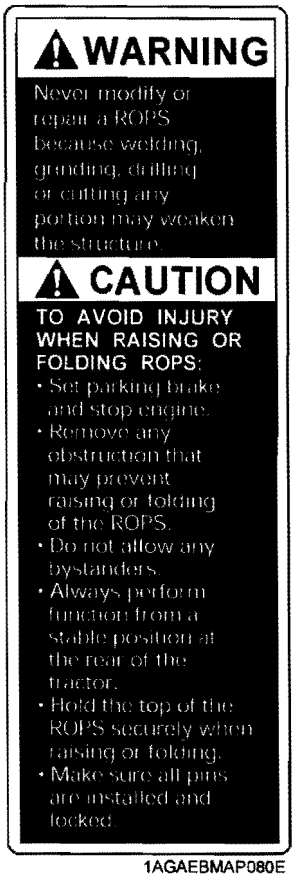
1AGAEBMAP075E

(2) Part No. 6C140-4744-1

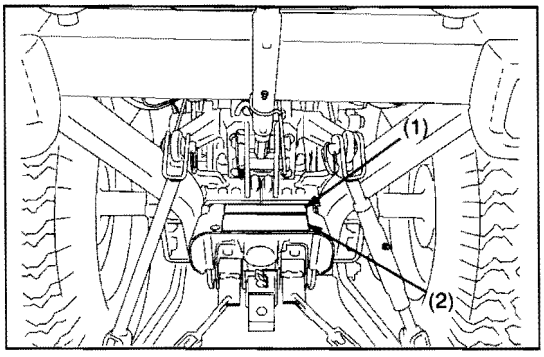


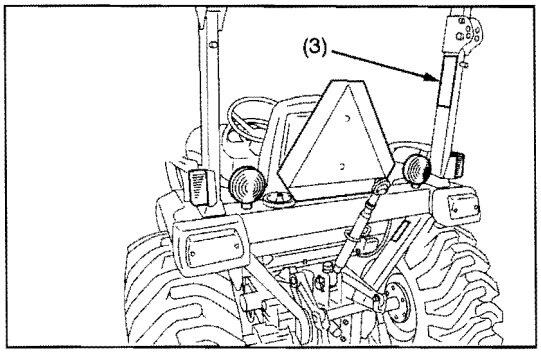
1AGAEBMAP076E

(3) Part No. 3A111-9554-1



1AGAEBMAP080E





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.

3TBAAALCP004A

SPECIFICATIONS

Model			B3200HSD	B3200HSDWO
PTO power			17.2 kW (23.0 HP)*	
Engine	Maker		KUBOTA	
	Model		V1505-E3-D24	
	Type		Indirect injection, vertical, water-cooled, 4 cycle diesel	
	Number of cylinders		4	
	Bore and stroke		78 x 78.4 mm (3.1 x 3.1 in.)	
	Total displacement		1498 cm^3 (91.5 cu.in.)	
	Engine gross power		23.9 kW (32.0 HP)*	
	Rated revolution		2700 min^{-1} (rpm)	
	Maximum torque		90 N·m (67 lbf·ft)	
	Battery		12 V, RC : 79 min, CCA : 433 A	
Capacities	Fuel tank		31 L (8.1 U.S.gals, 6.8 Imp.gals)	
	Engine crankcase (with filter)		5.4 L (5.7 U.S.qts, 4.8 Imp.qts)	
	Engine coolant		4.5 L (4.7 U.S.qts, 4.0 Imp.qts)	
	Transmission case		14.5 L (3.83 U.S.gals, 3.19 Imp.gals)	
Dimensions	Overall length (without 3-point hitch)		2520 mm (99.2 in.)	
	Overall width		1366 mm (53.8 in.)	
	Overall height (with ROPS)		2270 mm (89.4 in.)	
	Wheel base		1666 mm (65.6 in.)	
	Minimum ground clearance		370 mm (14.6 in.)	
	Tread	Front	935 mm (36.8 in.)	
		Rear	1050 mm (41.3 in.)	
Weight (with ROPS)			800 kg (1763 lbs)	
Clutch			Dry single plate	
Travelling system	Tires	Front	7 - 12	
		Rear	12.4 - 16	
	Steering		Integral type power steering	
	Transmission		Main-hydrostatic transmission, 3 range gear shift (3 forward, 3 reverse)	
	Brake		Wet disk type	
	Min. turning radius (with brake)		2.1 m (6.9 feet)	
Hydraulic system	Hydraulic control system		Quarter inching valve	
	Pump capacity		3-point hitch : 25.3 L/min (6.68 U.S.gals/min, 5.57 Imp.gals/min) Power steering : 12.2 L/min (3.22 U.S.gals/min., 2.68 Imp.gals/min)	
	3-point hitch		SAE Category 1	
	Max. lift force	At lift points	750 kg (1655 lbs)	
		24 in. behind lift points	590 kg (1300 lbs)	
PTO system	Rear PTO	Shaft	SAE 1-3/8, 6 splines	
		PTO / Engine speed rpm	1 speed 540 min^{-1} (rpm) at 2600 min^{-1} (rpm)	
	Mid PTO	Shaft	U.S.A. No.5 (KUBOTA 10-tooth) involute spline	
		PTO / Engine speed rpm	1 speed 2500 min^{-1} (rpm) at 2578 min^{-1} (rpm)	

Note : * Manufacture's estimate
The company reserves the right to change the specifications without notice.

W10281170

TRAVELLING SPEEDS

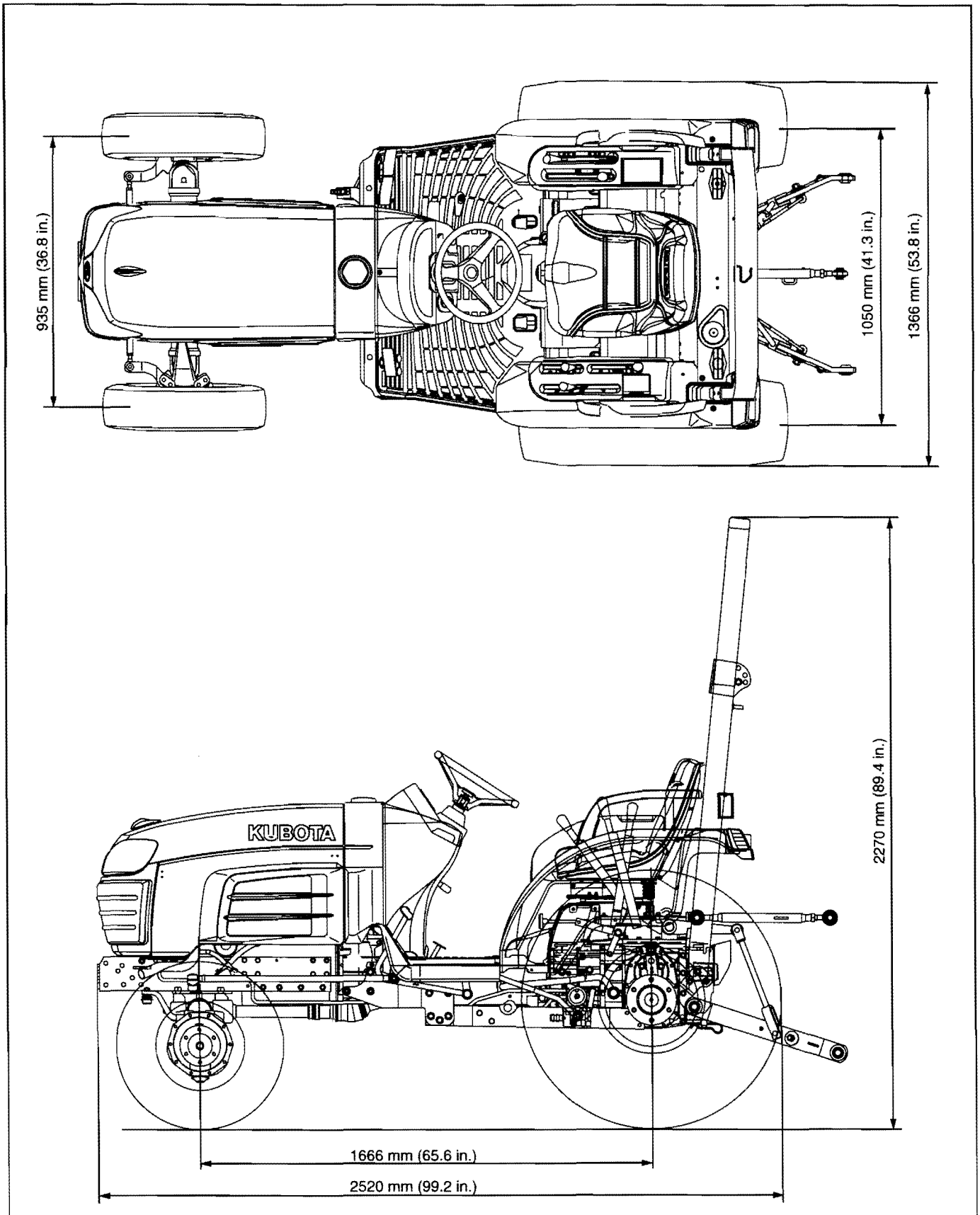
(At rated engine rpm)

Model		B3200			
Tire size (Rear)		12.4 -16 Farm		13.6 - 16 Turf	
	Range gear shift lever	km/h	mph	km/h	mph
Forward	Low	0 to 5.3	0 to 3.3	0 to 5.4	0 to 3.4
	Middle	0 to 9.2	0 to 5.8	0 to 9.4	0 to 6.0
	High	0 to 19.8	0 to 12.4	0 to 20.3	0 to 12.7
Reverse	Low	0 to 4.2	0 to 2.6	0 to 4.3	0 to 2.7
	Middle	0 to 7.2	0 to 4.5	0 to 7.4	0 to 4.6
	High	0 to 15.9	0 to 9.9	0 to 16.3	0 to 10.2

Note : The company reserves the right to change the specifications without notice.

W10330350

DIMENSIONS



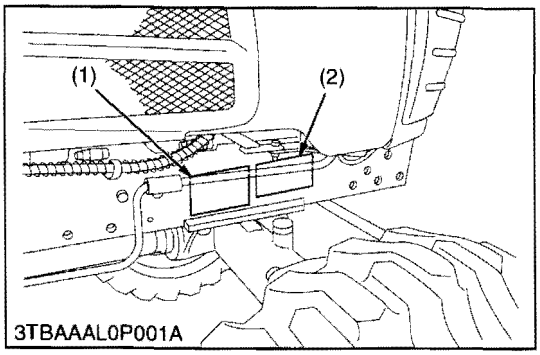
3TBAAALFP001A

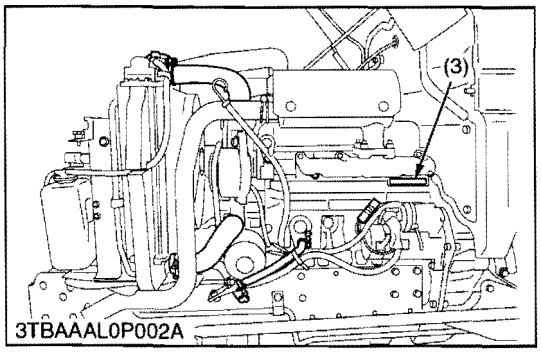
GENERAL

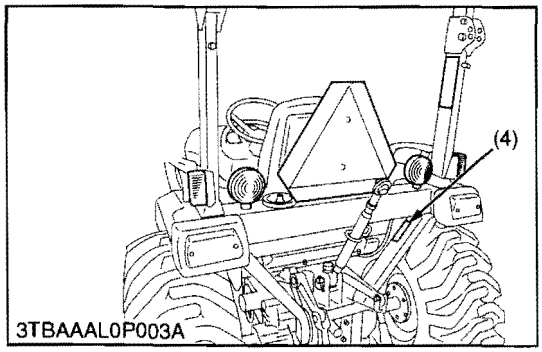
CONTENTS

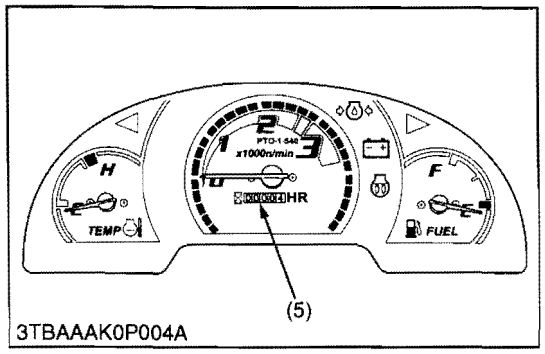
1. TRACTOR IDENTIFICATION

[1] MODEL NAME AND SERIAL NUMBER







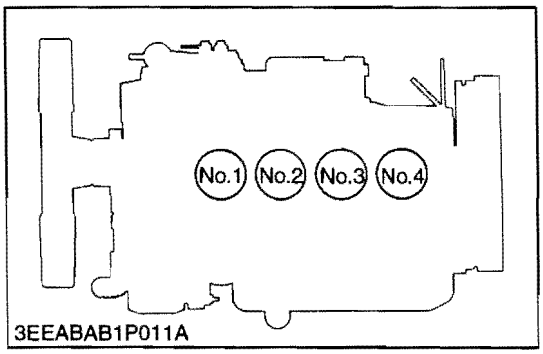


When contacting your local KUBOTA distributor, always specify engine serial number, tractor serial number, ROPS serial number and hour meter reading.

(1) Tractor Identification Plate
(2) Tractor Serial Number
(3) Engine Serial Number
(4) ROPS Identification Plate
(5) Hour Meter

W1010593

[2] CYLINDER NUMBER

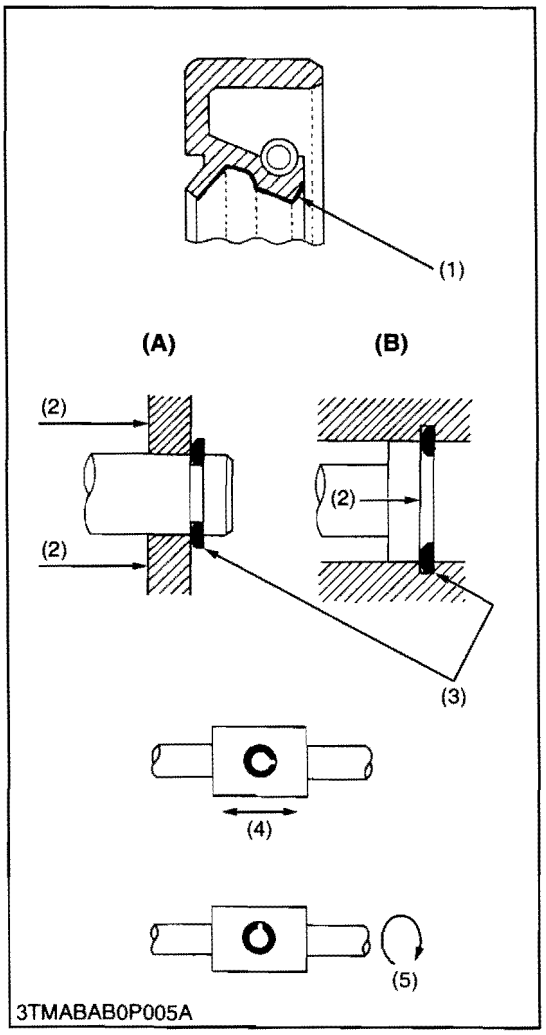


The cylinder numbers of KUBOTA diesel engine are designated as shown in the figure.

The sequence of cylinder numbers is given as No.1, No.2. No.3 and No.4 starting from the gear case side.

W1011077

2. GENERAL PRECAUTIONS



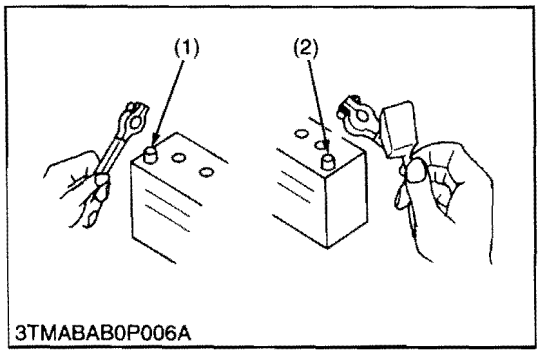
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used should be made according to the drawings provided.
- Before disassembling or servicing electrical wires, always disconnect the ground cable from the battery first.
- Remove oil and dirt from parts before measuring.
- Use only KUBOTA genuine parts for parts replacement to maintain machine performance and to assure safety.
- Gaskets and O-rings must be replaced during reassembly. Apply grease to new O-rings or oil seals before assembling. See the figure left side.
- When reassembling external snap rings or internal snap rings, they must be positioned so that sharp edge faces against the direction from which a force is applied. See the figure left side.
- When inserting spring pins, their splits must face the direction from which a force is applied. See the figure left side.
- To prevent damage to the hydraulic system, use only specified fluid or equivalent.

(1) Grease
(2) Force
(3) Sharp Edge
(4) Axial Force
(5) Rotating Movement

(A) External Snap Ring
(B) Internal Snap Ring

W1010787

3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

To ensure safety and prevent damage to the machine and surrounding equipment, heed the following precautions in handling electrical parts and wiring.

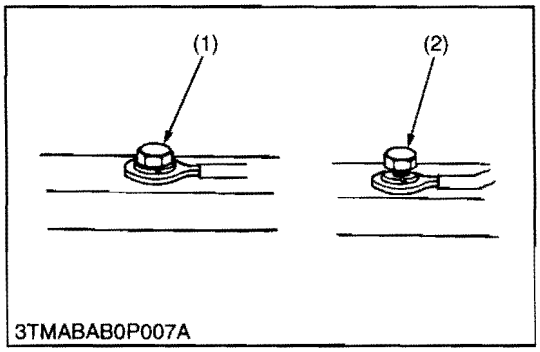
■ **IMPORTANT**

- **Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.**
- **Do not attempt to modify or remodel any electrical parts and wiring.**
- **When removing the battery cables, disconnect the negative cable first. When installing the battery cables, connect the positive cable first.**

(1) Negative Terminal (2) Positive Terminal

W1011102

[1] WIRING

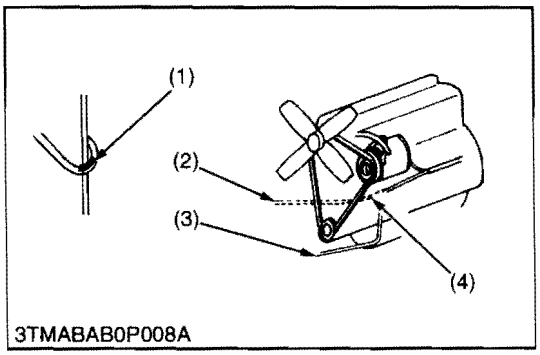


3TMABAB0P007A

- Securely tighten wiring terminals.

(1) Correct (Securely Tighten) (2) Incorrect (Loosening Leads to Faulty Contact)

W1011256

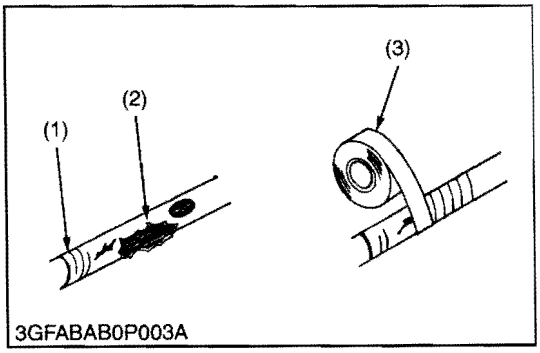


3TMABAB0P008A

- Do not let wiring contact dangerous part.

(1) Dangerous Part (3) Wiring (Correct)
(2) Wiring (Incorrect) (4) Dangerous Part

W1011360

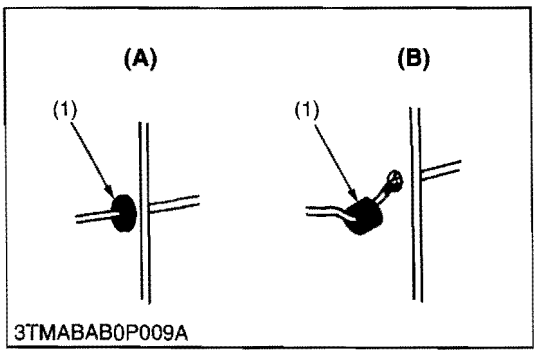


3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

(1) Aged (3) Insulating Vinyl Tape
(2) Torn

W1011482

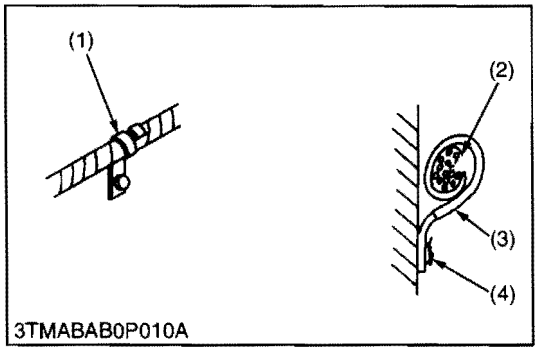


- Securely insert grommet.

(1) Grommet

(A) Correct
(B) Incorrect

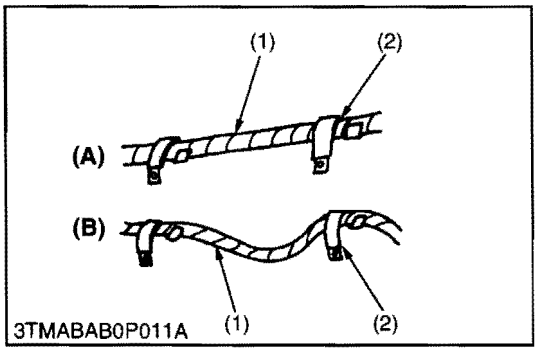
W1011601



- Securely clamp, being careful not to damage wiring.

(1) Clamp
• Wind Clamp Spirally
(2) Wire Harness
(3) Clamp
(4) Welding Dent

W1011774

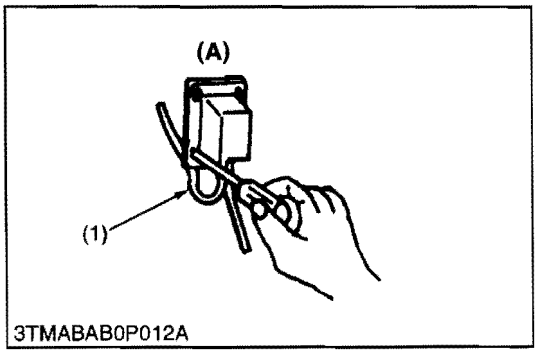


- Clamp wiring so that there is no twist, unnecessary sag, or excessive tension, except for movable part, where sag be required.

(1) Wiring
(2) Clamp

(A) Correct
(B) Incorrect

W1011940

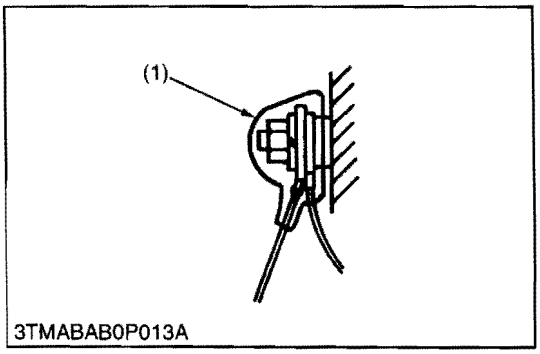


- In installing a part, take care not to get wiring caught by it.

(1) Wiring

(A) Incorrect

W1012065

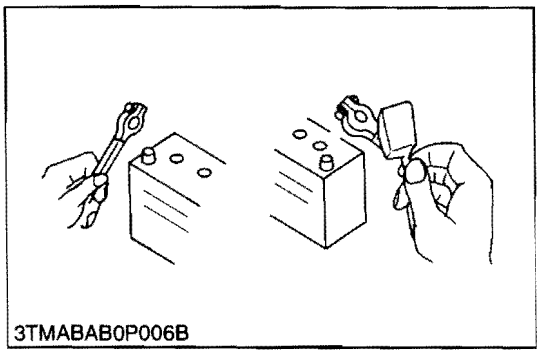


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

(1) Cover
- Securely Install Cover

W1012169

[2] BATTERY

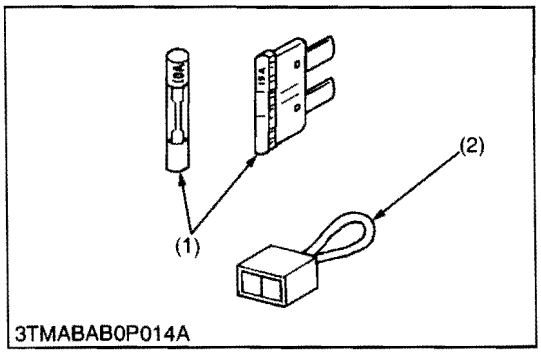


- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting cables to battery terminal posts, apply high temperature grease to them and securely install terminal covers on them.
- Do not allow dirt and dust to collect on battery.

⚠ CAUTION
- **Take care not to let battery liquid spill on your skin and clothes. If contaminated, wash it off with water immediately.**
- **Before recharging the battery, remove it from the machine.**
- **Before recharging, remove cell caps.**
- **Do recharging in a well-ventilated place where there is no open flame nearby, as hydrogen gas and oxygen are formed.**

W1012342

[3] FUSE

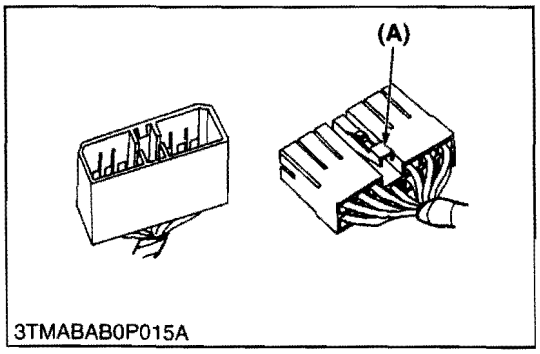


- Use fuses with specified capacity.
  Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of reserve power supply is exceeded.

(1) Fuse (2) Slow Blow Fuse

W1012543

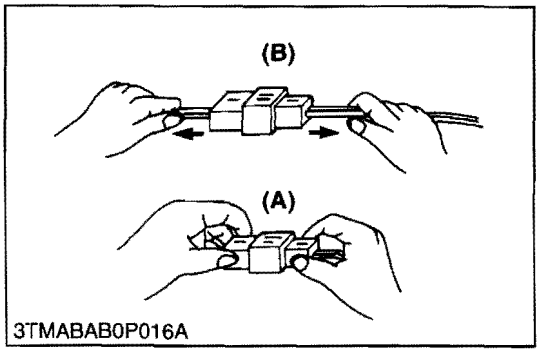
[4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

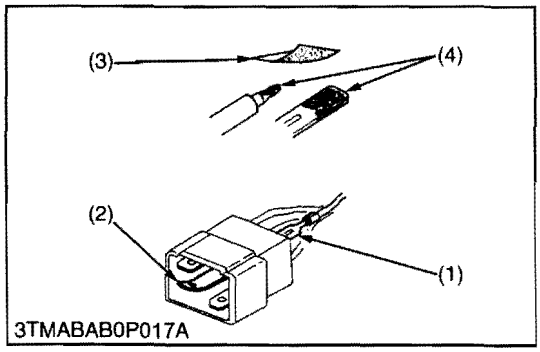
W1012701



- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct **(B) Incorrect**

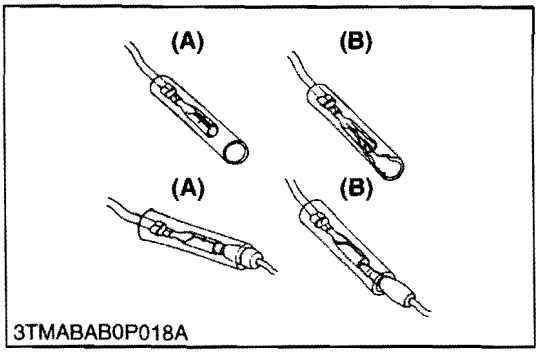
W1012798



- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make certain there is no terminal being exposed or displaced.

(1) Exposed Terminal
(2) Deformed Terminal
(3) Sandpaper
(4) Rust

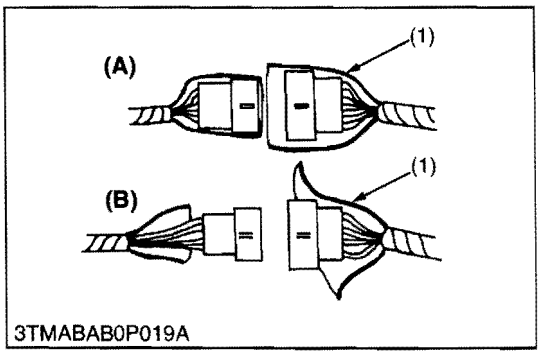
W1012915



- Make certain that there is no female connector being too open.

(A) Correct **(B) Incorrect**

W1013072



3TMABAB0P019A

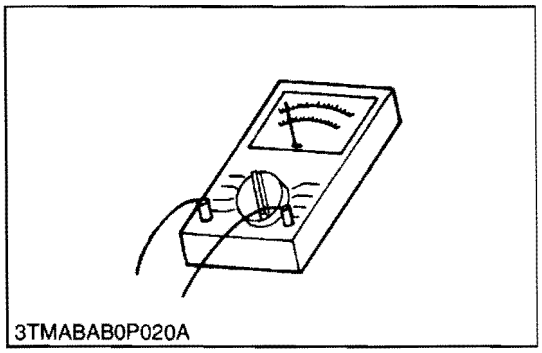
- Make certain plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct
(B) Incorrect

W1013190

[5] HANDLING OF CIRCUIT TESTER


3TMABAB0P020A

- Use tester correctly following manual provided with tester.
- Check for polarity and range.

W1013341

4. LUBRICANTS, FUEL AND COOLANT

No.	Locations	Capacities	Lubricants	
		B3200		
1	Fuel	31 L 8.2 U.S.gals 6.8 Imp.gals	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below −10 °C (14 °F)	
2	Coolant (with recovery tank)	4.5 L 4.8 U.S.qts 4.0 Imp.qts	Fresh clean water with anti-freeze	
3	Engine crankcase (with filter)	5.4 L 5.7 U.S.qts 4.8 Imp.qts	Engine oil : Refer to next page	
			Above 25 °C (77 °F)	SAE30, SAE10W-30 or 15W-40
			0 to 25 °C (32 to 77 °F)	SAE20, SAE10W-30 or 15W-40
			Below 0 °C (32 °F)	SAE10W, SAE10W-30 or 15W-40
4	Transmission case	14.5 L 3.83 U.S.gals 3.19 Imp.gals	KUBOTA UDT or SUPER UDT fluid*	
5	Front axle case	4.5 L 4.8 U.S.qts 4.0 Imp.qts	KUBOTA UDT or SUPER UDT fluid*, SAE 80-SAE 90 gear oil	

Grease				
	Greasing	No. of greasing points	Capacity	Type of grease
6	Speed control pedal	1	Until grease overflow.	Multipurpose grease NLGI-2 or NLGI-1 (GC-LB)
	Top link	1		
	Lifting rod (RH)	1		
	Battery terminal	2	Moderate amount	

*KUBOTA original transmission hydraulic fluid.

■ **NOTE**

Engine Oil :

- **Oil used in the engine should have an American Petroleum Institute (API) service classification and Proper SAE Engine Oil according to the ambient temperatures as shown above:**
- **With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-dulfur fuel, it is advisable to employ the "CF or better" lubricating oil with a high Total Base Number (TBN of 10 minimum).**
- **Refer to the following table for the suitable API classification of engine oil according to the Fuel : (Low Sulfur or High Sulfur Fuels).**

Fuel used	Engine oil classification (API classification)
High Sulfur Fuel (≥ 500 ppm)	**CF** (If the "CF-4, CG-4, CH-4, or CI-4" lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals. (approximately half))
Low Sulfur Fuel (< 500 ppm) or Ultra Low Sulfur Fuel (< 15 ppm)	**CF, CF-4, CG-4, CH-4** or **CI-4**

- **The CJ-4 engine oil is intended for DPF (Diesel Particulate Filter) type engines, and cannot be used on this tractor.**

Fuel :

- **Cetane number of 45 minimum. Cetane number greater than 50 is preferred, especially for temperatures below –20 °C (–4 °F) or elevations above 1500 m (5000 ft).**
- **If diesel sulfur content greater than 0.5 % sulfur content is used, reduce the service interval for engine oil and filter by 50 %.**
- **DO NOT use diesel fuel with sulfur content greater than 1.0 %.**
- **Diesel fuels specified to EN 590 or ASTM D975 are recommended.**
- **No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)**
- **Since this engine adopts EPA Tier 4 and Interim Tier 4 standards, the use of low sulfur fuel or ultra low sulfur fuel is mandatory in EPA regulated area (North America). Therefore, please use No.2-D S500 or S15 diesel fuel as an alternative to No.2-D, or use No.1-D S500 or S15 diesel fuel as an alternative to No.1-D if outside air temperature is below –10 °C (14 °F).**

Transmission Oil :

The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and to complete lubrication of the transmission, it is important that a multi-grade transmission fluid is used in this system. We recommend the use of KUBOTA UDT or SUPER UDT fluid for optimum protection and performance.

Do not mix different brands together.

- **Indicated capacities of water and oil are manufacturer's estimate.**

5. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLTS AND NUTS

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

Indication on top of bolt	⬡ 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

W10345420

[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit / Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8 (8 mm, 0.31 in.)	12 to 15	1.2 to 1.6	8.7 to 11	8.9 to 11	0.90 to 1.2	6.5 to 8.6
M10 (10 mm, 0.39 in.)	25 to 31	2.5 to 3.2	18 to 23	20 to 25	2.0 to 2.6	15 to 18
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1

W10481390

[3] METRIC SCREWS, BOLTS AND NUTS

Grade	Property class 8.8 (8.8)			Property class 10.9 (10.9)		
Unit / Nominal Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	24 to 27	2.4 to 2.8	18 to 20	30 to 34	3.0 to 3.5	22 to 25
M10	48 to 55	4.9 to 5.7	36 to 41	61 to 70	6.2 to 7.2	45 to 52
M12	78 to 90	7.9 to 9.2	58 to 66	103 to 117	10.5 to 12.0	76 to 86.7
M14	124 to 147	12.6 to 15.0	91.2 to 108	167 to 196	17.0 to 20.0	123 to 144
M16	197 to 225	20.0 to 23.0	145 to 166	260 to 304	26.5 to 31.0	192 to 224

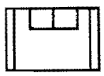
W1016172

[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS

Grade	SAE GR.5			SAE GR.8		
Unit / Nominal Diameter	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
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	48 to 56	4.9 to 5.8	35.0 to 42.0	61.1 to 73.2	6.23 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	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

W1022485

[5] PLUGS

Shape	Size	Material of opponent part					
		Ordinariness			Aluminum		
		N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
Tapered screw 	R1/8	13 to 21	1.3 to 2.2	9.4 to 15	13 to 21	1.3 to 2.0	9.4 to 15
	R1/4	25 to 44	2.5 to 4.5	18 to 32	25 to 34	2.5 to 3.5	18 to 25
	R3/8	49 to 88	5.0 to 9.0	37 to 65	49.0 to 58	5.0 to 6.0	37 to 43
	R1/2	59 to 107	6.0 to 11.0	44 to 79.5	59 to 78	6.0 to 8.0	44 to 57
Straight screw 	G1/4	25 to 34	2.5 to 3.5	18 to 25	–	–	–
	G3/8	62 to 82	6.3 to 8.4	46 to 60	–	–	–
	G1/2	49 to 88	5.0 to 9.0	37 to 65	–	–	–

0000001666E

6. MAINTENANCE CHECK LIST

No.	Item \ Period			Indication on hour meter										Important		Reference page
				50	100	150	200	250	300	350	400	450	500			
1	Engine oil		Change	★			☆				☆					G-16
2	Engine oil filter		Replace	★			☆				☆					G-16
3	Transmission oil filter (for HST)		Replace	★			☆				☆					G-17
4	Hydraulic oil filter		Replace	★							☆					G-18
5	Transmission fluid		Change								☆					G-29
6	Transmission strainer		Clean	★							☆					G-19
7	Front axle case oil		Change								☆					G-30
8	Front axle pivot		Adjust								☆					G-30
9	Engine start system		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆			G-20
10	Greasing		–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆			G-20
11	Wheel bolt torque		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆			G-22
12	Battery condition		Check		☆		☆		☆		☆		☆	*4		G-23
13	Air cleaner element	Primary element	Clean		☆		☆		☆		☆		☆	*1	@	G-25
			Replace											*2		G-31
		Secondary element	Replace													G-31
14	Fuel filter element		Clean		☆		☆		☆		☆		☆		@	G-25
			Replace								☆					G-30
15	Fan belt		Adjust		☆		☆		☆		☆		☆			G-26
16	Clutch		Adjust	★	☆		☆		☆		☆		☆			G-19
17	Brake		Adjust		☆		☆		☆		☆		☆			G-26
18	Radiator hose and clamp		Check				☆				☆					G-28
			Replace													G-32
19	Fuel line		Check		☆		☆		☆		☆		☆		@	G-27
			Replace													G-32
20	Intake air line		Check				☆				☆				@	G-27
			Replace													G-32
21	Toe-in		Adjust				☆				☆					G-28
22	Engine valve clearance		Adjust													G-31
23	Fuel injection nozzle injection pressure		Check												@	G-31
24	Injection pump		Check												@	G-31
25	Cooling system		Flush													G-32
26	Coolant		Change													G-32
27	Fuel system		Bleed													G-35
28	Clutch housing water		Drain													G-35
29	Fuse		Replace													G-35
30	Light bulb		Replace													G-36

W1035769

■ **IMPORTANT**

- **The jobs indicated by ★ must be done after the first 50 hours of operation.**
- ***1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.**
- ***2 : Every year or every 6 times of cleaning.**
- ***3 : Replace only if necessary.**
- ***4 : When the battery is used for less than 100 hours per year, check the fluid level annually.**
- **The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA non road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction. Please see the Warranty Statement in detail.**

No.	Item \ Period			Indication on hour meter								After purchase		Important		Reference page
				550	600	650	700	750	800	1500	3000	1 year	2 years			
1	Engine oil		Change		☆				☆							G-16
2	Engine oil filter		Replace		☆				☆							G-16
3	Transmission oil filter (for HST)		Replace		☆				☆							G-17
4	Hydraulic oil filter		Replace						☆							G-18
5	Transmission fluid		Change						☆							G-29
6	Transmission strainer		Clean						☆							G-19
7	Front axle case oil		Change						☆							G-30
8	Front axle pivot		Adjust						☆							G-30
9	Engine start system		Check	☆	☆	☆	☆	☆	☆							G-20
10	Greasing		–	☆	☆	☆	☆	☆	☆							G-20
11	Wheel bolt torque		Check	☆	☆	☆	☆	☆	☆							G-22
12	Battery condition		Check		☆		☆		☆					*4		G-23
13	Air cleaner element	Primary element	Clean		☆		☆		☆					*1	@	G-25
			Replace									☆		*2		G-31
		Secondary element	Replace									☆				G-31
14	Fuel filter element		Clean		☆		☆		☆						@	G-25
			Replace						☆							G-30
15	Fan belt		Adjust		☆		☆		☆							G-26
16	Clutch		Adjust		☆		☆		☆							G-19
17	Brake		Adjust		☆		☆		☆							G-26
18	Radiator hose and clamp		Check		☆				☆							G-28
			Replace										☆			G-32
19	Fuel line		Check		☆		☆		☆						@	G-27
			Replace										☆			G-32
20	Intake air line		Check		☆				☆						@	G-27
			Replace						☆				☆			G-32
21	Toe-in		Adjust		☆				☆							G-28
22	Engine valve clearance		Adjust						☆							G-31
23	Fuel injection nozzle injection pressure		Check							☆	☆				@	G-31
24	Injection pump		Check								☆				@	G-31
25	Cooling system		Flush										☆			G-32
26	Coolant		Change										☆			G-32
27	Fuel system		Bleed									Service as required				G-35
28	Clutch housing water		Drain													G-35
29	Fuse		Replace													G-35
30	Light bulb		Replace													G-36

W1026171

■ IMPORTANT

- **The jobs indicated by ★ must be done after the first 50 hours of operation.**
- ***1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.**
- ***2 : Every year or every 6 times of cleaning.**
- ***3 : Replace only if necessary.**
- ***4 : When the battery is used for less than 100 hours per year, check the fluid level annually.**
- **The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA non road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction. Please see the Warranty Statement in detail.**

7. CHECK AND MAINTENANCE

⚠ CAUTION

- **Be sure to check and service the tractor on a flat place with engine shut off, the parking brake on and chock the wheels.**

[1] DAILY CHECK

To prevent trouble from occurring, it is important to know the condition of the tractor. Check the following items before starting.

Checking

- Check areas where previous trouble was experienced.
- Walk around the tractor.

1. Check the tire pressure, and check for wear and damage.
2. Check for oil and water leaks.
3. Check the engine oil level.
4. Check the transmission fluid level.
5. Check the coolant level.
6. Check the condition of seat belt and ROPS attaching hardware.
7. Check and clean the radiator screen and grille.
8. Check the nuts of the tires are tight.
9. Check the number plate or SMV emblem for damage and cleaner replace as necessary if equipped.
10. Care of danger, warning and caution labels.
11. Clean around the exhaust manifold and the muffler of the engine.

- While sitting in the operator's seat.

1. Check the HST pedal, brake pedals and clutch pedal.
2. Check the parking brake.
3. Check the steering wheel.

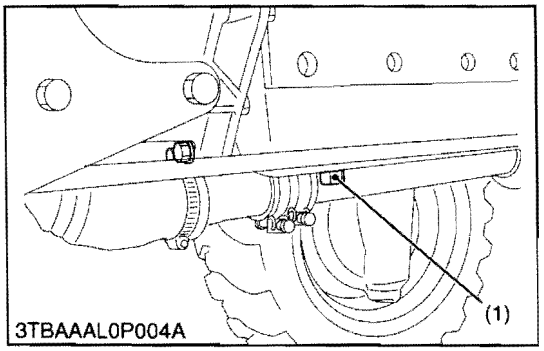
- Turning the key switch.

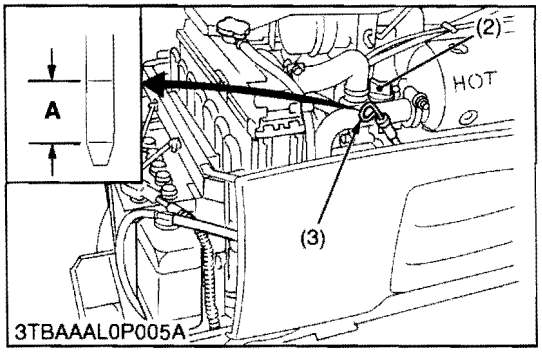
1. Check the performance of the easy checker lights.
2. Check the head lights, tail lights and hazard lights. Clean if necessary.
3. Check the performance of the meters and gauges.

- Starting the engine.

1. Check to see that the lights on the Easy Checker go off.
2. Check the color of the exhaust gas.
3. Check the brakes for proper operation.

[2] CHECK POINTS OF INITIAL 50 HOURS





Changing Engine Oil

CAUTION

To avoid personal injury :

- **Be sure to stop the engine and remove the key before changing the oil.**
- **Allow engine to cool down sufficiently, oil can be not and can burn.**

1. Place an oil pan underneath the engine.
2. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
3. Screw in the drain plug (1).
4. Fill with the new oil up to the upper notch on the dipstick.

■ IMPORTANT

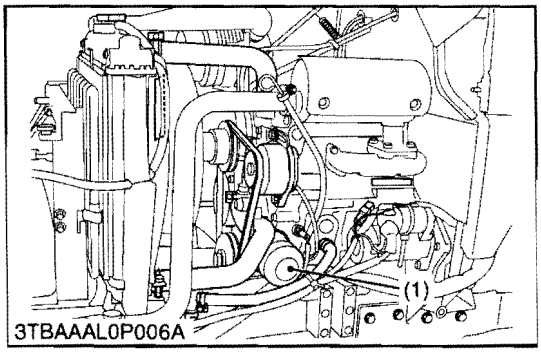
- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9)**

Engine oil capacity	5.4 L 5.7 U.S.qts 4.8 Imp.qts

(1) Drain Plug
(2) Oil Inlet
(3) Dipstick

A : Proper Oil Level

W1031890



Replacing Engine Oil Filter Cartridge

CAUTION

- **Be sure to stop the engine before changing oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

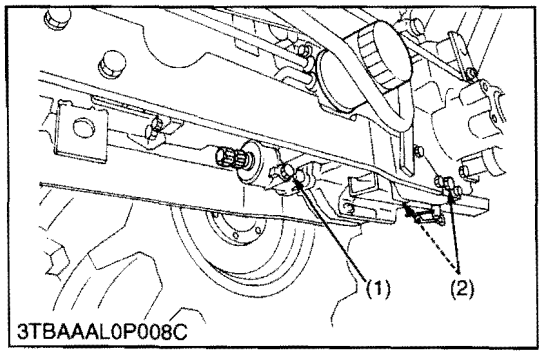
1. Remove the oil filter cartridge with the filter wrench.
2. Apply a slight coat of oil onto the cartridge gasket.
3. To install the new cartridge, screw it in by hand. Over tightening may cause deformation of rubber gasket.
4. After the new cartridge has been replaced, the engine oil normally decrease a little. Thus see that the engine oil does not leak through the seal and be sure to read the oil level on the dipstick. Then, replenish the engine oil up to the specified level.

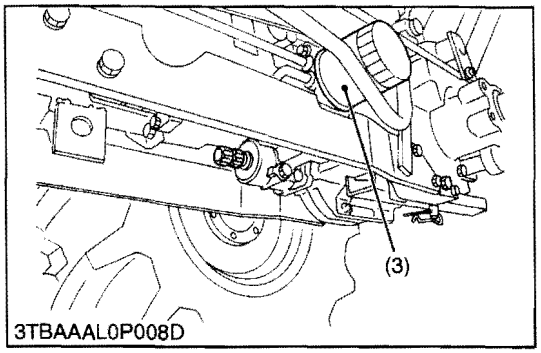
■ IMPORTANT

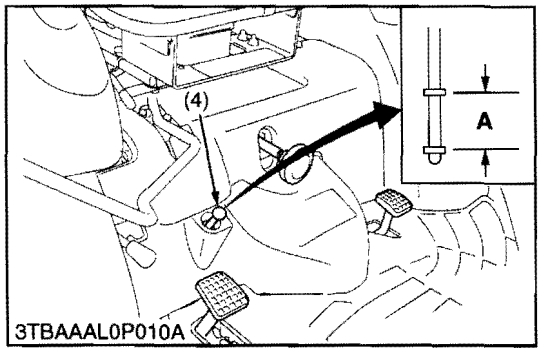
- **To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA genuine filter or its equivalent.**

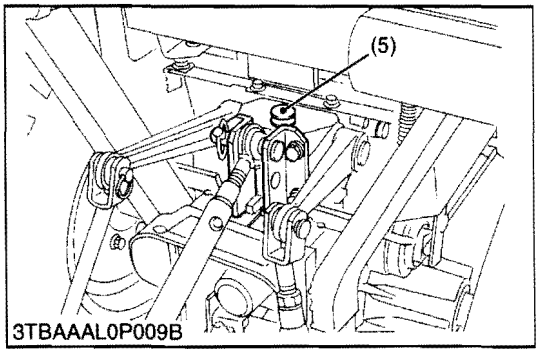
(1) Engine Oil Filter Cartridge

W1028333









Replacing Transmission Oil Filter (for HST)

⚠ CAUTION

To avoid personal injury :

- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. Remove the drain plugs at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs.
3. Remove the oil filter.
4. Put a film of clean transmission oil on the rubber seal of the new filter.
5. Quickly tighten the filter until it contacts the mounting surface, then, with a filter wrench, tighten it an additional 1 turn only.
6. After the new filter has been replaced, fill the transmission oil up to the upper notch on the dipstick.
7. After running the engine for a few minutes, stop the engine and check the oil level again, add oil to the prescribed level.
8. Make sure that the transmission fluid does not leak past the seal on the filter.

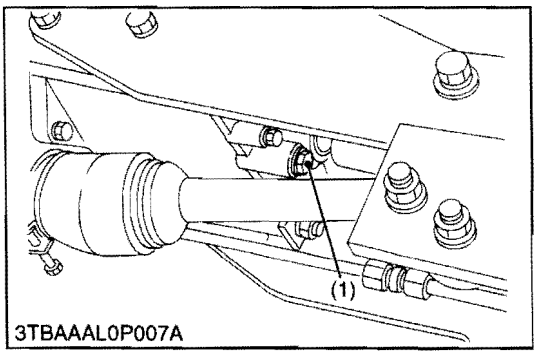
■ IMPORTANT

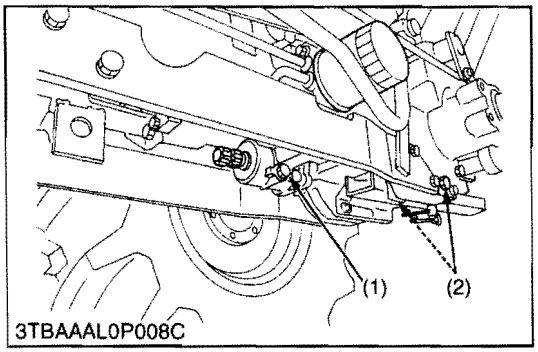
- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**

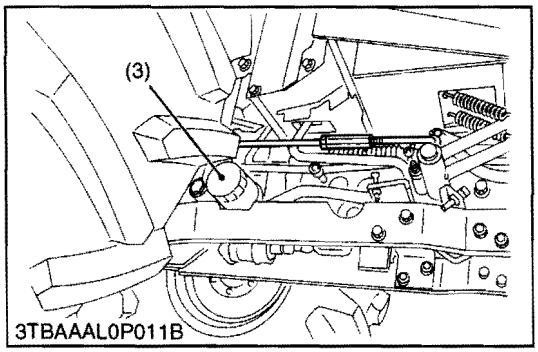
(1) Drain Plug
(2) Drain Plugs (Both Sides)
(3) Transmission Oil Filter
(4) Dipstick
(5) Oil Inlet

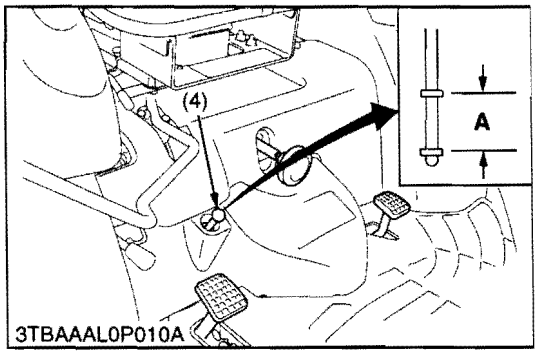
A : Oil level is acceptable within this range.

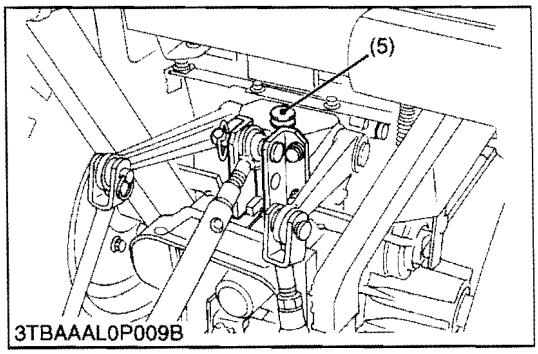
W1030975











Replacing Hydraulic Oil Filter

CAUTION

To avoid personal injury:

- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. To drain the used oil, remove the drain plug at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug.
3. Remove the oil filter.
4. Put a film of clean transmission oil on rubber seal of new filter.
5. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
6. Fill with new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).

Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

7. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.
8. After the new filter has been replaced, the transmission fluid level will decrease a little. Make sure that the transmission fluid does not leak through the seal, and check the fluid level. Top off if necessary.
9. Properly dispose of used oil.

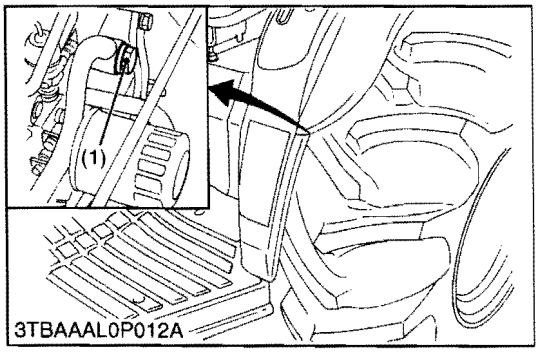
■ IMPORTANT

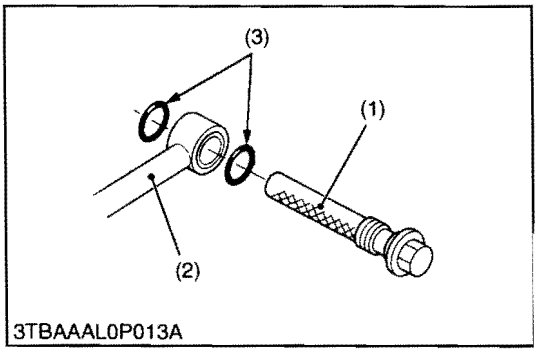
- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**
- **If the 3-point hitch can not be raised by setting the hydraulic control lever to the UP position after long term storage or when changing the transmission oil, turn steering wheel to the right and left several times to bleed air from the system.**
- **Do not operate the tractor immediately after changing the transmission fluid.**

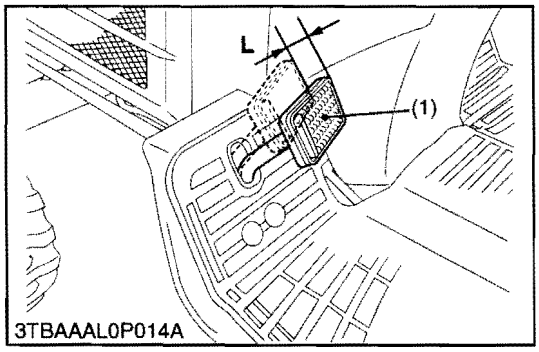
(1) Drain Plug
(2) Drain Plugs (Both Sides)
(3) Hydraulic Oil Filter
(4) Dipstick
(5) Oil Inlet

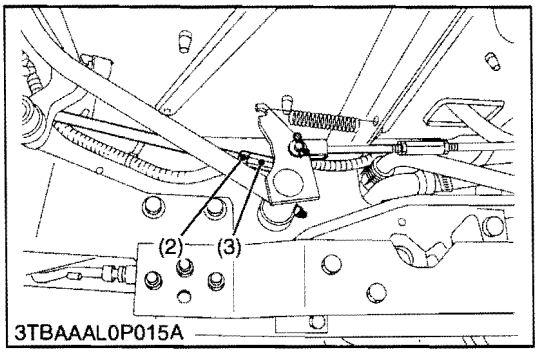
A : Oil level is acceptable within this range.

W1028973









Cleaning Transmission Strainer

1. When changing the transmission fluid, disassemble and rinse the strainer with nonflammable solvent to completely clean off filings. When reassembling be careful not to damage the parts.

■ **NOTE**

- **Since the fine filings in the oil can damage the precision component parts of the hydraulic system, the end of the suction line is provided with an oil strainer.**

(1) Strainer
(2) Suction Line
(3) O-ring

W1026962

Checking Clutch Pedal Free Travel

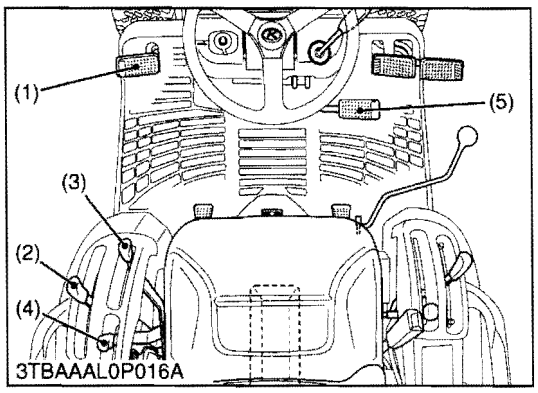
1. Stop the engine and remove the key.
2. Slightly depress the clutch pedal and measure free travel at top of pedal stroke.
3. If adjustment is needed, loosen the lock nut and turn the turnbuckle to adjust the rod length within in acceptable limits.
4. Retighten the lock nut.

Clutch pedal free travel **"L"** on top of clutch pedal	20 to 30 mm 0.8 to 1.2 in.

(1) Clutch Pedal
(2) Lock Nut
(3) Turnbuckle

W1045847

[3] CHECK POINTS OF EVERY 50 HOURS



Checking Engine Start System

⚠ CAUTION

- **Do not allow anyone near the tractor while testing.**
- **If the tractor does not pass the test do not operate the tractor.**

■ **Preparation before testing**

1. Sit on operator's seat.
2. Set the parking brake and stop the engine.
3. Shift the range gear shift lever to **"NEUTRAL"** position.
4. Place the speed control pedal in **"NEUTRAL"** position.
5. Shift the rear-PTO gear shift lever and mid-PTO gear shift lever to **"OFF"** (Disengaged) position.
6. Fully depress the clutch pedal.

■ **Test : Switch for the clutch pedal**

1. Release the clutch pedal.
2. Turn the key to **"START"** position.
3. The engine must not crank.

■ **Test : Switch for the speed control pedal**

1. Fully depress the clutch pedal.
2. Depress the speed control pedal.
3. Turn the key to **"START"** position.
4. The engine must not crank.

■ **Test : switch for the rear-PTO gear shift lever**

1. Fully depress the clutch pedal.
2. Place the speed control pedal in **"NEUTRAL"** position.
3. Shift the rear-PTO gear shift lever to **"ON"** (Engaged) position.
4. Turn the key to **"START"** position.
5. The engine must not to crank.

■ **Test : Switch for the mid-PTO gear shift lever**

1. Shift the rear-PTO gear shift lever to **"OFF"** (Disengaged) position.
2. Shift the mid-PTO gear shift lever to **"ON"** (Engaged) position.
3. Turn the key to **"START"** position.
4. The engine must not crank.

■ **Test : Switch for the operator's seat**

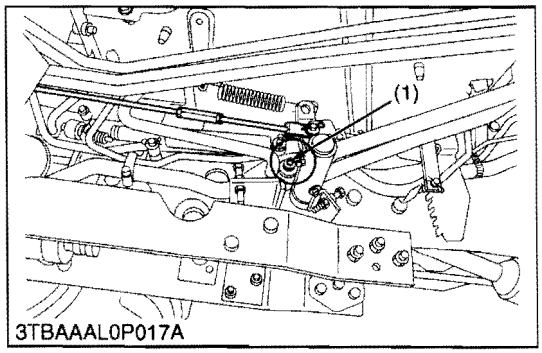
1. Sit on operator's seat.
2. Start the engine.
3. Fully depress the clutch pedal.
4. Shift the rear-PTO gear shift lever to **"ON"** (Engaged) position.
5. Stand up. (Do not get off the machine.)
6. The engine must shut off after approximately 1 second.
7. If it does not stop, check or replace the safety switch.

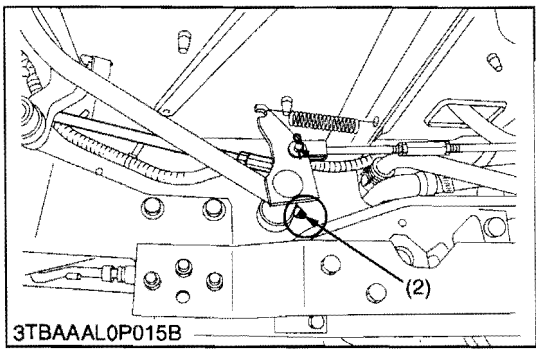
■ **NOTE**

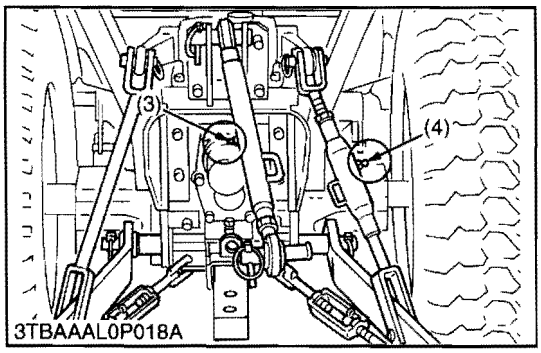
- **If the engine cranks during any of these tests, adjust or replace the required safety switch.**

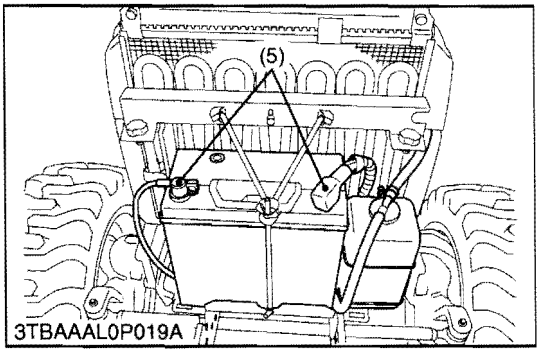
(1) Clutch Pedal
(2) Range Gear Shift Lever (L-M-H)
(3) Mid-PTO Gear Shift Lever
(4) Rear-PTO Gear Shift Lever
(5) Speed Control Pedal

W1027341







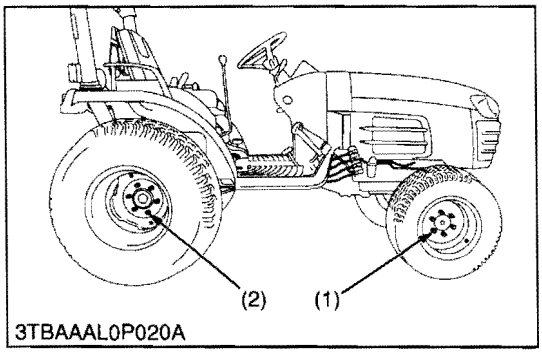


Greasing

1. Apply a grease to the following position as figures.

(1) Grease Fitting (HST Pedal)
(2) Grease Fitting (Clutch Pedal)
(3) Grease Fitting (Top Link)
(4) Grease Fitting (Lifting Rod, R.H.)
(5) Battery Terminals

W1030618



3TBAAAL0P020A

Checking Wheel Mounting Nuts Tightening Torque

CAUTION

- **Never operate tractor with a loose rim, wheel, or axle.**
- **Any time nuts are loosened, retighten to specified torque.**
- **Check all nuts frequently and keep them tight.**

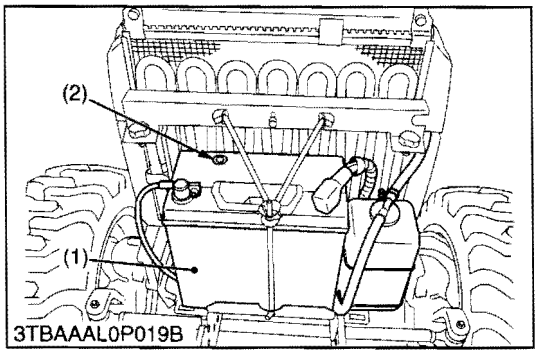
1. Check wheel nuts regularly especially when new. If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting nut	77 to 90 N·m 7.9 to 9.2 kgf·m 57 to 67 lbf·ft
	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting bolt	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Front Wheel Mounting Nut (2) Rear Wheel Mounting Nut

W1030922

[4] CHECK POINTS OF EVERY 100 HOURS



Checking Clutch Pedal Free Travel

1. See page G-19.

W1031246

Checking Battery Condition (To be continued)

⚠ DANGER

To avoid the possibility of battery explosion:
For the refillable type battery, follow the instructions below.

- **Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.**

⚠ CAUTION

- **Never remove the vent plugs while the engine is running.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately and get medical attention.**
- **Wear eye protection and rubber gloves when working around battery.**

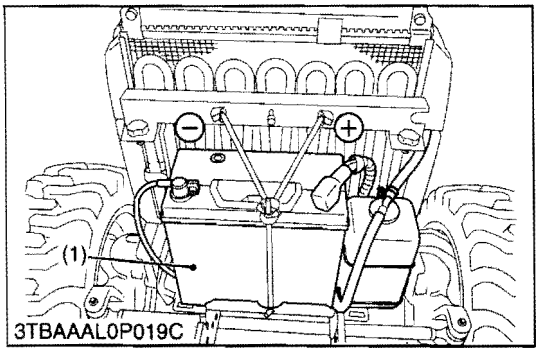
■ NOTE

- **The factory-installed battery is of non-refillable type. If the indicator turns white, do not charge the battery but replace it with new one.**

1. Mishandling the battery shortens the service life and adds to maintenance costs.
2. The original battery is maintenance free type battery, but need some servicing.
   If the battery is weak, the engine is difficult to start and the lights be dim. It is important check the battery periodically.
3. Check the battery condition by reading the indicator.
   State of indicator display.
   Green: Specify gravity of electrolyte and quality of electrolyte are both in good condition.
   Black: Need charging battery.
   White: Need charging battery.

(1) Battery (2) Indicator

W1095602



Checking Battery Condition (Continued)

■ Battery Charging

⚠ CAUTION

- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When charging battery, remove battery vent plugs.**
- **When disconnecting the cable from the battery, start with the negative terminal first.**
  When connecting the cable to the battery, start with the positive terminal first.
- **Never check battery charge by placing a metal object across the posts.**
  Use a voltmeter or hydrometer.

1. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
2. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time.
   When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
   Failure to do this will shorten the battery's service life.
3. The battery is charged if the indicator display turns green from black.
4. When exchanging an old battery into new one, use battery of equal specification shown in table 1.

Table 1

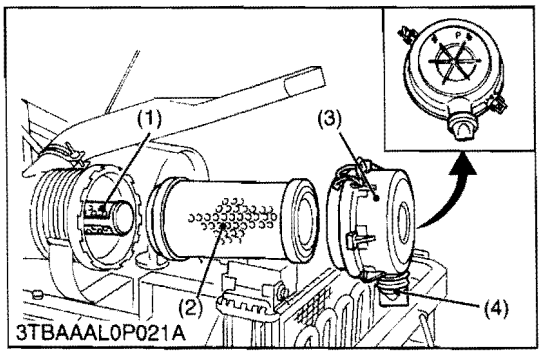
Battery Type	Volt (V)	Capacity at 5 H.R.	Reserve at (min.)	Cold Cranking Amps	Normal Charging Rate (A)
55B24L (S)-MF	12	36	79	433	4.5

■ Battery Storage

1. When storing the tractor for long periods of time, remove the battery from tractor, adjust the electrolyte to the proper level and store in a dry place out of direct sunlight.
2. The battery self-discharges while it is stored.
   Recharge it once every three months in hot seasons and once every six months in cold seasons.

(1) Battery

W1033925



Cleaning Air Cleaner Element

1. Remove the air cleaner cover (3) and primary element (2).
2. Clean the primary element if :
   - When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).
   - When carbon or oil adheres to the element, soak the element in detergent for 15 minutes then wash it several times in water, rinse with clean water and dry it naturally. After element is fully dried, inspect inside of the element with a light and check if it is damaged or not.
3. When replacing the air cleaner primary element (2), replace the secondary element (1) as well : Once a year or after every six times of cleaning, whichever comes first.

■ **NOTE**
- **Check to see if the evacuator valve (4) is blocked with dust.**

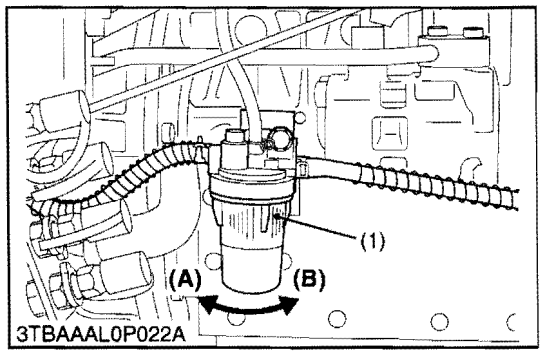
■ **IMPORTANT**
- **The air cleaner uses a dry element, never apply oil.**
- **Do not run the engine with filter element removed.**
- **Be sure to refit the dust cup with the arrow ↑ (on the rear of cup) upright. If the dust cup is improperly fitted, evacuator valve will not function and dust will adhere to the element.**
- **Do not touch the secondary element except in cases where replacing is required.**

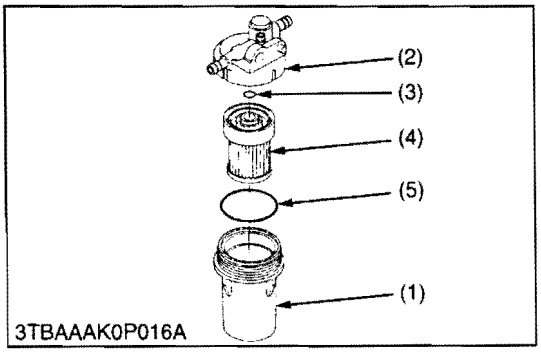
■ **Evacuator Valve**

Open the evacuator valve (4) once a week under ordinary conditions or daily when used in a dusty place to get rid of large particles of dust and dirt.

(1) Secondary (Safety) Element
(2) Primary Element
(3) Air Cleaner Cover
(4) Evacuator Valve

W1032132





Cleaning Fuel Filter

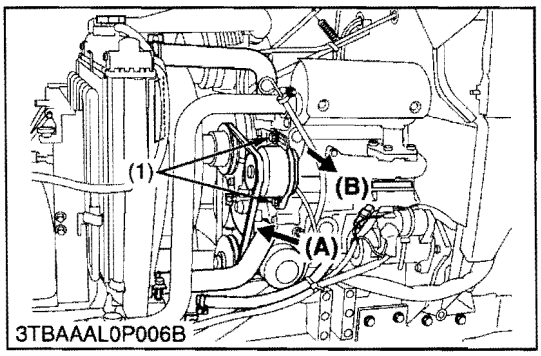
This job should not be done in the field, but in a clean place.

1. Loosen and remove the fuel filter bowl (1), and rinse the inside with kerosene.
2. Take out the filter element (4) and dip it in the kerosene to rinse.
3. After cleaning, reassemble the fuel filter, keeping out dust and dirt.
4. Bleed the fuel system. (See page G-35.)

■ **NOTE**
- **When the fuel filter bowl has been removed, fuel stops flowing from the fuel tank. If the fuel tank is almost full, however, the fuel will flow back from the fuel return pipe to the fuel filter. Before the above checking, make sure the fuel tank is less than half-full.**

(1) Fuel Filter Bowl
(2) Filter Bracket
(3) O-ring
(4) FIlter Element
(5) O-ring
(A) Loosen
(B) Tighten

W1032473



Checking Fan Belt Tension

CAUTION

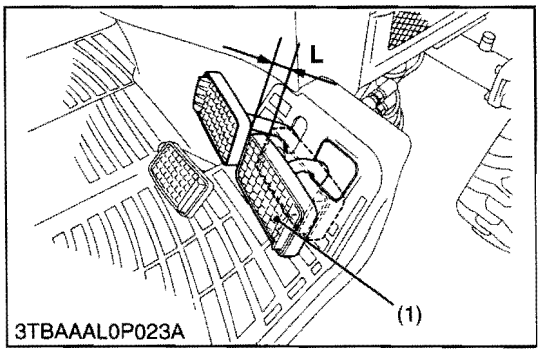
- **Be sure to stop engine before checking belt tension.**

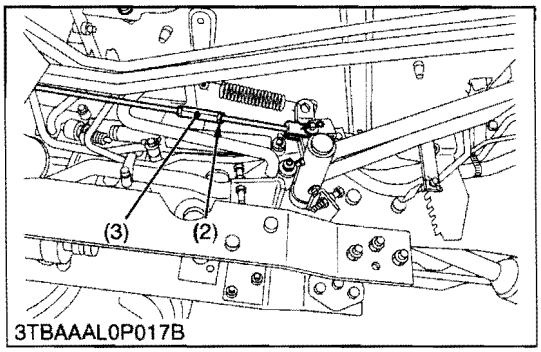
1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension in incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

Fan belt tension	Factory spec.	A deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

(1) Bolt
(A) Check the belt tension
(B) To Tighten

W1032755





Adjusting Brake Pedal Free Travel

CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**
- **The difference between the right and left pedal free travel must be less than 5.0 mm (0.20 in.).**

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut and turn the turnbuckle to adjust the brake rod length.
4. Retighten the lock nut securely.
5. Keep the free travel in the right and left brake pedals equal.

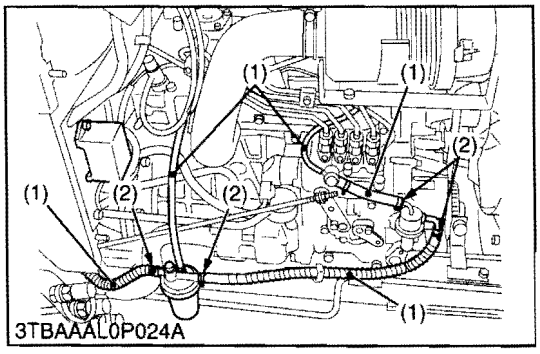
Brake pedal free travel (L)	Factory spec.	30 to 40 mm 1.2 to 1.5 in.

NOTE

- **After checking brake pedal free travel, be sure to engage the parking brake lever fully and check to see that the brake pedals are securely locked.**

(1) Brake Pedal
(2) Lock Nut
(3) Turnbuckle
L : Free Travel

W1033014



Checking Fuel Line

CAUTION

- **Stop the engine when attempting the check and change prescribed below.**
- **Remember to check the fuel line periodically. The fuel line is subject to wear and aging, fuel may leak out onto the running engine, causing a fire.**

1. Check to see that all line and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.
3. The fuel line is made of rubber and ages regardless of period of service. Replace the fuel pipe together with the clamp every two years and securely tighten.
4. However, if the fuel pipe and clamp are found damaged or deteriorated earlier than two years, then change or remedy.
5. After the fuel line and clamp have been changed, bleed the fuel system.

■ IMPORTANT

- **When the fuel line is disconnected for change, close both ends of the fuel line with a piece of clean cloth or paper to prevent dust and dirt from entering. Entrance of dust and dirt causes malfunction of the fuel injection pump. In addition, particular care must be taken not to admit dust and dirt into the fuel pump.**

(1) Fuel Hoses (2) Hose Clamps

W1033302

[5] CHECK POINTS OF EVERY 200 HOURS

Changing Engine Oil

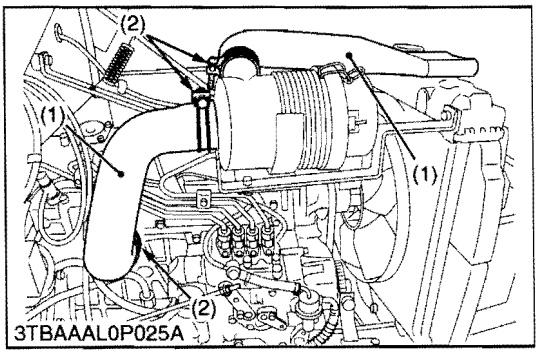
1. See page G-16.

W1034989

Replacing Engine Oil Filter Cartridge

1. See page G-16.

W1033616

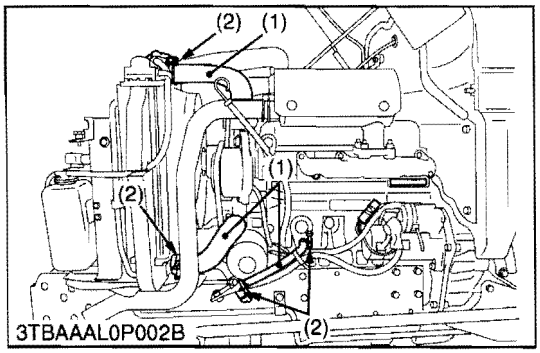


Checking Intake Air Line

1. Check to see that hoses and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

(1) Hose Clamp (2) Hose

W1033680



Checking Radiator Hose and Hose Clamp

Check to see if radiator hoses are properly fixed every 200 hours of operation or six months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten bands securely.
2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen, hardened or cracked. Replace hoses and hose clamps every 2 years or earlier if checked and found that hoses are swollen, hardened or cracked.

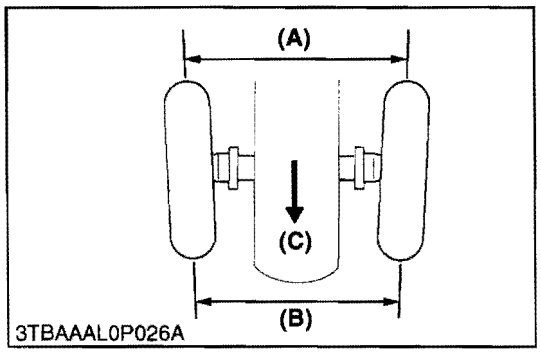
■ Precaution at Overheating

Take the following actions in the event the coolant temperature be nearly or more than the boiling point, what is called **"Overheating"**.

1. Stop the machine operation in a safe place and keep the engine unloaded idling.
2. Don't stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking that there gets on danger such as burn, get rid of the causes of overheating according to the manual, see **"Troubleshooting"** section, and then, start again the engine.

(1) Radiator Hose (2) Clamp

W1033808

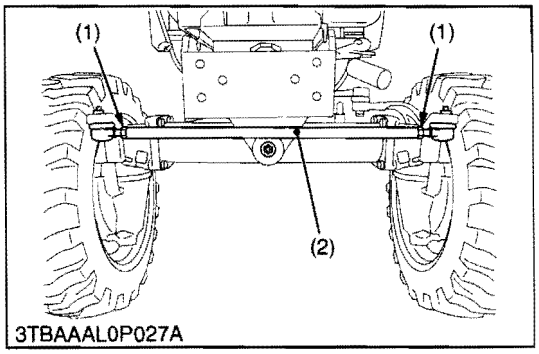


Adjusting Toe-in

1. Park tractor on a flat place.
2. Turn steering wheel so front wheels are in the straight ahead position.
3. Lower the implement, lock the park brake and stop the engine.
4. Measure distance between tire beads at front of tire, hub height.
5. Measure distance between tire beads at rear of tire, hub height.
6. Front distance should be 0 to 10 mm (0 to 3/8 in.) less than rear distance. If not, adjust tie-rod length.

■ Adjusting procedures

1. Loosen the tie-rod nut.
2. Turn the tie-rod to adjust the rod length until the proper toe-in measurement is obtained.
3. Retighten the tie-rod nut.

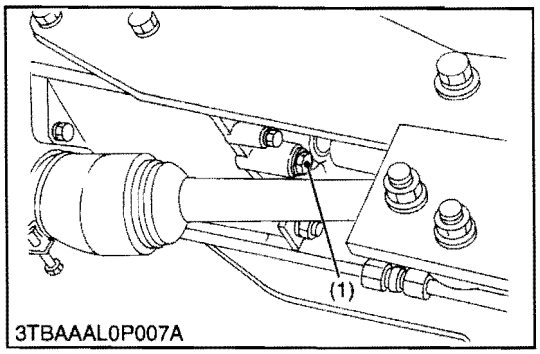


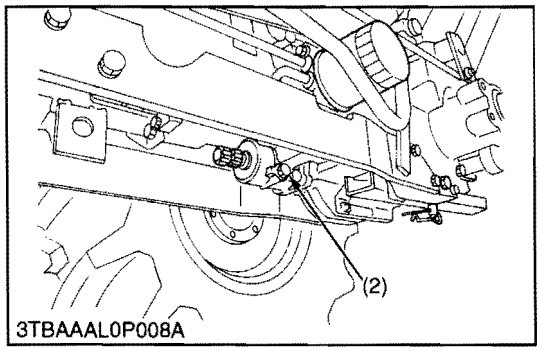
(1) Tie-rod Nut
(2) Tie-rod

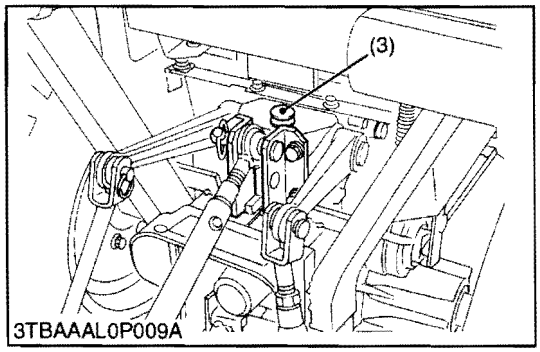
(A) Wheel-to-wheel distance at rear
(B) Wheel-to-wheel distance at front
(C) "FRONT"

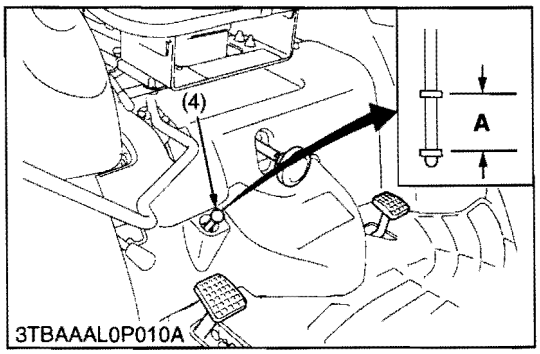
W1030674

[6] CHECK POINTS OF EVERY 400 HOURS









Replacing Hydraulic Oil Filter Cartridge

1. See page G-18.

W1034352

Changing Transmission Fluid

CAUTION

- **Be sure to stop the engine before checking and changing the transmission fluid.**

1. Place an oil pan under the tractor.
2. Remove the drain plugs (1), (2) at the bottom of the rear axle cases, transmission case and front transmission case.
3. Drain the transmission fluid.
4. After draining, screw in the four drain plugs.
5. Fill new oil from filling port after removing the filling plug (3) up to the upper notch on the dipstick (4).
6. After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

IMPORTANT

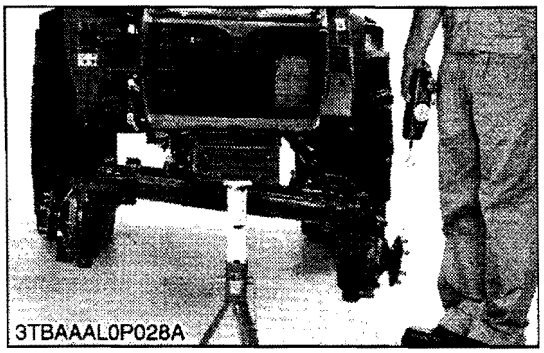
- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevents damage to the transmission.**
- **Do not mix different brands oil together.**

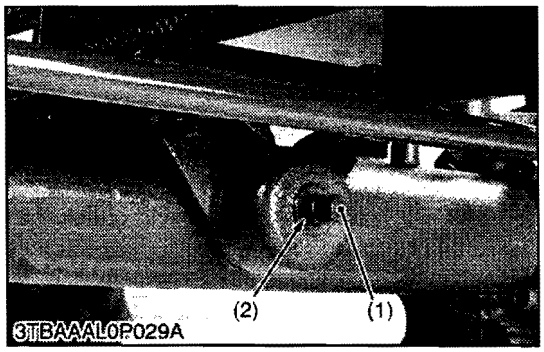
Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

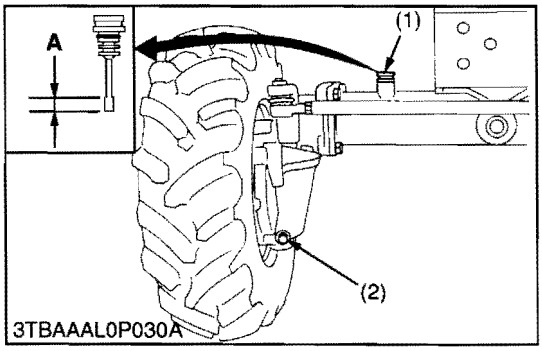
(1) Drain Plug
(2) Drain Plug
(3) Filling Plug
(4) Dipstick

A : Proper Oil Level

W1028543







Adjusting Front Axle Pivot (Front Axle Rocking Force)

If the front axle pivot pin adjustment is not correct, front wheel vibration can occur causing vibration in the steering wheel

1. Jack up the front side of tractor.
2. Set a spring balance to the front axle flange.
3. Measure the front axle rocking force.

■ **NOTE**

- **When adjusting the locking force, apply liquid gasket (Three Bond 1206D or equivalent) to the thread part of an adjusting screw.**

4. If the measurement is not within the factory specifications, adjust with the adjusting screw (1).
5. Tighten the lock nut (2) firmly.

Front axle rocking force	Factory spec.	50.0 to 100 N 5.10 to 10.1 kgf 11.3 to 22.4 lbf

(1) Adjusting Screw (2) Lock Nut

W1034698

Changing Front Axle Case Oil

1. Park the tractor on a firm, flat and level surface.
2. To drain the used oil, remove the right and left drain plugs and filling plug at the front axle case and drain the oil completely into the oil pan.
3. After draining, reinstall the drain plugs.
4. Fill with new oil up to the upper notch on the dipstick.
5. After filling, reinstall the filling plug.
6. Properly dispose of used oil.

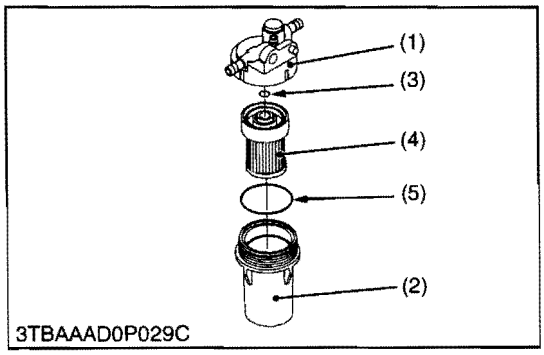
■ **IMPORTANT**

- **After ten minutes, check the oil level again, add oil to prescribed level.**
- **Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9)**

Oil capacity	4.5 L 4.8 U.S.qts 4.0 Imp.qts

(1) Filling Plug with Dipstick
(2) Drain Plug
(A) Oil Level is acceptable within this range.

W1034410



Replacing Fuel Filter Element

1. The fuel filter element should be replaced every 400 hours. See page G-25.

(1) Filter Bracket
(2) Fuel Filter Bowl
(3) O-ring
(4) Filter Element
(5) O-ring

W1034902

[7] CHECK POINTS OF EVERY 800 HOURS

Checking Valve Clearance

1. See page 1-S11.

W1035152

[8] CHECK POINTS OF EVERY 1500 HOURS

Checking Fuel Injection Nozzle Injection Pressure

1. See page 1-S17.

W1035218

[9] CHECK POINTS OF EVERY 3000 HOURS

Checking Injection Pump

1. See page 1-S16.

W1035273

[10] CHECK POINTS OF EVERY 1 YEAR

Replacing Air Cleaner Primary Element and Secondary Element

1. See page G-25.

W1035328

[11] CHECK POINTS OF EVERY 2 YEARS

Replacing Fuel Hoses

1. See page G-27.

W1051733

Replacing Intake Air Hoses

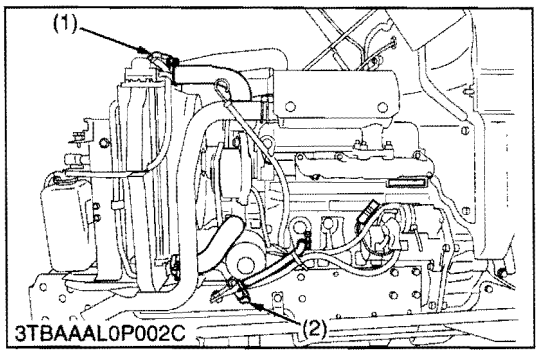
1. See page G-27.

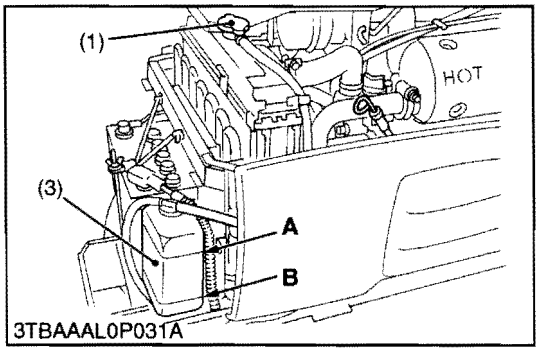
W1051790

Replacing Radiator Hoses

1. See page G-28.

W1051847





Flushing Cooling System and Changing Coolant

⚠ CAUTION

- **Do not remove the radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

1. Stop the engine, remove the key and let it cool down.
2. To drain the coolant, open the radiator drain cock and remove the radiator cap. The radiator cap must be removed to completely drain the coolant.
3. After all coolant is drained, close the drain cock.
4. Fill with clean water and cooling system cleaner.
5. Follow directions of the cleaner instruction.
6. After flushing, fill with clean water and anti-freeze until the coolant level is just below the radiator cap. Install the radiator cap securely.
7. Fill with coolant up to the **"FULL"** mark on the recovery tank.
8. Start and operate the engine for few minutes.
9. Stop the engine, remove the key and let cool.
10. Check coolant level of recovery tank and add coolant if necessary
11. Properly dispose of used coolant.

■ IMPORTANT

- **Do not start engine without coolant.**
- **Use clean, fresh water and anti-freeze to fill the radiator and recovery tank.**
- **When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.**
- **Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.**

Coolant capacity (with recover tank)	4.5 L 4.8 U.S.qts 4.0 Imp.qts

(1) Radiator Cap
(2) Drain Cock
(3) Recovery Tank

A : FULL
B : LOW

W1037510

Flush Cooling System and Changing Coolant (Continued)

■ **Anti-Freeze**

⚠ CAUTION

- **When using antifreeze, put on some protection such as rubber gloves (Antifreeze contains position.).**
- **If should drink antifreeze, throw up at once and take medical attention.**
- **When antifreeze comes in contact with the skin or clothing, wash it off immediately.**
- **Do not mix different type of antifreeze.**
  The mixture can produce chemical reaction causing harmful substances.
- **Antifreeze is extremely flammable and explosive under certain conditions. Keep fire and children away from antifreeze.**
- **When draining fluids from the engine, place some container underneath the engine body.**
- **Do not pour waste onto the grounds, down a drain, or into any water source.**
- **Also, observe the relevant environmental protection regulations when disposing of antifreeze.**

If it freezes, coolant can damage the cylinders and radiator. If the ambient temperature falls below 0 °C (32 °F) or before a long-term storage, let out cooling water completely, or mix fresh water with long-life coolant and fill the radiator and reserve tank with the mixture.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, fill the radiator with fresh water and empty it again.
   Repeat this procedure 2 or 3 times to clean up the inside.
3. Mixing the LLC
   Put the LLC in cooling water in the percentage (%) for a target temperature. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and antifreeze differs according to the make of the antifreeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

W10801950

Flush Cooling System and Changing Coolant (Continued)

■ **IMPORTANT**

- **When the antifreeze is mixed with water, the antifreeze mixing ratio must be less than 50 %.**

Vol % Anti-freeze	Freezing Point		Boiling Point*	
	°C	°F	°C	°F
40	-24	-12	106	222
50	-37	-34	108	226

*At 760 mmHg pressure (atmospheric). A higher boiling points is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system

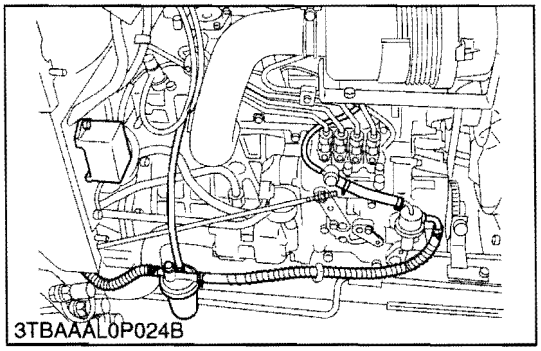
5. Adding the LLC
   - Add only water if the mixture reduces in amount by evaporation.
   - If there is a mixture leak, add the LLC of the same manufacture and type in the same mixture percentage.
     *Never add any long-life coolant of different manufacture. (Different brands may have different additive components, and the engine may fail to perform as specified.
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anticorrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

■ **NOTE**

- **The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.**
- **When the coolant level drops due to evaporation, add water only to keep the antifreeze mixing ratio less than 50 %. In case of leakage, add antifreeze and water in the specified mixing ratio before filling in to the radiator.**

W10812160

[12] OTHERS


3TBAAAL0P024B

Bleeding Fuel System

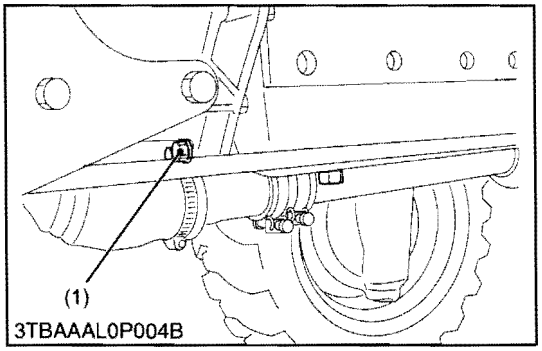
Air must be removed:

1. When the fuel filter or lines are removed.
2. When the tank is completely empty.
3. After the tractor has not been used for a long period of time.

Bleeding procedure is as follows.

1. Fill the fuel tank with fuel.
2. Start the engine and run for about 30 seconds, and then stop the engine.

W1039026



3TBAAAL0P004B

Draining Clutch Housing Water

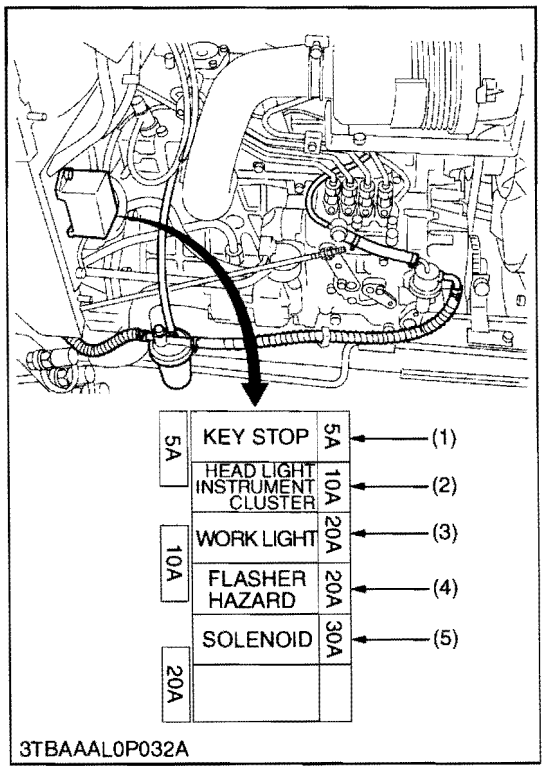
■ **NOTE**

- **The tractor is equipped with a water drain plug (1) under the clutch housing.**
- **After operating in rain, snow or tractor has been washed, water may get into the clutch housing.**

1. Remove the drain plug and drain the water, then install the plug again.

(1) Water Drain Plug

W1039199



3TBAAAL0P032A

Replacing Fuse

1. The tractor electrical system is protected from potential damage by fuses.
   A blown fuse indicates that there is an overload or short somewhere in the electrical system.
2. If any of the fuses should blow, replace with a new one of the same capacity.

■ **IMPORTANT**

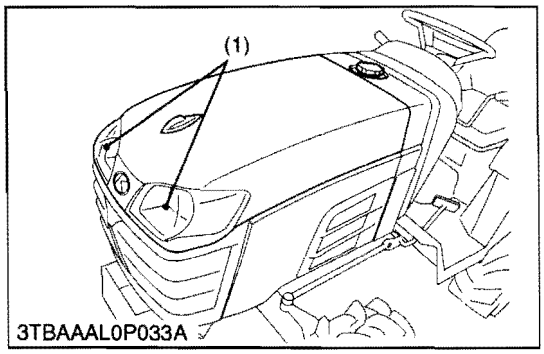
- **Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to the "TROUBLESHOOTING" section of this manual.**

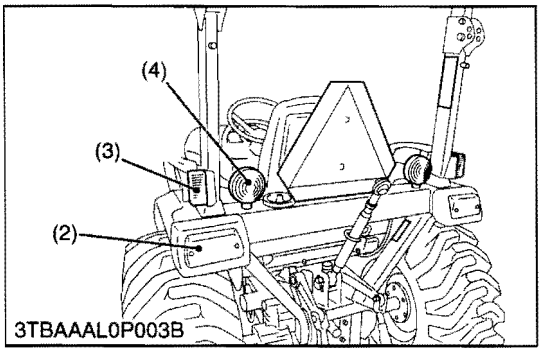
■ **Protected Circuit**

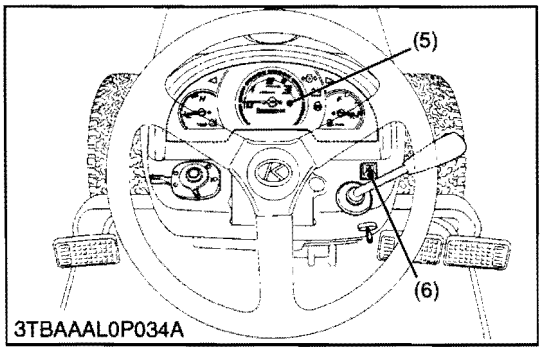
- **Do not use the fuse except indicated capacity.**

Fuse No.	Capacity (A)	Protected circuit
(1)	5	Key stop
(2)	10	Head light, Instrument panel
(3)	20	Work light
(4)	20	Flasher / Hazard light
(5)	30	Engine stop solenoid
(6)	Slow blow fuse	Check circuit against wrong battery connection

W1039315







Replacing Light Bulb

1. Head lights :
   Take the bulb out of the light body and replace with a new one.
2. Other lights :
   Detach the lens and replace the bulb.

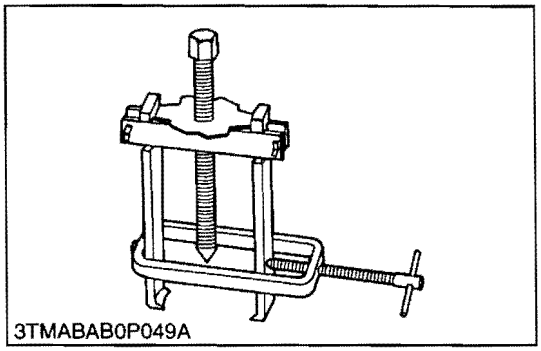
Light	Capacity
Head light	23 W
Tail light	8 W
Turn signal / Hazard light	23 W and 32 W
Instrument panel light	1.7 W
Hazard light switch indicator	0.6 W

(1) Head Light
(2) Tail Lamp
(3) Turn Signal and Hazard Light (23W)
(4) Turn Signal and Hazard Light (32W)
(5) Meter Panel
(6) Hazard Switch

W1039659

8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE

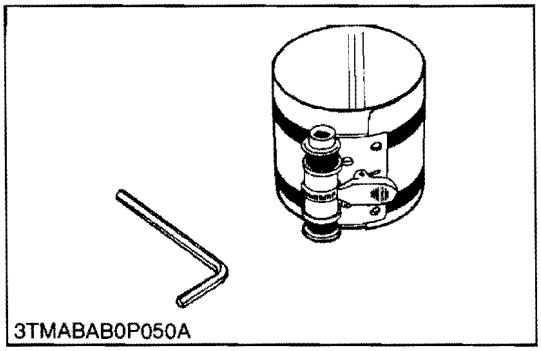

3TMABAB0P049A

Special Use Puller Set

Code No.: 07916-09032

Application: Use exclusively for pulling out bearing, gears and other parts with ease.

W1037539

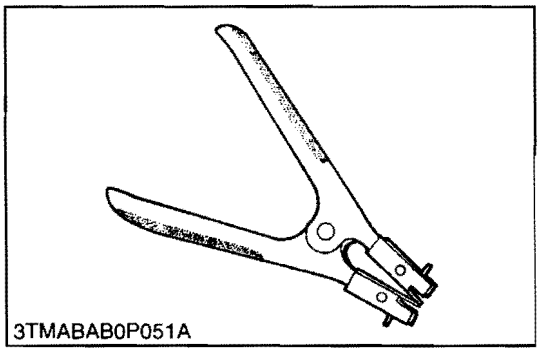

3TMABAB0P050A

Piston Ring Compressor

Code No.: 07909-32111

Application: Use exclusively for pushing in the piston with piston rings into the cylinder.

W1037605

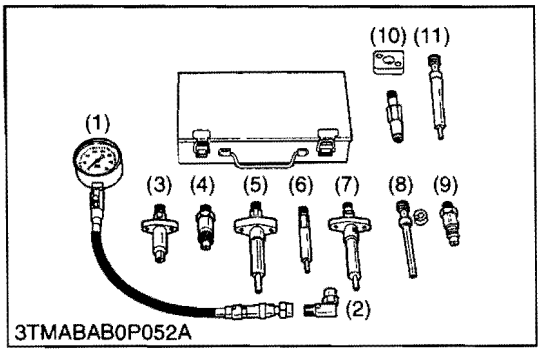

3TMABAB0P051A

Piston Ring Tool

Code No.: 07909-32121

Application: Use exclusively for removing or installing the piston ring with ease.

W1037658



3TMABAB0P052A

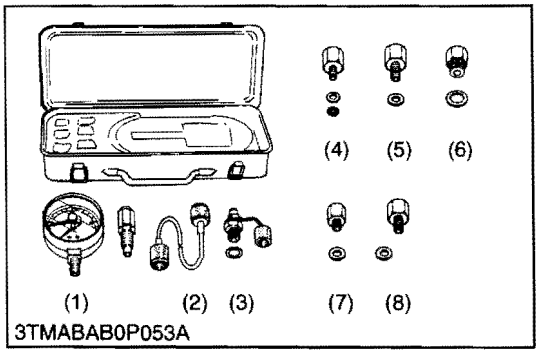
Diesel Engine Compression Tester

Code No.: 07909-30208 (Assembly) 07909-31251 (G)
07909-30934 (A to F) 07909-31271 (I)
07909-31211 (E and F) 07909-31281 (J)
07909-31231 (H)

Application: Use to measure diesel engine compression and diagnostics of need for major overhaul.

(1) Gauge
(2) L Joint
(3) Adaptor **A**
(4) Adaptor **B**
(5) Adaptor **C**
(6) Adaptor **E**
(7) Adaptor **F**
(8) Adaptor **G**
(9) Adaptor **H**
(10) Adaptor **I**
(11) Adaptor **J**

W1037711



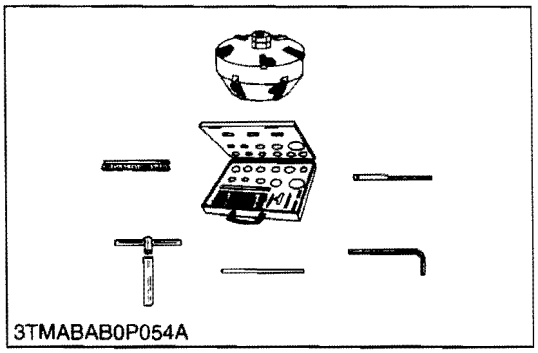
Oil Pressure Tester

Code No.: 07916-32032

Application: Use to measure lubricating oil pressure.

(1) Gauge
(2) Cable
(3) Threaded Joint
(4) Adaptor **1**
(5) Adaptor **2**
(6) Adaptor **3**
(7) Adaptor **4**
(8) Adaptor **5**

W1037937



Valve Seat Cutter

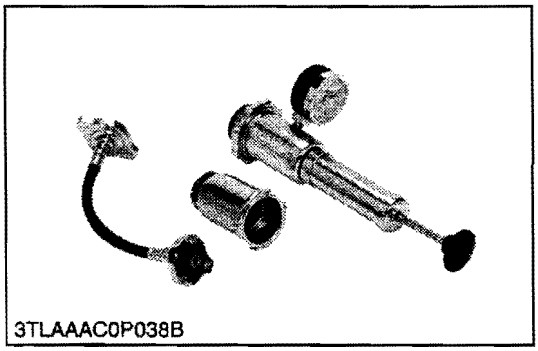
Code No.: 07909-33102

Application: Use to reseat valves.

Angle : 0.785 rad (45 °)
0.262 rad (15 °)

Diameter : 28.6 mm (1.126 in.) 38.0 mm (1.496 in.)
31.6 mm (1.244 in.) 41.3 mm (1.626 in.)
35.0 mm (1.378 in.) 50.8 mm (2.000 in.)

W1038169

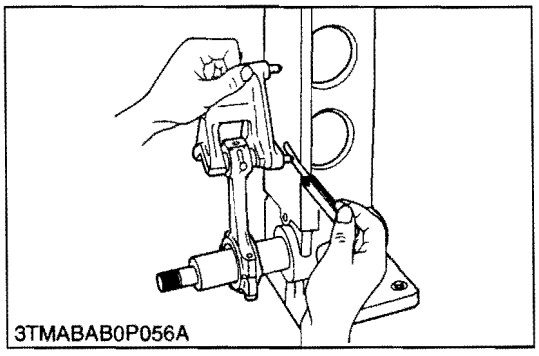


Radiator Tester

Code No.: 07909-31551

Application: Use to check of radiator cap pressure, and leaks from cooling system.

W1038266



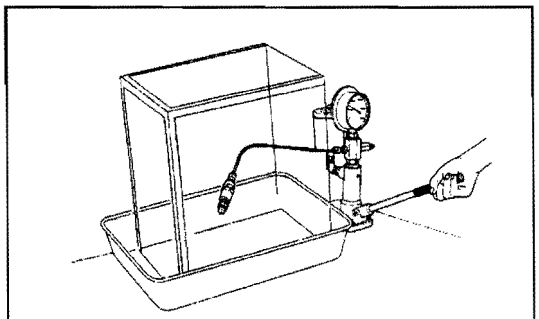
Connecting Rod Alignment Tool

Code No.: 07909-31661

Application: Use to check the connecting rod alignment.

Applicable range : Connecting rod big end I.D.
30 to 75 mm (1.18 to 2.95 in.) dia.
Connecting rod length
65 to 300 mm (2.56 to 11.81 in.)

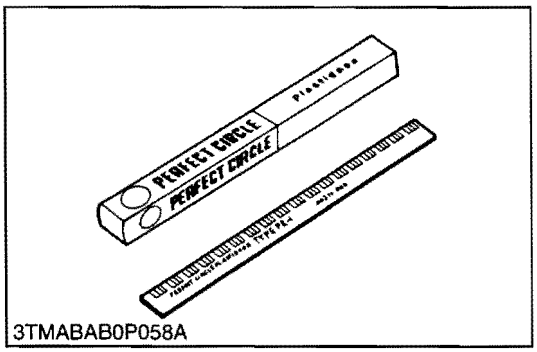
W1038319


3TLABAB1P041A

Nozzle Tester

Code No.: 07909-31361
Application: Use to check the fuel injection pressure and spray pattern of nozzle.
Measuring range : 0 to 50 MPa (0 to 500 kgf/cm^2, 0 to 7000 psi)

W1038394

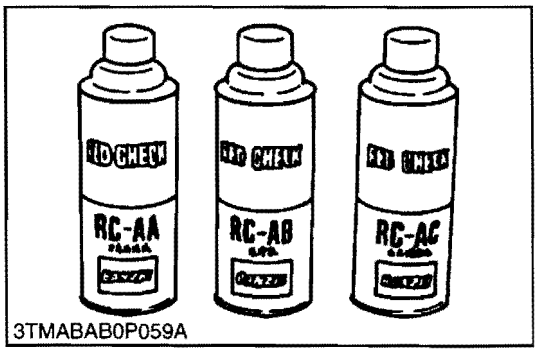


3TMABAB0P058A

Plastigage

Code No.: 07909-30241
Application: Use to check the oil clearance between crankshaft and bearing, etc..
Measuring range : Green.....0.025 to 0.076 mm (0.001 to 0.003 in.)
Red.....0.051 to 0.152 mm (0.002 to 0.006 in.)
Blue.....0.102 to 0.229 mm (0.004 to 0.009 in.)

W1038481

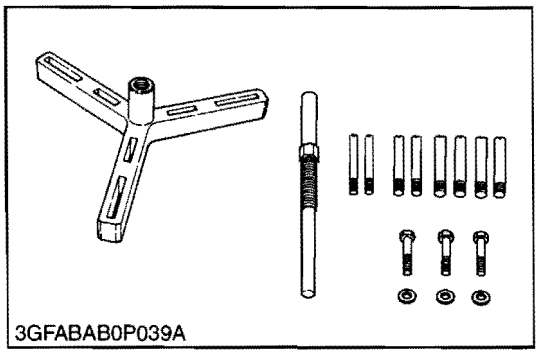


3TMABAB0P059A

Red Check

Code No.: 07909-31371
Application: Use to check cracks on cylinder head, cylinder block, etc..

W1038544


3GFABAB0P039A

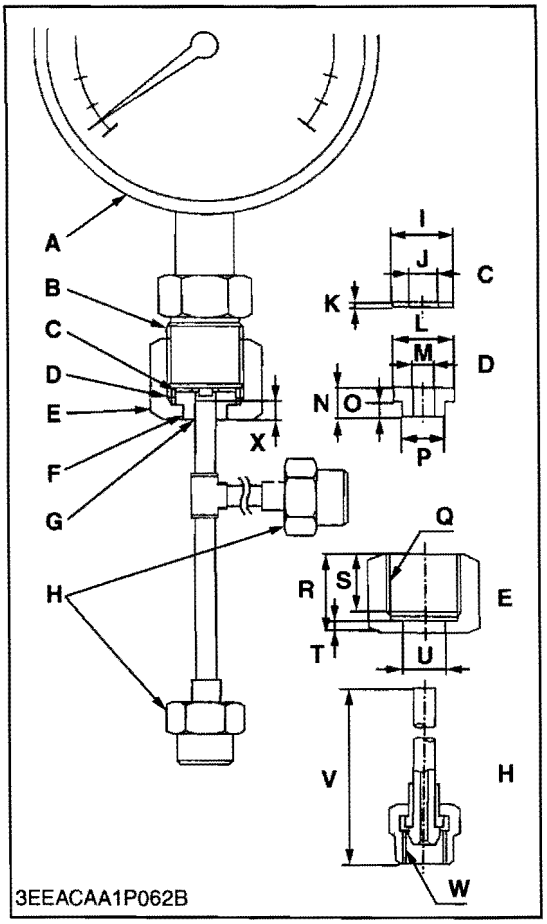
Flywheel Puller

Code No.: 07916-32011
Application: Use exclusively for removing the flywheel with ease.

W1038597

■ NOTE

- **The following special tools are not provided, so make them referring to the figure.**



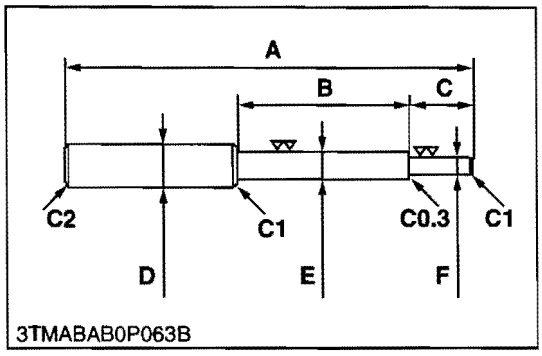
3EEACAA1P062B

Injection Pump Pressure Tester

Application: Use to check fuel tightness of injection pumps.

A	Pressure gauge full scale : More than 29.4 MPa (300 kgf/cm^2, 4267 psi)
B	PF 1/2
C	Copper gasket
D	Flange (Material : Steel)
E	Hex. nut 27 mm (1.1 in.) across the plat
F	Adhesive application
G	Fillet welding on the enter circumference
H	Retaining nut
I	17 mm dia. (0.67 in. dia.)
J	8.0 mm dia. (0.31 in. dia.)
K	1.0 mm (0.039 in.)
L	17 mm dia. (0.67 in. dia.)
M	6.10 to 6.20 mm dia. (0.241 to 0.244 in. dia.)
N	8.0 mm (0.31 in.)
O	4.0 mm (0.16 in.)
P	11.97 to 11.99 mm dia. (0.4713 to 0.4720 in. dia.)
Q	PF 1/2
R	23 mm (0.91 in.)
S	17 mm (0.67 in.)
T	4.0 mm (0.16 in.)
U	12.00 to 12.02 mm dia. (0.472 to 0.4732 in. dia.)
V	100 mm (3.94 in.)
W	M12 × P1.5
X	5.0 mm (0.20 in.)

W10252400



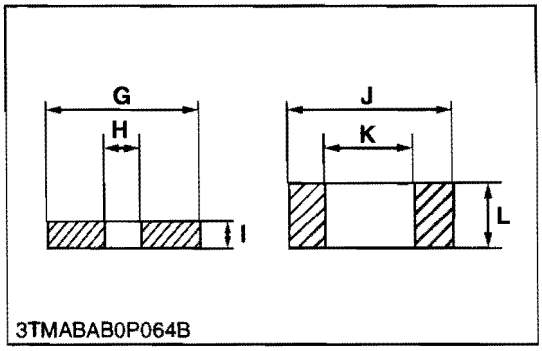
3TMABAB0P063B

Valve Guide Replacing Tool

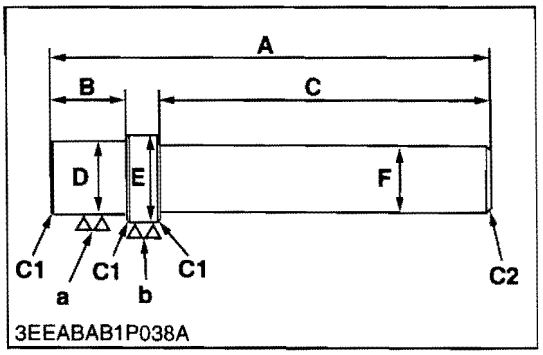
Application: Use to press out and press in the valve guide.

A	225 mm (8.86 in.)
B	70 mm (2.8 in.)
C	45 mm (1.8 in.)
D	20 mm dia. (0.79 in. dia.)
E	11.7 to 11.9 mm dia. (0.461 to 0.468 in. dia.)
F	6.50 to 6.60 mm dia. (0.256 to 0.259 in. dia.)
G	25 mm (0.98 in.)
H	6.70 to 7.00 mm dia. (0.264 to 0.275 in. dia.)
I	5.0 mm (0.20 in.)
J	20 mm dia. (0.79 in. dia.)
K	12.5 to 12.8 mm dia. (0.493 to 0.503 in. dia.)
L	8.90 to 9.10 mm (0.351 to 358 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

W10250170



3TMABAB0P064B



3EEABAB1P038A

Bushing Replacing Tool

Application: Use to press out and press in the bushing.

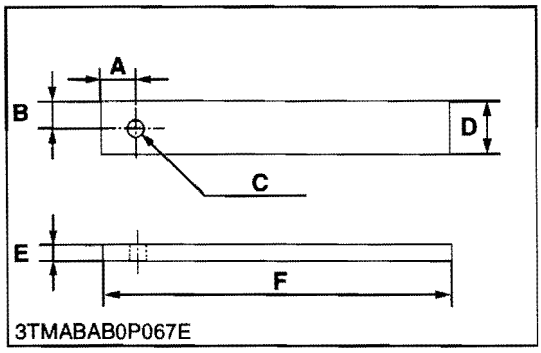
1. For small end bushing

A	157 mm (6.18 in.)
B	24 mm (0.94 in.)
C	120 mm (4.72 in.)
D	21.8 to 21.9 mm dia. (0.859 to 0.862 in. dia.)
E	24.8 to 24.9 mm dia. (0.977 to 0.980 in. dia.)
F	20 mm dia. (0.79 in. dia.)
a	6.3 μm (250 μin.)
b	6.3 μm (250 μin.)

2. For idle gear bushing

A	196 mm (7.72 in.)
B	26 mm (1.0 in.)
C	150 mm (5.91 in.)
D	25.80 to 25.90 mm dia. (1.016 to 1.019 in. dia.)
E	28.80 to 28.90 mm dia. (1.134 to 1.137 in. dia.)
F	20 mm dia. (0.79 in. dia.)
a	6.3 μm (250 μin.)
b	6.3 μm (250 μin.)

W12358870



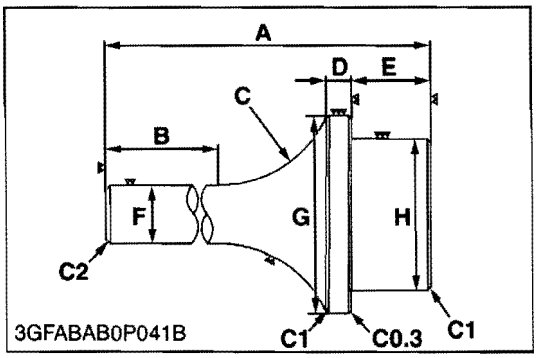
3TMABAB0P067E

Flywheel Stopper

Application: Use to loosen and tighten the flywheel screw.

A	20 mm (0.79 in.)
B	15 mm (0.59 in.)
C	10 mm dia. (0.39 in. dia.)
D	30 mm (1.2 in.)
E	8.0 mm (0.31 in.)
F	200 mm (7.87 in.)

W10259480



Crankshaft Bearing 1 Replacing Tool

Application: Use to press out and press in the crankshaft bearing 1.

[Press Out]

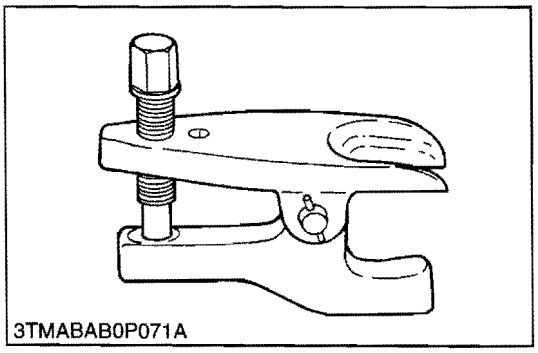
A	135 mm (5.31 in.)
B	72 mm (2.8 in.)
C	40 mm radius (1.6 in. radius)
D	10 mm (0.39 in.)
E	24 mm (0.94 in.)
F	20 mm dia. (0.79 in. dia.)
G	51.20 to 51.40 mm dia. (2.016 to 2.023 in. dia.)
H	47.30 to 47.50 mm dia. (1.863 to 1.870 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

[Press In]

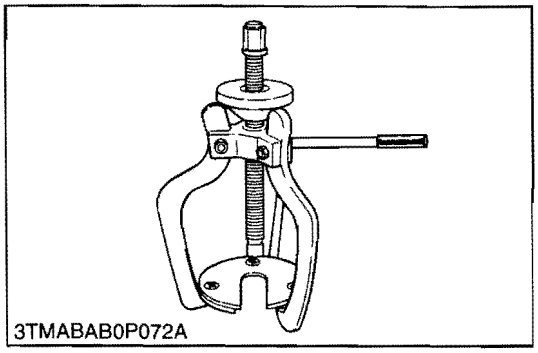
A	135 mm (5.31 in.)
B	72 mm (2.8 in.)
C	40 mm radius (1.6 in. radius)
D	10 mm (0.39 in.)
E	24 mm (0.94 in.)
F	20 mm dia. (0.79 in. dia.)
G	68 mm dia. (2.7 in. dia.)
H	47.30 to 47.50 mm dia. (1.863 to 1.870 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

W10261390

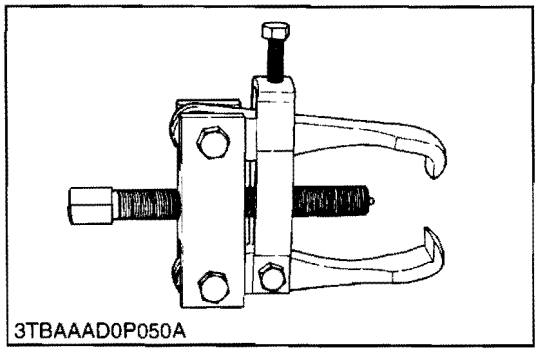
[2] SPECIAL TOOLS FOR TRACTOR


3TMABAB0P071A

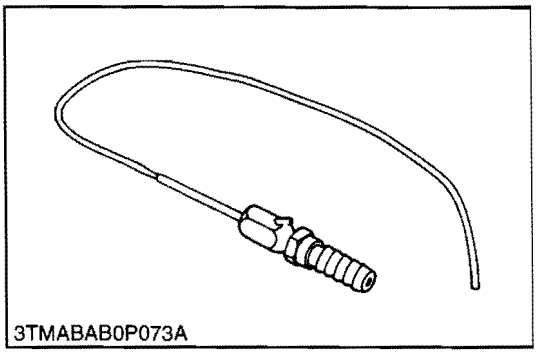
Tie-rod End Lifter
Code No.: 07909-39051
Application: Use for removing the tie-rod end with ease.
W1041183


3TMABAB0P072A

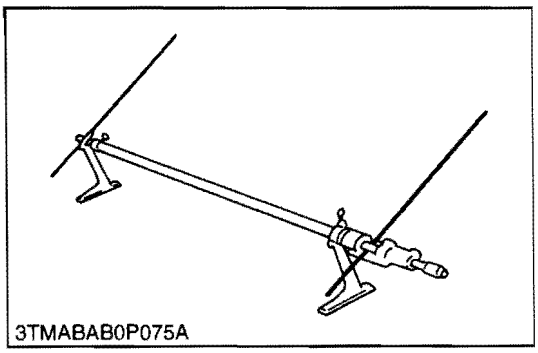
Steering Wheel Puller
Code No.: 07916-51090
Application: Use for removing the steering wheel without damaging the steering shaft.
W1041234


3TBAAAD0P050A

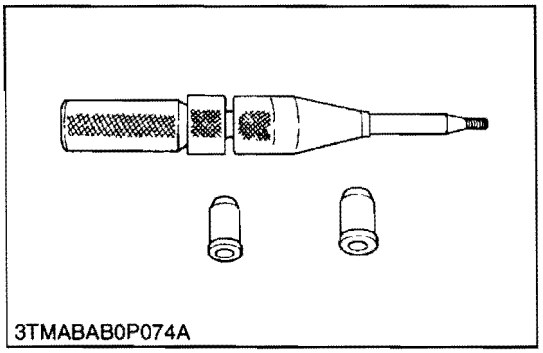
Pitman Arm Puller
Code No.: 07909-39051
Application: Use for removing the tie-rod end with ease.
W1041282


3TMABAB0P073A

Injector CH3
Code No.: 07916-52501
Application: Use for injecting calcium chloride solution into, and removing it from, rear tires.
W1041330


3TMABAB0P075A

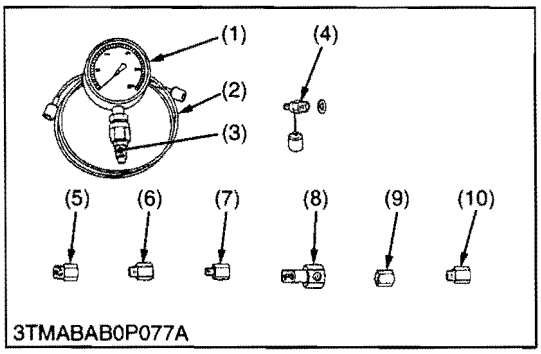
Toe-in Gauge
Code No.: 07909-31681
Application: This allows easy measurement of toe-in for all machine models.
W1041378


3TMABAB0P074A

Clutch Center Tool (For B and L Series Tractors)

Application: The Clutch center tool can be used for all B and L series tractors with a diaphragm clutch by changing tip guides. Center piece diameter is 14 mm (0.55 in.)

W1041426



3TMABAB0P077A

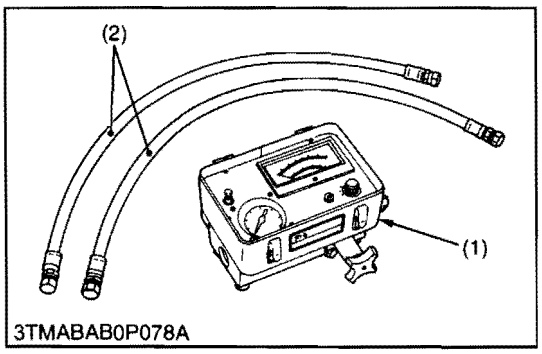
Relief Valve Pressure Tester

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 x 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)

W1041474



3TMABAB0P078A

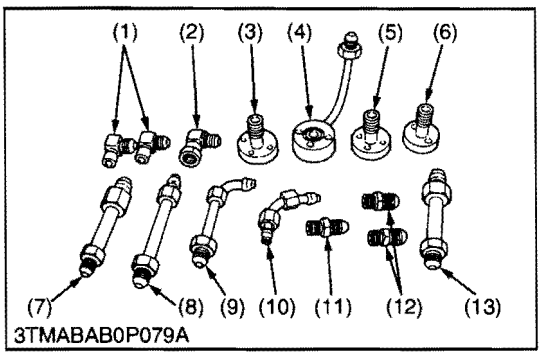
Flow Meter

Code No.: 07916-52791 (Flow Meter)
07916-52651 (Hydraulic Test Hose)

Application: This allows easy testing of hydraulic system.

(1) Flow Meter
(2) Hydraulic Test Hose

W1041522



3TMABAB0P079A

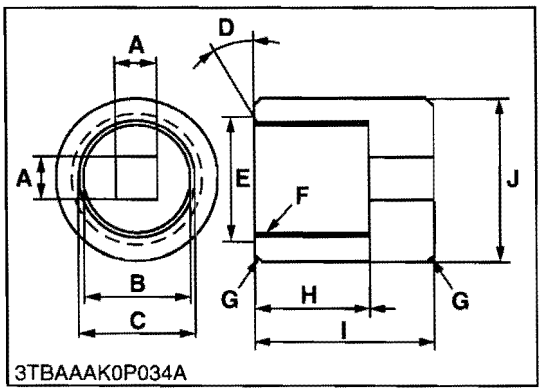
Adaptor Set for Flow Meter

Code No.: 07916-54031

Application: Use for testing the hydraulic system.

(1) Adaptor **52**
(2) Adaptor **53**
(3) Adaptor **54**
(4) Adaptor **61**
(5) Adaptor **62**
(6) Adaptor **63**
(7) Adaptor **64**
(8) Adaptor **65**
(9) Adaptor **66**
(10) Adaptor **67**
(11) Adaptor **68**
(12) Adaptor **69**
(13) Hydraulic Adaptor **1**

W1041575



3TBAAAK0P034A

Bevel Gear Shaft (10T) Tool

Application : Use for measuring and tightening the bevel gear shaft.

A	6.4 to 6.6 mm square (0.25 to 0.26 in. square)
B	17.5 mm dia. (0.689 in. dia.)
C	20 mm dia. (0.79 in. dia.)
D	0.52 rad (30 °)
E	21 mm dia. (0.83 in. dia.)
F	Involute spline (refer to below)
G	Chamfer 1.0 mm (0.039 in.)
H	25mm (0.98 in.)
I	35 mm dia. (1.4 in. dia.)
J	28 mm dia. (1.1 in. dia.)

(Involute Spline)

- INTERNAL 20 x 14 x 1.25

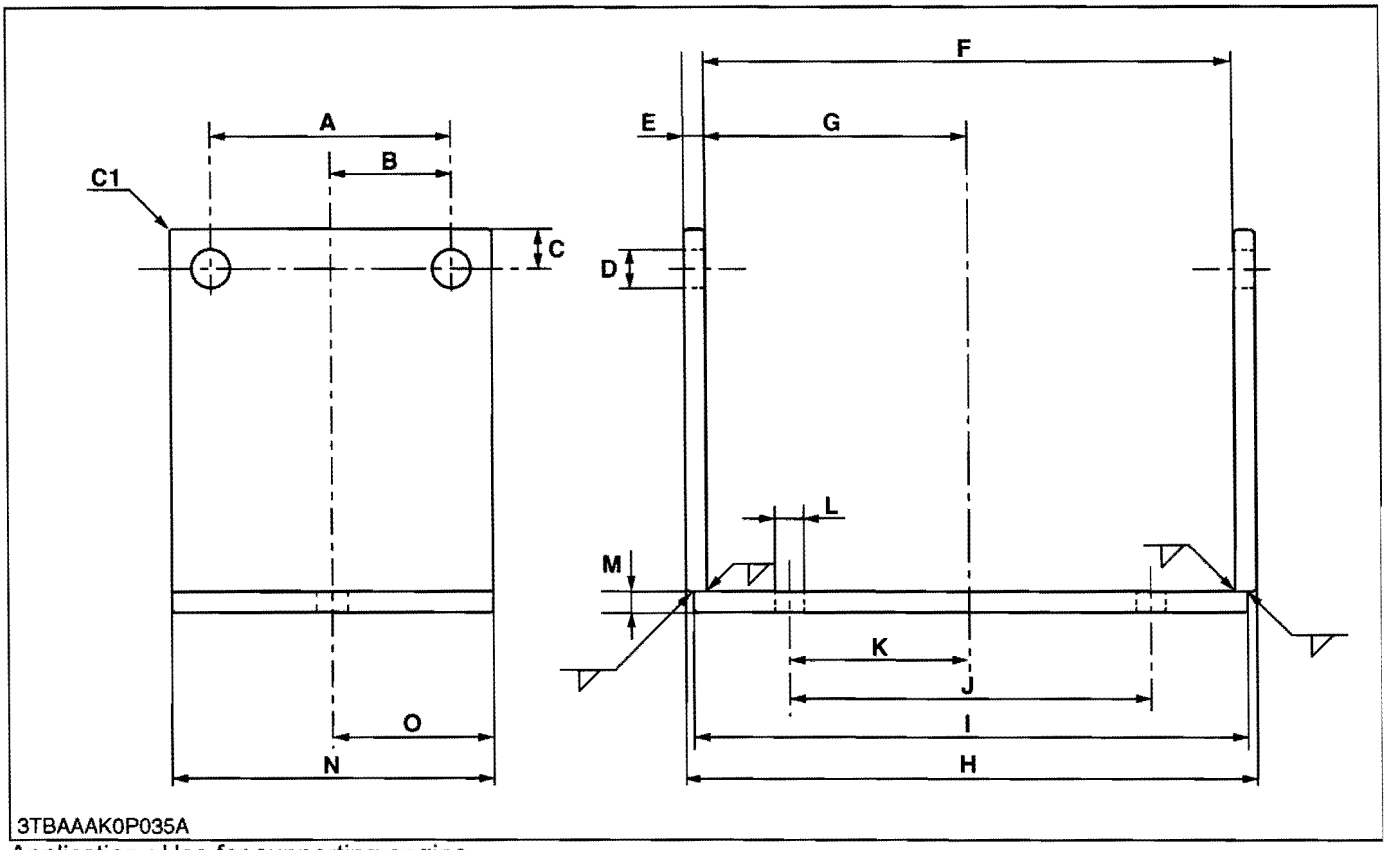
Coefficient of profile shifting		+0.800
Tool	Tooth form	Stub tooth
	Module	1.250
	Pressure angle	0.35 rad (20 °)
Number of teeth		14
Diameter of basic pitch circle		17.5 mm (0.689 in.)
Tooth thickness	Between pin diameter	15.084 to 15.155 mm (0.59386 to 0.59665 in.) (Pin diameter = 2.50 mm (0.0984 in.))

(Reference)

- This tool can be made by welding the coupling (6C050-14520) and socket wrench.

W1015236

Disassembling Stand



3TBAAAK0P035A

Application : Use for supporting engine.

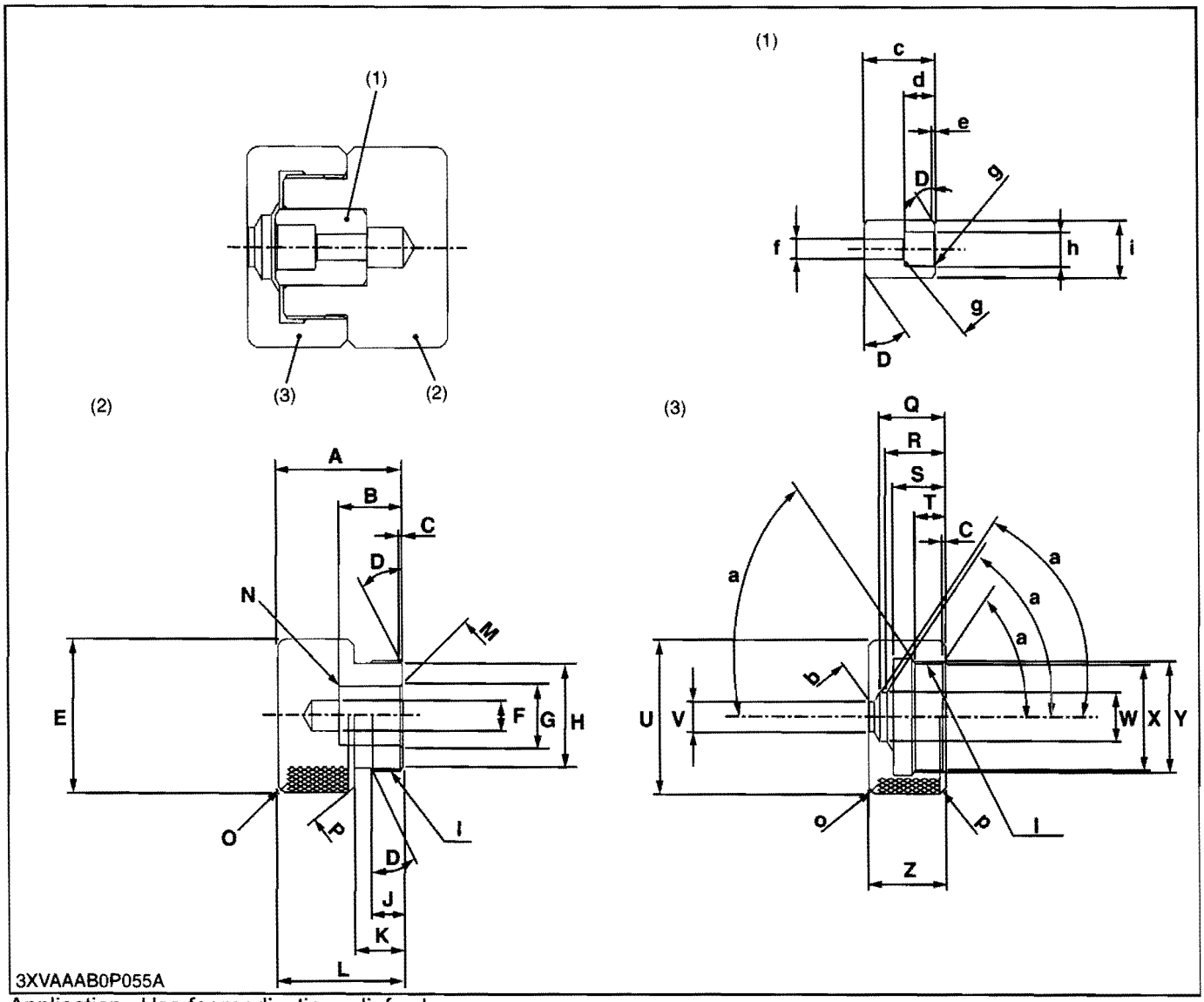
■ **NOTE**

- **This special tool is not provided, so make it referring to figure.**

A	80 mm (3.1 in.)	**G**	110 mm (4.33 in.)	**M**	9 mm (0.4 in.)
B	40 mm (2.0 in.)	**H**	238 mm (9.37 in.)	**N**	134 mm (5.28 in.)
C	16.5 mm (0.650 in.)	**I**	230 mm (9.06 in.)	**O**	67 mm (2.6 in.)
D	16 mm dia. (0.63 in. dia.)	**J**	150 mm (5.91 in.)	**C1**	Chamfer 1 mm (0.04 in.)
E	9 mm (0.4 in.)	**K**	75 mm (3.0 in.)		
F	220 mm (8.66 in.)	**L**	12 mm dia. (0.47 in. dia.)		

W1056389

Check and High Pressure Relief Valve Assembly Tool



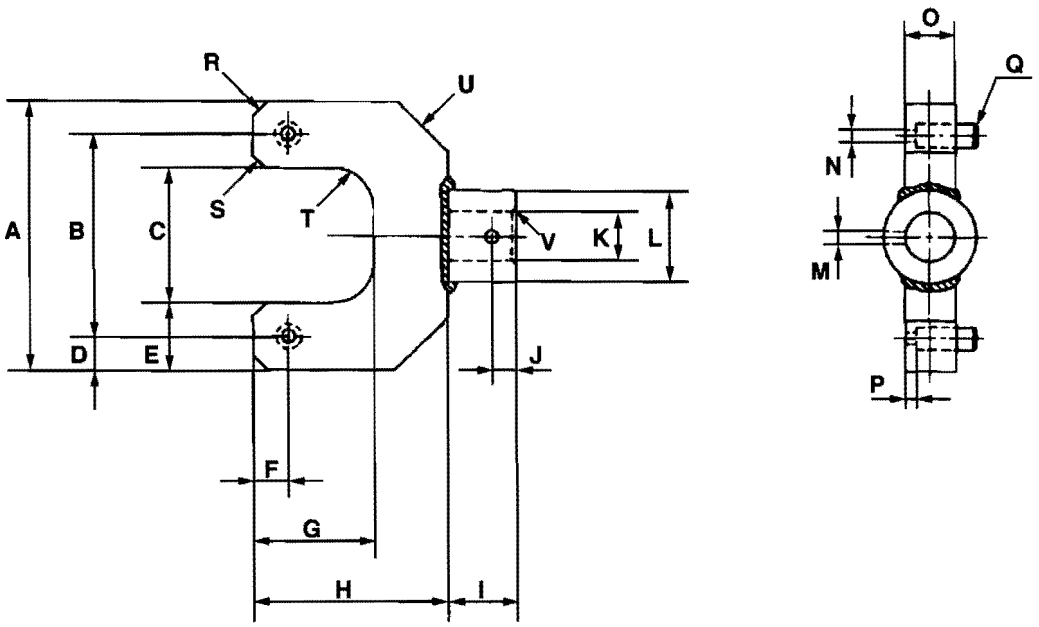
Application : Use for readjusting relief valve pressure.

A	30 mm (1.181 in.)	N	Chamfer 0.4 mm (0.157 in.)	a	1.05 rad (10 °)
B	21 mm (0.827 in.)	O	Chamfer 3 mm (0.118 in.)	b	Chamfer 0.3 mm (0.012 in.)
C	1 mm (0.039 in.)	P	Chamfer 2 mm (0.079 in.)	c	23 mm (0.906 in.)
D	0.52 rad (30 °)	Q	21.4 mm (0.843 in.)	d	10 mm (0.394 in.)
E	50 mm dia. (1.969 in. dia.)	R	19 mm (0.748 in.)	e	1 mm (0.039 in.)
F	10 mm dia. (0.394 in. dia.)	S	17 mm (0.669 in.)	f	6.5 mm (0.256 in.)
G	9.1 to 9.3 mm dia. (0.359 to 0.366 in. dia.)	T	10 mm (0.393 in.)	g	Chamfer 0.5 mm (0.020 in.)
H	34 mm dia. (1.336 in. dia.)	U	50 mm dia. (1.969 in. dia.)	h	11.1 to 11.3 mm (0.437 to 0.445 in.)
I	M36 x 1.5 mm Pitch	V	9.8 mm dia. (0.386 in. dia.)	i	18.8 to 19.0 mm (0.740 to 0.748 in.)
J	10 mm (0.394 in.)	W	16 mm dia. (0.629 in. dia.)		
K	16 mm (0.630 in.)	X	34.5 mm dia. (1.358 in. dia.)	(1)	Spacer
L	41 mm (1.614 in.)	Y	38 mm dia. (1.496 in. dia.)	(2)	Block
M	Chamfer 1 mm (0.039 in.)	Z	25 mm (0.984 in.)	(3)	Cap

W1088885

PS Plug Wrench

Application : Use for tightening the plug for ball nut assembling.



3TBAAAD0P045A

A	64 mm (2.51 in.)	L	22.0 mm dia. (0.87 in. dia.)
B	48 mm (1.89 in.)	M	3.2 mm dia. (0.13 in. dia.)
C	36.2 to 36.3 mm (1.425 to 1.429 in.)	N	3 mm dia. (0.12 in. dia.)
D	8 mm (0.31 in.)	O	12 mm (0.47 in.)
E	13 mm (0.55 in.)	P	3 mm (0.12 in.)
F	8 mm (0.31 in.)	Q	Pin : 6 mm dia. × 15 mm length (0.24 in. dia. × 0.59 in. length)
G	33 mm (1.30 in.)	R	C3 : Chamfer 3 mm (0.12 in.)
H	45 mm (1.77 in.)	S	C3 : Chamfer 3 mm (0.12 in.)
I	16 mm (0.63 in.)	T	R10 : 10 mm radius (0.39 in. radius)
J	6 mm (0.24 in.)	U	C12 : Chamfer 12 mm (0.47 in.)
K	12.0 to 12.1 mm dia. (0.472 to 0.476 in. dia.)	V	C1 : Chamfer 1 mm (0.04 in.)

9. TIRES

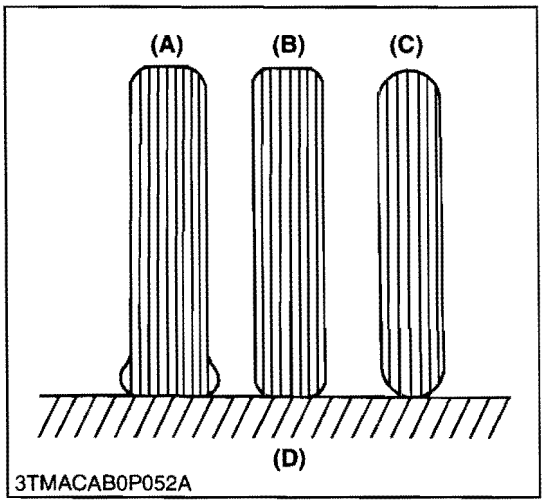
[1] TIRE PRESSURE

⚠ CAUTION

- **Do not attempt mount a tire. This should be done by a qualified person with the proper equipment.**

■ IMPORTANT

- **Do not use tires larger than specified.**
- **When you intend to mount different size of tires from equipped ones, consult your distributor about front drive gear ratio for detail.**
- **Excessive wear of tires may occur due to improper gear ratio.**



Through the tire pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, check it every day and inflate as necessary.

To inflate the wheel tires, use an air compressor or hand pump.

■ Recommended Inflation Pressure

- Maintain the pressure shown below for normal use.

	Tire sizes	Inflation pressure
Front	7 - 12, 4PR	170 kPa (1.7 kgf/cm^2, 24 psi)
	24 x 8.50 - 14, 4PR	150 kPa (1.5 kgf/cm^2, 22 psi)
	23 x 8.50 - 14 Ind., 4PR	241 kPa (2.5 kgf/cm^2, 35 psi)
Rear	12.4 - 16, 4PR	110 kPa (1.1 kgf/cm^2, 16 psi)
	13.6 - 16, 4PR	100 kPa (1.0 kgf/cm^2, 14 psi)
	12.4 - 16 Ind., 4PR	138 kPa (1.4 kgf/cm^2, 20 psi)

■ NOTE

- **Maintain the maximum pressure in front tires, if using a front loader of when equipped with a full load of front weights.**

■ Dual Tires

- Dual tires are not approved.

(A) Insufficient
(B) Standard
(C) Excessive
(D) Ground

W1043571

[2] TREAD ADJUSTMENT

⚠ CAUTION

- **Support tractor securely on stands before removing a wheel.**
- **Never operate tractor with a loose rim, wheel or axle.**

■ IMPORTANT

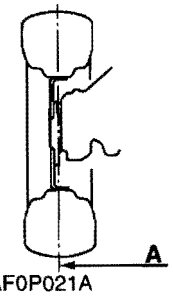
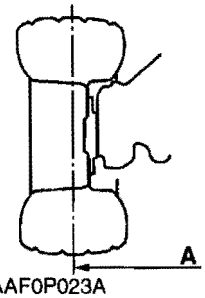
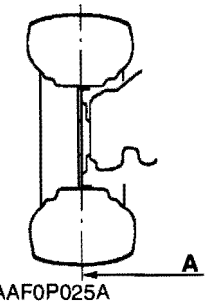
- **Always attach tires as shown in the figure.**
- **If not attached as the figure, transmission parts may be damaged.**
- **Do not use tires larger than specified.**

(1) Front Wheels

Front wheel cannot be adjusted.

■ IMPORTANT

- **Do not turn front discs to obtain wider tread. In setting up the front wheels, make sure that the inflation valve stem of the tires face outward.**

7 - 12 Farm	24 x 8.50 - 14 Turf	23 x 8.50 - 14 Ind.
 3TBAAAF0P021A	 3TBAAAF0P023A	 3TBAAAF0P025A
935 mm (36.8 in.)	930 mm (36.6 in.)	905 mm (35.6 in.)

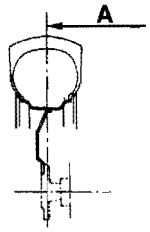
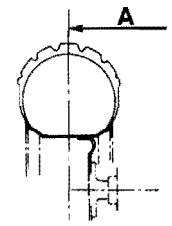
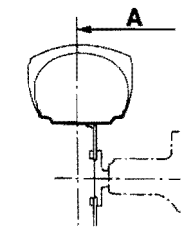
A : Tread

(2) Rear Wheels

Rear tread width can not be adjusted.

■ IMPORTANT

- **Always attach tires as shown in the drawings.**
- **If not attached as illustrated, transmission parts may be damaged.**

12.4 - 16 Farm	13.6 - 16 Turf	12.4 x 16 Ind.
 3TBAAAK0P024A	 3TBAAAK0P025A	 3TBAAAK0P027A
1050 mm (41.3 in.)	1050 mm (41.3 in.)	1050 mm (41.3 in.)

A : Tread

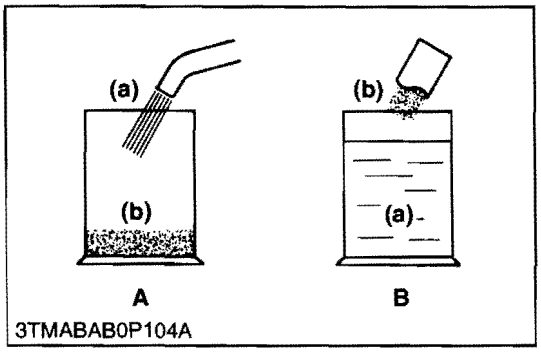
[3] TIRE LIQUID INJECTION

Auxiliary weights can be used to increase traction force for plowing in fields or clayey grounds.

Another way is to inject water or another liquid, such as a calcium chloride solution in the tires. Water must not be used in winter since it freezes at 0 °C (32 °F). The calcium chloride solution will not freeze and moreover, affords higher effect than water since its specific gravity is higher than that of water by about 20 %. Below is an explanation of calcium chloride solution injection.

■ **IMPORTANT**

- **Do not fill the front tires with liquid.**



3TMABAB0P104A

Preparation of Calcium Chloride Solution

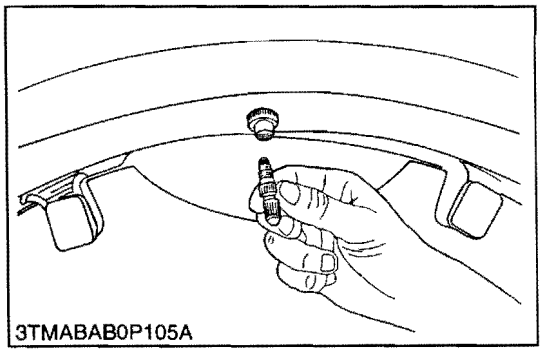
⚠ CAUTION

- **When making a calcium chloride solution, do not pour water over calcium chloride since this results in chemical reaction which will cause high temperature. Instead add a small amount of calcium chloride to the water at a time until the desired solution is achieved.**

Freezing temp.	Weight of $CaCl_2$ to be dissolved in 100 L (26.5 U.S.gals, 22.0 Imp.gals) of water
–5 °C (23 °F)	12 kg (26.4 lbs)
–10 °C (14 °F)	21 kg (46.3 lbs)
–15 °C (5 °F)	28 kg (61.7 lbs)
–20 °C (–4 °F)	34 kg (75.0 lbs)
–25 °C (–13 °F)	40 kg (88.2 lbs)
–30 °C (–22 °F)	44 kg (97.0 lbs)
–35 °C (–31 °F)	49 kg (108 lbs)
–40 °C (–40 °F)	52 kg (114.6 lbs)
–45 °C (–49 °F)	56 kg (123.5 lbs)
–50 °C (–58 °F)	61 kg (134.5 lbs)

(a) Water **(b) $CaCl_2$ (Calcium Chloride)**

W1045753

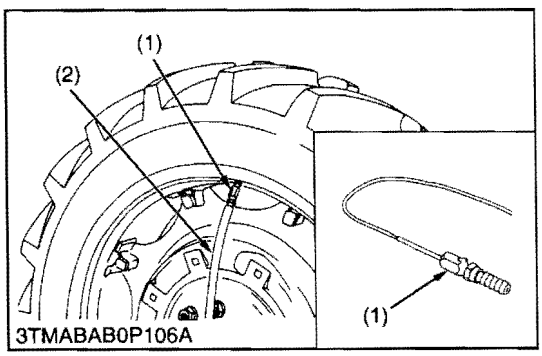

3TMABAB0P105A

Attaching Injector

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the top.
3. Remove the air valve, and attach the injector (Code No. 07916-52501).

(1) Injector (2) Hose

W1045985



3TMABAB0P106A

Fig. 1

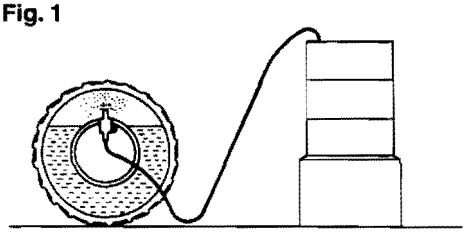


Fig. 2

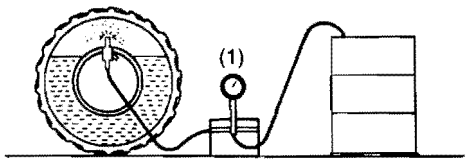
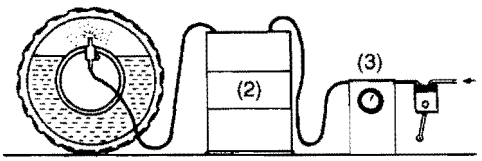
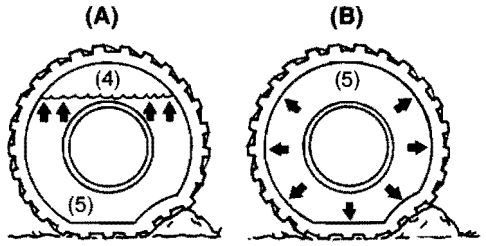


Fig. 3



3TMABAB0P111A



3TMABAB0P107A

Injection

CAUTION

- **When a calcium chloride solution is used, cool it before pouring it into the tire.**
- **Do not fill tires with water or solution more than 75 % of full capacity (to the valve stem level).**
- **To avoid damage of transmission, do not use rear wheel weights and liquid ballast at the same time.**

The following four ways can be used to inject water or a calcium chloride solution into tires.

1. Gravity injection (Fig. 1)
2. Pump injection (Fig. 2)
3. Pressure tank injection (Fig. 3)
4. Injection directly from tap (only when water is being used)

■ NOTE

- **Once injection is completed, reset the air valve, and pump air into the tire to the specified pressure.**

Weight of calcium chloride solution filling 75 % of full capacity of a tire.

Tire sizes	12.4 - 16
Slush free at –10 °C (14 °F) Solid at –30 °C (–22 °F) [Approx. 1 kg (2 lbs) $CaCl_2$ per 4 L (1 gal) of water]	85 kg (187 lbs)
Slush free at –24 °C (–11 °F) Solid at –47 °C (–53 °F) [Approx. 1.5 kg (3.5 lbs) $CaCl_2$ per 4 L (1 gal) of water]	89 kg (196 lbs)
Slush free at –47 °C (–53 °F) Solid at –52 °C (–62 °F) [Approx. 2.25 kg (5 lbs) $CaCl_2$ per 4 L (1 gal) of water]	94 kg (207 lbs)

(1) Pump
(2) Pressure Tank
(3) Compressor
(4) Air
(5) Water

(A) Correct : 75 %
Air compresses like a cushion
(B) Incorrect : 100 % full water can not be compressed

W1046135

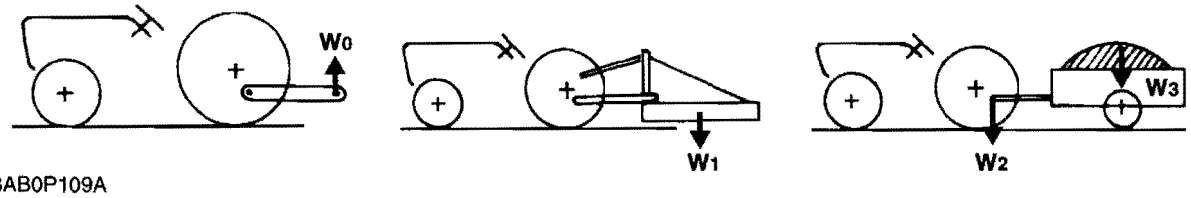
10. IMPLEMENT LIMITATIONS

The KUBOTA Tractor has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use with implements which are not sold or approved by KUBOTA and which exceed the maximum specifications listed below, or which are otherwise unfit for use with the KUBOTA Tractor may result in malfunctions or failures of the tractor, damage to other property and injury to the operator or others. [Any malfunctions or failures of the tractor resulting from use with improper implements are not covered by the warranty.]

	Tread (max. width) with farm tires		Lower link end max. loading weight W0
	Front	Rear	
B3200	935 mm (36.8 in.)	1050 mm (41.3 in.)	360 kg (800 lbs)

	Actual figures		
	Implement weight W1 and / or size	Max. Drawbar Load W2	Trailer loading weight W3 Max. capacity
B3200	As in the following list (Shown on the next page)	500 kg (1100 lbs)	1500 kg (3300 lbs)

Lower link end max. loading capacity .....The max. allowable load which can be put on the lower link end : W0
Implement weight.....The implement's weight which can be put on the lower link : W1
Max. drawbar load W2
Trailer loading weight .....The max. loading weight for trailer (without trailer's weight) : W3



3TMABAB0P109A

■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**

No.	Implement		Remarks		B3200HSD	B3200HSDWO
1	Mower	Mid-mount	Max. cutting width Max. weight	mm (in.) kg (lbs)	1830 (72) 205 (451)	– –
		Rotary-cutter (1 Blade)	Max. cutting width Max. weight	mm (in.) kg (lbs)	1220 (48) 227 (500)	
		Rear-mount (2 or 3 Blade)	Max. cutting width Max. weight	mm (in.) kg (lbs)	1830 (72) 227 (500)	
		Flail-mower	Max. cutting width	mm (in.)	1220 (48)	
		Sickle bar	Max. cutting width	mm (in.)	1524 (60)	
2	Rotary tiller		Max. cutting width Max. weight Slip clutch	mm (in.) kg (lbs)	1270 (50) 250 (550) Necessary	
3	Bottom plow		Max. size	mm (in.)	305 (12) x 2	
4	Disc plow		Max. size	mm (in.)	559 (22) x 2	
5	Cultivator		Max. size	mm (in.)	1524 (60) 1 Row	
6	Disc harrow		Max. harrowing width Max. weight	mm (in.) kg (lbs)	1676 (66) 250 (550)	
7	Sprayer		Max. tank capacity	L (U.S.gals)	246 (65)	
8	Front blade		Max. cutting width Sub frame	mm (in.)	1676 (66) Necessary	
9	Rear blade		Max. cutting width Max. weight	mm (in.) kg (lbs)	1676 (66) 250 (550)	
10	Front loader		Max. lifting capacity (Bucket center) Max. width Sub frame	kg (lbs) mm (in.)	400 (880) 1524 (60) Necessary	
11	Box blade		Max. cutting width Max. weight	mm (in.) kg (lbs)	1372 (54) 227 (500)	
12	Back hoe		Max. digging depth Max. weight Sub frame	mm (in.) kg (lbs)	1830 (72) 363 (800) Necessary	
13	Snow blower		Max. digging depth Max. weight Sub frame	mm (in.) kg (lbs)	1524 (60) 227 (500) Necessary	
14	Trailer		Max. load capacity Max. drawbar load	kg (lbs) kg (lbs)	1500 (3300) 360 (800)	

■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	–
	Air in the fuel system	Bleed	G-35
	Water in the fuel system	Change fuel and repair or replace fuel system	–
	Fuel hose clogged	Clean	–
	Fuel filter clogged	Change	G-30
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-9
	Fuel with low cetane number	Use specified fuel	–
	Incorrect injection timing	Adjust	1-S15
	Injection nozzle clogged	Repair or replace	1-S18
	Injection pump malfunctioning	Replace	1-S31
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S29
	Improper valve timing	Correct or replace timing gear	1-S32
	Piston ring and cylinder worn	Replace	1-S50
	Excessive valve clearance	Adjust	1-S11
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Replace	G-30
	Air cleaner clogged	Clean or replace	G-25, 31
	Fuel leak due to loosing injection pipe retaining nut	Tighten retaining nut	–
	Injection pump malfunctioning	Replace	1-S35
	Incorrect nozzle injection pressure	Adjust	1-S18
	Injection nozzle stuck or clogged	Repair or replace	1-S18
	Governor malfunctioning	Repair	–
Either White or Blue Exhaust Gas Is Observed	Excessive engine oil	Reduce to specified level	1-S21
	Piston ring and cylinder worn or stuck	Repair or replace	1-S50
	Incorrect injection timing	Adjust	1-S15
	Deficient compression	Repair	1-S10, 28, 34

W1014322

Symptom	Probable Cause	Solution	Reference Page
Either Black or Dark Gray Exhaust Gas Is Observed	Overload	Reduce the load	–
	Low grade fuel used	Use specified fuel	–
	Fuel filter clogged	Replace	G-31
	Air cleaner clogged	Clean or replace	G-25, 31
	Deficient nozzle injection	Repair or replace nozzle	1-S27
Deficient Output	Incorrect injection timing	Adjust	1-S15
	Engine's moving parts seem to be seizing	Repair or replace	–
	Uneven fuel injection	Replace injection pump	1-S32
	Deficient nozzle injection	Repair or replace nozzle	1-S27
	Compression leak	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S29
Excessive Lubricant Oil Consumption	Piston ring's gap facing the same direction	Shift ring gap direction	1-S36
	Oil ring worn or stuck	Replace	1-S36
	Piston ring groove worn	Replace piston	1-S36
	Valve stem and valve guide worn	Replace	1-S41
	Oil leaking due to defective seals or packing	Replace	–
Fuel Mixed into Lubricant Oil	Injection pump's plunger worn	Replace injection pump	1-S32
	Deficient nozzle injection	Repair or replace nozzle	1-S27
	Injection pump broken	Replace	1-S32
Water Mixed into Lubricant Oil	Head gasket defective	Replace	1-S29
	Cylinder block or cylinder head flawed	Replace	–
Low Oil Pressure	Engine oil insufficient	Replenish	G-14
	Oil strainer clogged	Clean	1-S34
	Oil filter cartridge clogged	Replace	G-16
	Relief valve stuck with dirt	Clean	–
	Relief valve spring weaken or broken	Replace	–
	Excessive oil clearance of crankshaft bearing	Replace	1-S53
	Excessive oil clearance of crankpin bearing	Replace	1-S52
	Excessive oil clearance of rocker arm	Replace	1-S44
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-9
	Oil pump defective	Repair or replace	1-S56

W1014322

Symptom	Probable Cause	Solution	Reference Page
High Oil Pressure	Different type of oil	Use specified type of oil	G-9
	Relief valve defective	Replace	–
Engine Overheated	Engine oil insufficient	Replenish	1-S21
	Fan belt broken or tensioned improperly	Replace or adjust	1-S12
	Coolant insufficient	Replenish	G-9
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	G-22
	Coolant flow route corroded	Clean or replace	G-32
	Radiator cap defective	Replace	1-S14
	Radiator hose damaged	Replace	G-32
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S28
	Incorrect injection timing	Adjust	1-S15
	Unsuitable fuel used	Use specified fuel	G-9

W1014322

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	–
Compression Pressure	–	3.73 to 4.11 MPa 38.0 to 42.0 kgf/cm^2 541 to 597 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
	Variance Among Cylinders	–	10 % or less
Top Clearance		0.55 to 0.70 mm 0.0217 to 0.0276 in.	–
Cylinder Head Surface	Flatness	–	0.05 mm 0.0020 in.
Valve Recessing (Intake and Exhaust)		–0.05 to 0.25 mm –0.0020 to 0.0098 in.	0.40 mm 0.0157 in.
Valve Stem to Valve Guide	Clearance	0.035 to 0.065 mm 0.0014 to 0.0025 in.	0.10 mm 0.0039 in.
	Valve Stem (O.D.)	6.960 to 6.975 mm 0.2741 to 0.2746 in.	–
	Valve Guide (I.D.)	7.010 to 7.025 mm 0.2760 to 0.2765 in.	–
Valve Face	Angle (IN.)	1.047 rad 60 °	–
	Angle (EX.)	0.785 rad 45 °	–
Valve Seat	Angle (IN.)	1.047 rad 60 °	–
	Angle (EX.)	0.785 rad 45 °	–
	Width	2.12 mm 0.0835 in.	–
Valve Spring	Free Length	37.0 to 37.5 mm 1.457 to 1.476 in.	36.5 mm 1.437 in.
	Tilt	–	1.0 mm 0.039 in.
	Setting Load / Setting Length	117.4 N / 31.0 mm 11.97 kgf / 31.0 mm 26.4 lbf / 1.22 in.	100.0 N / 31.0 mm 10.2 kgf / 31.0 mm 22.5 lbf / 1.22 in.
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.10 mm 0.0039 in.
	Rocker Arm Shaft (O.D.)	11.973 to 11.984 mm 0.4714 to 0.4718 in.	–
	Rocker Arm (I.D.)	12.000 to 12.018 mm 0.4724 to 0.4731 in.	–

W10138740

Item		Factory Specification	Allowable Limit
Push Rod	Alignment	–	0.25 mm 0.0098 in.
Tappet to Tappet Guide Bore	Oil Clearance	0.020 to 0.062 mm 0.0008 to 0.0024 in.	0.07 mm 0.0028 in.
	Tappet (O.D.)	19.959 to 19.980 mm 0.7858 to 0.7866 in.	–
	Tappet Guide Bore (I.D.)	20.000 to 20.021 mm 0.7874 to 0.7882 in.	–
Idle Gear	Crank Gear to Idle Gear 1 (Backlash)	0.032 to 0.115 mm 0.0013 to 0.0045 in.	0.15 mm 0.0059 in.
	Idle Gear 1 to Cam Gear (Backlash)	0.036 to 0.114 mm 0.0014 to 0.0045 in.	0.15 mm 0.0059 in.
	Idle Gear 1 to Injection Pump Gear (Backlash)	0.034 to 0.116 mm 0.0013 to 0.0046 in.	0.15 mm 0.0059 in.
	Idle Gear 1 to Idle Gear 2 (Backlash)	0.0033 to 0.117 mm 0.0013 to 0.0046 in.	0.15 mm 0.0059 in.
	Idle Gear 2 to Governor Gear (Backlash)	0.030 to 0.117 mm 0.0012 to 0.0046 in.	0.15 mm 0.0059 in.
Idle Gear Shaft to Idle Gear Bushing	Idle Gear 1 (Clearance)	0.020 to 0.054 mm 0.0008 to 0.0021 in.	0.10 mm 0.0039 in.
	Idle Gear Bushing I.D. (Clearance)	26.000 to 26.021 mm 1.0236 to 1.0244 in.	–
	Idle Gear Shaft 1 O.D. (Clearance)	25.967 to 25.980 mm 1.0223 to 1.0228 in.	–
	Idle Gear 2 (Clearance)	0.020 to 0.054 mm 0.0008 to 0.0021 in.	0.10 mm 0.0039 in.
	Idle Gear Bushing I.D. (Clearance)	26.000 to 26.021 mm 1.0236 to 1.0244 in.	–
	Idle Gear Shaft 2 O.D. (Clearance)	25.967 to 25.980 mm 1.0223 to 1.0228 in.	–
Idle Gear	Idle Gear 1 (Side Clearance)	0.20 to 0.51 mm 0.0079 to 0.0201 in.	0.80 mm 0.0315 in.
	Idle Gear 2 (Side Clearance)	0.20 to 0.51 mm 0.0079 to 0.0201 in.	0.80 mm 0.0315 in.

W1013874

Item		Factory Specification	Allowable Limit
Camshaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
	Alignment	–	0.01 mm 0.0004 in.
	Cam Height (IN.)	28.80 mm 1.1339 in.	28.75 mm 1.1319 in.
	Cam Height (EX.)	29.0 mm 1.1417 in.	28.95 mm 1.1398 in.
Camshaft Journal to Cylinder Block Bore	Oil Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
	Camshaft Journal (O.D.)	35.934 to 35.950 mm 1.4147 to 1.4153 in.	–
	Cylinder Block Bore (I.D.)	36.000 to 36.025 mm 1.4173 to 1.4183 in.	–
Piston Pin Bore	I.D.	22.000 to 22.013 mm 0.8661 to 0.8667 in.	22.03 mm 0.8673 in.
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.15 mm 0.0059 in.
	Piston Pin (O.D.)	22.002 to 22.011 mm 0.8662 to 0.8666 in.	–
	Small End Bushing (I.D.)	22.025 to 22.040 mm 0.8671 to 0.8677 in.	–
Piston Ring to Piston Ring Groove	Second Ring (Clearance)	0.085 to 0.112 mm 0.0033 to 0.0044 in.	0.2 mm 0.0079 in.
	Oil Ring (Clearance)	0.020 to 0.055 mm 0.0008 to 0.0021 in.	0.15 mm 0.0059 in.
Connecting Rod	Alignment	–	0.05 mm 0.0020 in.
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	–	0.02 mm 0.0008 in.
Crankshaft to Crankshaft Bearing 1	Oil Clearance	0.034 to 0.114 mm 0.0013 to 0.0045 in.	0.20 mm 0.0079 in.
	Crankshaft (O.D.)	47.934 to 47.950 mm 1.8872 to 1.8878 in.	–
	Crankshaft Bearing 1 (I.D.)	47.984 to 48.048 mm 1.8891 to 1.8916 in.	–
Crankshaft to Crankshaft Bearing 2	Oil Clearance	0.034 to 0.095 mm 0.0013 to 0.0037 in.	0.20 mm 0.0079 in.
	Crankshaft (O.D.)	47.934 to 47.950 mm 1.8872 to 1.8878 in.	–
	Crankshaft Bearing 2 (I.D.)	47.984 to 48.029 mm 1.8891 to 1.8909 in.	–

W1013874

Item		Factory Specification	Allowable Limit
Crankshaft to Crankshaft Bearing 3	Oil Clearance	0.034 to 0.098 mm 0.0013 to 0.0039 in.	0.20 mm 0.0079 in.
	Crankshaft (O.D.)	51.921 to 51.940 mm 2.0441 to 2.0449 in.	–
	Crankshaft Bearing 3 (I.D.)	51.974 to 52.019 mm 2.0462 to 2.0480 in.	–
Crank Pin and Crank Pin Bearing	Oil Clearance	0.029 to 0.091 mm 0.0011 to 0.0036 in.	0.20 mm 0.0079 in.
	Crank Pin (O.D.)	39.959 to 39.975 mm 1.5732 to 1.5738 in.	–
	Crank Pin Bearing (I.D.)	40.004 to 40.050 mm 1.5750 to 1.5768 in.	–
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
Cylinder Liner I.D.		78.000 to 78.019 mm 3.0709 to 3.0716 in.	+0.15 mm 0.0059 in.
Cylinder Liner I.D.	Oversized	+0.5 mm 0.0197 in.	+0.15 mm 0.0059 in.

W1013874

LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	More than 49 kPa 0.5 kgf/cm^2 7 psi	–
	At Rated Speed	196 to 441 kPa 2.0 to 4.5 kgf/cm^2 28 to 64 psi	147 kPa 1.5 kgf/cm^2 21 psi
Inner Rotor to Outer Rotor	Clearance	0.06 to 0.18 mm 0.0024 to 0.0071 in.	–
Outer Rotor to Pump Body	Clearance	0.100 to 0.180 mm 0.0039 to 0.0071 in.	–
Inner Rotor to Cover	Clearance	0.025 to 0.075 mm 0.0010 to 0.0030 in.	–

W10138740

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm / 98 N (10 kgf, 22 lbf) 0.28 to 0.35 in. / 98 N (10 kgf, 22 lbf)	–
Thermostat	Valve Opening Temperature (At Beginning)	69.5 to 72.5 °C 157.1 to 162.5 °F	–
	Valve Opening Temperature (Opened Completely)	85 °C 185 °F	–
Radiator Cap	Pressure Falling Time	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm^2 13 → 9 psi	–
Radiator	Water Leakage Test Pressure	No leak at specified pressure 137 kPa 1.4 kgf/cm^2 20 psi	–

W10139730

FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Pump	Injection Timing	0.25 to 0.27 rad 14.25 to 15.75 ° before T.D.C.	–
Pump Element	Fuel Tightness		13.73 MPa 140 kgf/cm^2 1991 psi
Delivery Valve	Fuel Tightness	10 seconds or more for pressure falling from 13.73 to 12.75 MPa from 140 to 130 kgf/cm^2 from 1991 to 1849 psi	5 seconds or more for pressure falling from 13.73 to 12.75 kPa from 140 to 130 kgf/cm^2 from 1991 to 1849 psi
Injection Nozzle	Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm^2 1991 to 2134 psi	–
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm^2, 1849 psi)	–

W10135990

3. TIGHTENING TORQUES

Tightening torque of screws, bolts and nuts on the table below are specially specified. (For general use screws, bolts and nuts : See page G-11.)

■ **NOTE**

- **In removing and applying the bolts and nuts marked with "*", a pneumatic wrench or similar pneumatic tool, if employed, must be used with enough care not to get them seized.**
- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **The letter "M" in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.**

[1] TRACTOR SECTION

Item	N·m	kgf·m	lbf·ft
Steering wheel mounting nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Sub-frame mounting bolt (M12)	77.5 to 90.2	8.2 to 9.2	59 to 66
Sub-frame mounting bolt (M14)	124 to 147	12.9 to 15.3	93 to 111
Main frame and front case mounting bolt	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5
Engine and front axle frame mounting bolt	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2

W1012736

[2] ENGINE SECTION

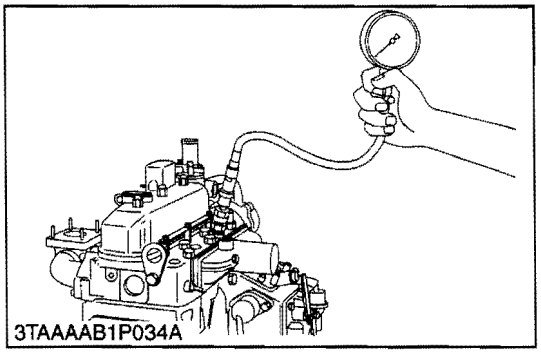
Item	Size x Pitch	N·m	kgf·m	lbf·ft
*Cylinder head cover cap nuts	M7 x 1.0	6.9 to 8.8	0.7 to 0.9	5.1 to 6.5
*Cylinder head screw	M10 x 1.25	63.7 to 68.6	6.5 to 7.0	47.0 to 50.6
*Main bearing case screw 1	M8 x 1.25	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
*Main bearing case screw 2	M9 x 1.25	49.0 to 53.9	5.0 to 5.5	36.2 to 39.8
*Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
*Connecting rod screw	M8 x 1.0	41.2 to 46.1	4.2 to 4.7	30.4 to 34.0
*Rocker arm bracket nuts	M7 x 1.0	21.6 to 26.5	2.2 to 2.7	15.9 to 19.5
*Idle gear shaft screws	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Fan drive pulley screw	M14 x 1.5	235.4 to 245.2	24.0 to 25.0	173.6 to 180.8
*Bearing case cover screws	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Glow plugs	M8 x 1.0	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Oil switch taper screw	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nuts	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe assembly retaining nuts	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Starter's terminal **B** mounting nut	M8	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7

W1013236

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

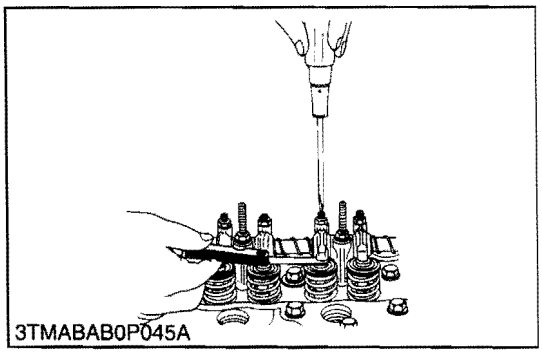
1. Run the engine until it is warmed up.
2. Stop the engine.
3. Remove the air cleaner, the muffler and all glow plugs (or nozzles).
4. Set a compression tester with the adaptor to the glow plug hole (or nozzle hole).
   Nozzle Hole : Adaptor H
   Glow Plug Hole : Adaptor L
5. After making sure that the stop lever is set at the stop position (non-injection), run the engine with the starter and measure the compression pressure.
6. Repeat steps 4 and 5 for each cylinder.
7. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the glow plug hole and measure the compression pressure again.
8. If the compression pressure is still less than the allowable limit, check the top clearance, valve clearance and cylinder head.
9. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

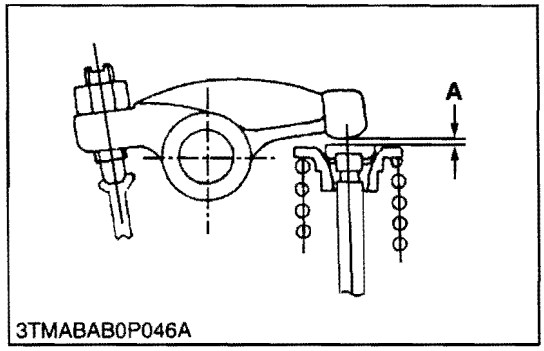
■ **NOTE**

- **Check the compression pressure with the specified valve clearance.**
- **Always use a fully charged battery for performing this test.**
- **Variances in cylinder compression values should be under 10 %.**

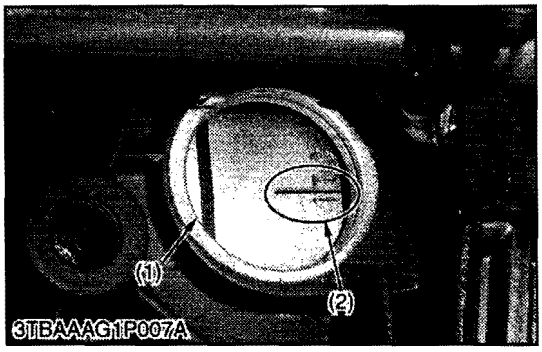
Compression pressure	Factory spec.	2.84 to 3.23 MPa 29.0 to 33.0 kgf/cm^2 412 to 469 psi
	Allowable limit	2.25 MPa 23.0 kgf/cm^2 327 psi

W1019387


3TMABAB0P045A



3TMABAB0P046A



3TBAAAG1P007A

Valve Clearance

■ **IMPORTANT**

- **Valve clearance must be checked and adjusted when engine is cold.**

1. Remove the head cover, the glow plugs and the timing window cover on the clutch housing.
2. Align the **"1TC"** mark line on the flywheel and center of timing window so that the No. 1 piston comes to the compression top dead center.
3. Check the following valve clearance marked with "☆" using a feeler gauge.
4. If the clearance is not within the factory specifications, adjust with the adjusting screw.

Valve clearance	Factory spec.	0.145 to 0.185 mm 0.0057 to 0.0073 in.

■ **NOTE**

- **The "TC" marking line on the flywheel is just for No. 1 cylinder. There is no "TC" marking for the other cylinders.**
- **No. 1 piston comes to the T.D.C. position when the "TC" marking line is aligned with center of timing window on front case. Turn the flywheel 0.26 rad (15 °) clockwise and counterclockwise to see if the piston is at the compression top dead center or the overlap position. Now referring to the table below, readjust the valve clearance. (The piston is at the compression top dead center when both the IN. and EX. valves do not move; it is at the overlap position when both the valves move.)**
- **Finally turn the flywheel 6.28 rad (360 °) and align the "TC" marking line and the center of timing window. Adjust all the other valve clearance as required.**
- **After turning the flywheel counterclockwise twice or three times, recheck the valve clearance, firmly tighten the lock nut of the adjusting screw.**

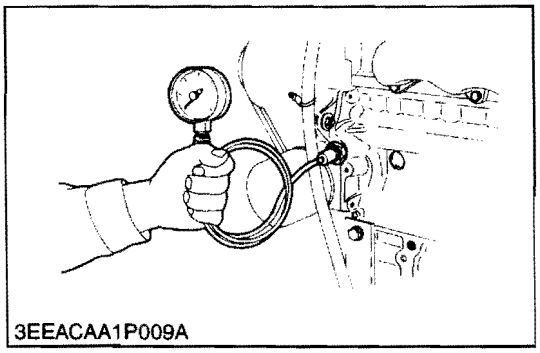
Number of cylinders / Valve arrangement / Adjustable cylinder / Location of piston		4-cylinder	
		IN.	EX.
When No. 1 piston comes to compression top dead center	No. 1	☆	☆
	No. 2	☆	
	No. 3		☆
	No. 4		
When No. 1 piston comes to overlap position	No. 1		
	No. 2		☆
	No. 3	☆	
	No. 4	☆	☆

(1) Timing Window
(2) TC Mark Line

A : Valve Clearance

W1019900

(2) Lubricating System


3EEACAA1P009A

Engine Oil Pressure

1. Remove the engine oil pressure switch, and set an oil pressure tester.
2. Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.
3. If the oil pressure is less than the allowable limit, check the following.

- Engine oil insufficient
- Oil pump defective
- Oil strainer clogged
- Oil filter cartridge clogged
- Oil gallery clogged
- Excessive oil clearance
- Foreign matter in the relief valve

Engine oil pressure	At idle speed	Factory spec.	More than 49 kPa 0.5 kgf/cm^2 7 psi
	At rated speed	Factory spec.	196 to 441 kPa 2.0 to 4.5 kgf/cm^2 28 to 64 psi
		Allowable limit	147 kPa 1.5 kgf/cm^2 21 psi

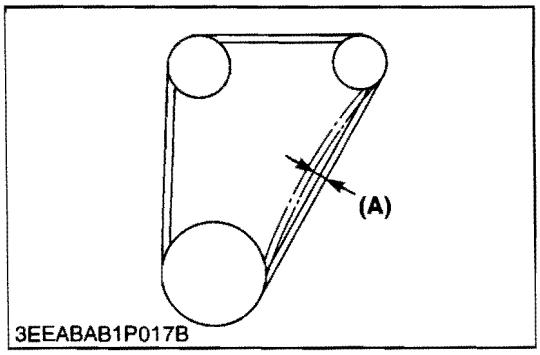
(When reassembling)

- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

Tightening torque	Oil pressure switch	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 lbf·ft

W1020167

(3) Cooling System



3EEABAB1P017B

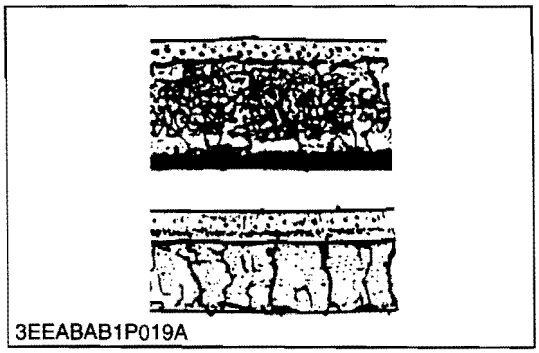
Fan Belt Tension

1. Measure the deflection **(A)**, depressing the belt halfway between the fan drive pulley and alternator pulley at specified force (98 N, 10 kgf, 22 lbf).
2. If the measurement is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

Deflection **(A)**	Factory spec.	7.0 to 9.0 mm 0.28 to 0.35 in.

(A) Deflection

W1020324

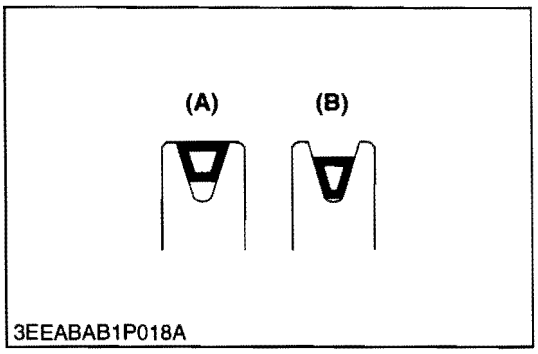

3EEABAB1P019A

Fan Belt Damage and Wear

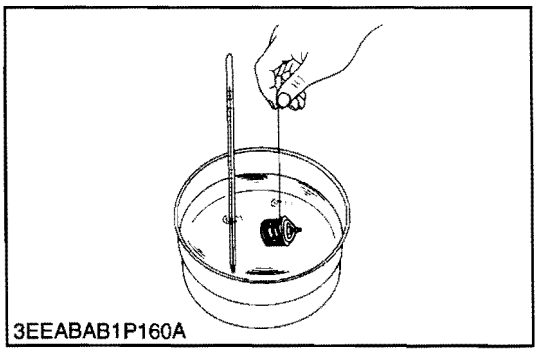
1. Check the fan belt for damage.
2. If the fan belt is damaged, replace it.
3. Check if the fan belt is worn and sunk in the pulley groove.
4. If the fan belt is nearly worn out and deeply sunk in the pulley groove, replace it.

(A) Good **(B) Bad**

W1020476



3EEABAB1P018A


3EEABAB1P160A

Thermostat Valve Opening Temperature

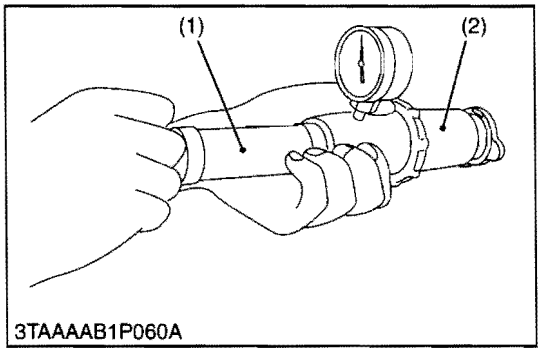
1. Suspend the thermostat in the water by a string with its end inserted between the valve and seat.
2. Heating the water gradually, read the temperature when the valve opens and leaves the string.
3. Continue heating and read the temperature when the valve opens approx. 8 mm (0.315 in.).
4. If the measurement is not within the factory specifications, replace the thermostat.

Thermostat's valve opening temperature	Factory spec.	69.5 to 72.5 °C 157.1 to 162.5 °F
Temperature at which thermostat completely opens	Factory spec.	85 °C 185 °F

W1020620

CAUTION

- **When removing the radiator cap, wait at least ten minutes after the engine has stopped and cooled down. Otherwise, hot water way gush out, scalding nearby people.**



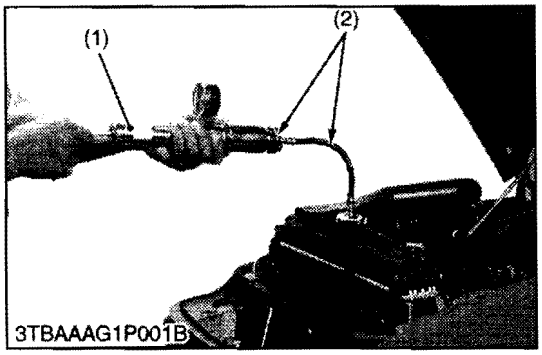
Radiator Cap Air Leakage

1. Set a radiator tester (1) and adaptor (2) on the radiator cap.
2. Apply the specified pressure 88 kPa (0.9 kgf/cm^2, 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm^2, 9 psi).
3. If the measurement is less than the factory specification, replace the radiator cap.

Pressure falling time	Factory spec.	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm^2 from 13 to 9 psi)

(1) Radiator Tester (2) Adaptor

W1020764



Radiator Water Leakage

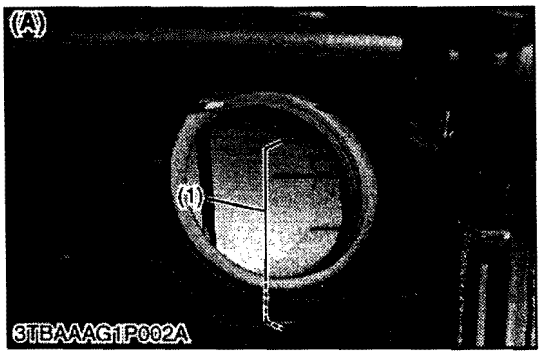
1. Pour a specified amount of water into the radiator.
2. Set a radiator tester (1) and an adaptor (2) and raise the water pressure to the specified pressure.
3. Check the radiator for water leaks.
4. For water leak from the pinhole, repair with the radiator cement. When water leak is excessive, replace the radiator.

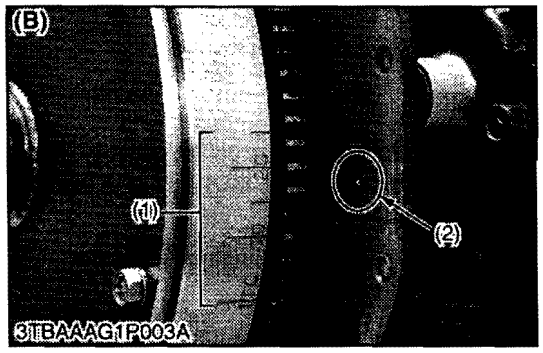
Radiator water leakage test pressure	Factory spec.	137 kPa 1.4 kgf/cm^2 20 psi

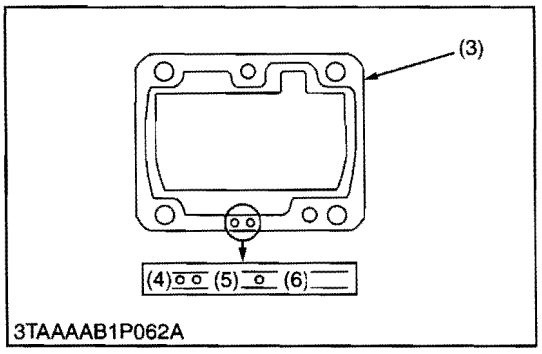
(1) Radiator Tester (2) Adaptor

W1020928

(4) Fuel System







Injection Timing

1. Remove the injection pipes.
2. Remove the engine stop solenoid.
3. Turn the flywheel counterclockwise (facing the flywheel) until fuel flows from the delivery valve holder.
4. Continue to turn the flywheel slowly, and stop it as soon as the fuel level at the tip of the delivery valve holder begins to increase.
5. Check to see if the timing angle lines on the flywheel is aligned with the alignment mark (2).
6. If the injection timing is out of adjustment, readjust the timing with shims.

Injection timing	Factory spec.	0.27 to 0.31 rad (16 to 18 °) before T.D.C.

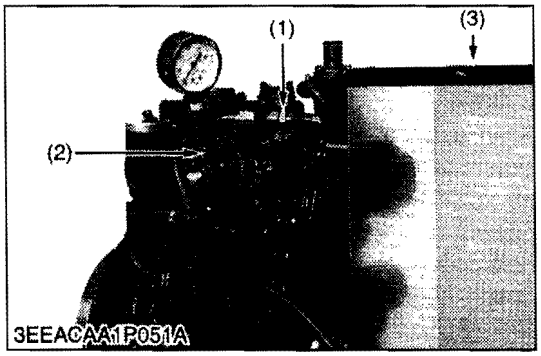
■ **NOTE**

- **The sealant is applied to both sides of the shim (soft metal gasket shim). The liquid gasket is not required for assembling.**
- **Shims are available in thickness of 0.20 mm (0.0079 in.), 0.25 mm (0.0098 in.) and 0.30 mm (0.0118 in.). Combine these shims for adjustments.**
- **Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad (0.5 °).**
- **In disassembling and replacing the injection pump, be sure to use the same number of new shims with the same thickness.**
- **Refer to figure below to check the thickness of the shims.**

(1) Timing Line
(2) Alignment Mark
(3) Shim (Soft Metal Gasket Shim)
(4) Two-holes:
0.20 mm (0.0079 in.)
(5) One-hole:
0.25 mm (0.0098 in.)
(6) Without hole:
0.30 mm (0.0118 in.)

A : Engine mounted on the tractor
B : Engine only

W1021080



Fuel Tightness of Pump Element

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Install the injection pump pressure tester to the injection pump.
4. Install the injection nozzle (1) jetted with the proper injection pressure to the injection pump pressure tester (2). (Refer to the photo.)
5. Set the speed control lever to the maximum speed position.
6. Run the starter to increase the pressure.
7. If the pressure can not reach the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

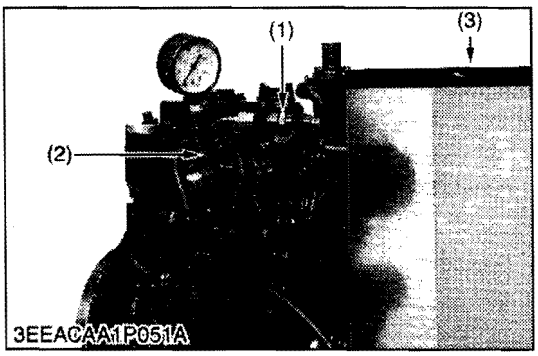
Fuel tightness of pump element	Allowable limit	13.73 MPa 140 kgf/cm^2 1991 psi

■ **NOTE**

- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

(1) Injection Nozzle
(2) Injection Pump Pressure Tester
(3) Protection Cover for Jetted Fuel

W1021224



Fuel Tightness of Delivery Valve

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Set a pressure tester to the fuel injection pump.
4. Install the injection nozzle (1) jetted with the proper injection pressure to the injection pump pressure tester (2).
5. Run the starter to increase the pressure.
6. Stop the starter when the fuel jets from the injection nozzle. After that, turn the flywheel by the hand and raise the pressure to approx. 13.73 MPa (140 kgf/cm^2, 1991 psi).
7. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 13.73 to 12.75 MPa (from 140 to 130 kgf/cm^2, from 1991 to 1849 psi).
8. Measure the time needed to decrease the pressure from 13.73 to 12.75 MPa (from 140 to 130 kgf/cm^2, from 1991 to 1849 psi).
9. If the measurement is less than allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

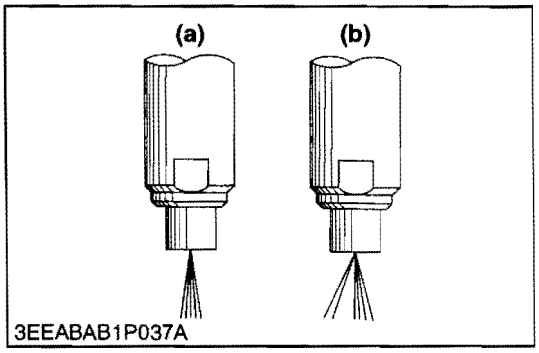
Fuel tightness of delivery valve	Factory spec.	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi
	Allowable limit	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi

■ **NOTE**

- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

(1) Injection Nozzle
(2) Injection Pump Pressure Tester
(3) Protection Cover for Jetted Fuel

W1036111



Nozzle Spraying Condition

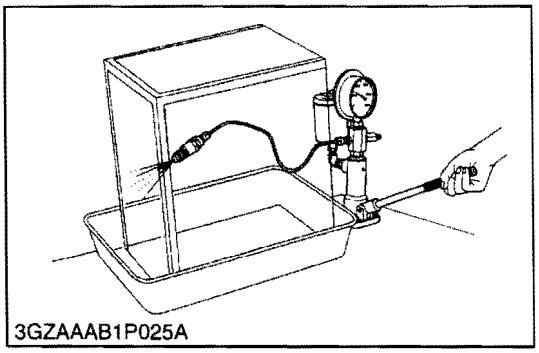
⚠ CAUTION

- **Check the injection pressure and condition after confirming that there is nobody standing in the direction the fume goes.**
- **If the fume from the nozzle directly injects the human body, cells may be destroyed and blood poisoning may be caused.**

1. Set the injection nozzle to a nozzle tester, and check the nozzle spraying condition.
2. If the spraying condition is defective, replace the nozzle piece.

(a) Good **(b) Bad**

W1021368


3GZAAAB1P025A

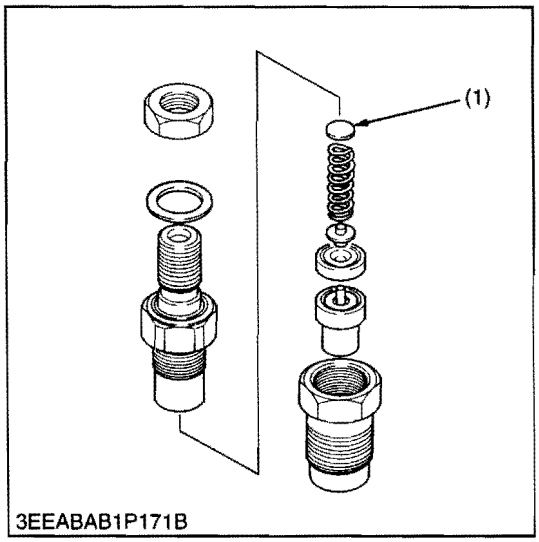
Fuel Injection Pressure

1. Set the injection nozzle to a nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the adjusting washer (1) in the nozzle holder to adjust it.

Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm^2 1991 to 2134 psi

(Reference)

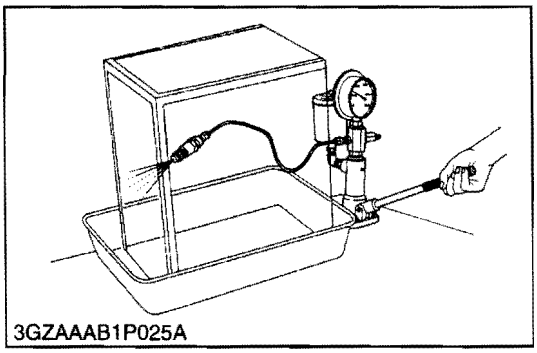
- Pressure variation with 0.01 mm (0.0004 in.) difference of adjusting washer thickness
  Approx. 235 kPa (2.4 kgf/cm^2, 34 psi)
- Pressure with 0.01 mm (0.0004 in.) difference of adjusting washer thickness varies approx. 235 kPa (2.4 kgf/cm^2, 34 psi).



3EEABAB1P171B

(1) Adjusting Washer

W1021532

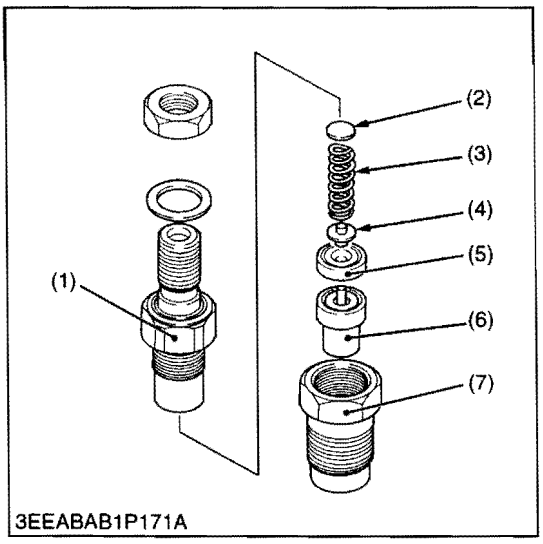

3GZAAAB1P025A

Valve Seat Tightness

1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm^2, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

Valve seat tightness	Factory spec.	No fuel leak at 12.75 MPa 130 kgf/cm^2 1849 psi

W1021684



Nozzle Holder

1. Secure the nozzle retaining nut (7) with a vise.
2. Remove the nozzle holder (1), and take out parts inside.

(When reassembling)

- Assemble the nozzle in clean fuel oil.
- Install the push rod (4), noting its direction.
- After assembling the nozzle, be sure to adjust the fuel injection pressure.

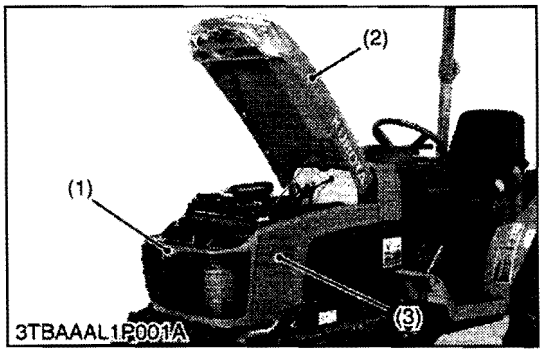
Tightening torque	Nozzle holder	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 lbf·ft
	Overflow pipe retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 lbf·ft
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft

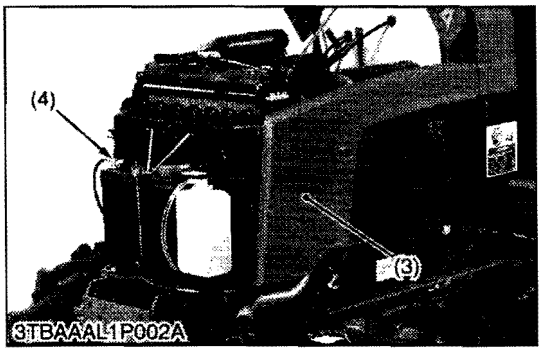
(1) Nozzle Holder
(2) Adjusting Washer
(3) Nozzle Spring
(4) Push Rod
(5) Distance Piece
(6) Nozzle Piece
(7) Nozzle Retaining Nut

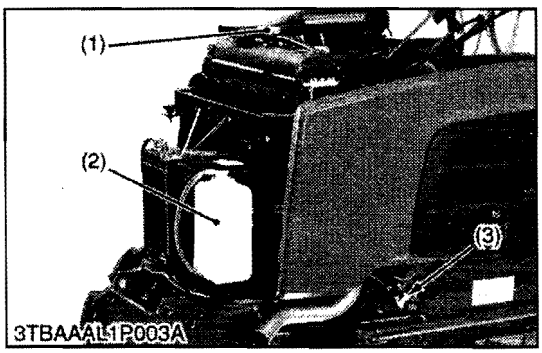
W1021828

[2] PREPARATION

(1) Separating Engine from Clutch Housing







Bonnet, Front Grille, Side Cover and Battery Negative Cord

1. Open the bonnet (2) and remove the front grille (1).
2. Disconnect the negative cord (4).
3. Disconnect the head light connectors and remove the bonnet (2).
4. Remove the side covers (3).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the negative cord first. When connecting, positive cord first.**

(1) Front Grille
(2) Bonnet
(3) Side Cover
(4) Battery Negative Code

W1107733

Draining Coolant

⚠ **CAUTION**

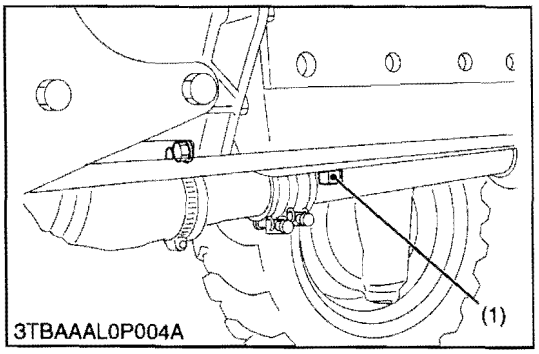
- **Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**

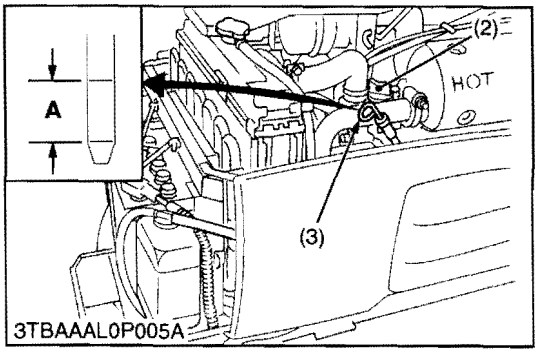
1. Loosen the drain cock (3) from the radiator hose to drain coolant.
2. Remove the radiator cap (1) to drain coolant completely.

Coolant capacity (with recovery tank)	4.5 L 4.8 U.S.qts 4.0 Imp.qts

(1) Radiator Cap
(2) Recovery Tank
(3) Drain Cock

W1013719





Draining Engine Oil

1. Place an oil pan underneath the engine.
2. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
3. Screw in the drain plug (1).

(When refilling)

- Fill with the new oil up to the upper notch on the dipstick.

■ IMPORTANT

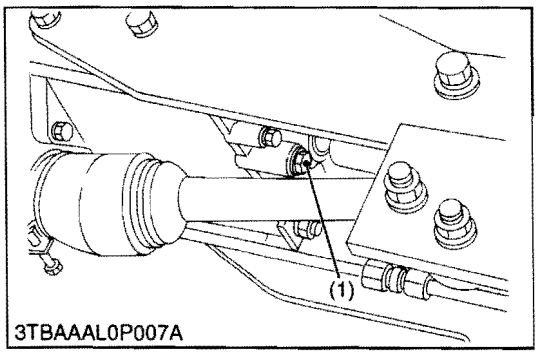
- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)**

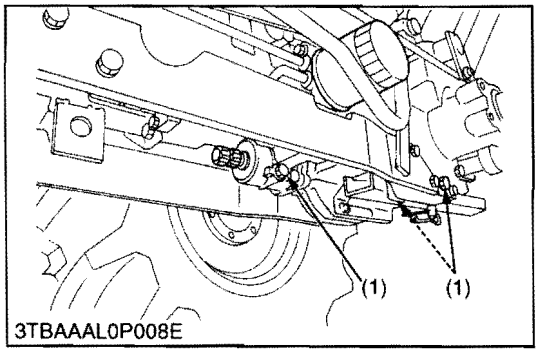
Engine oil capacity	5.4 L 5.7 U.S.qts 4.8 Imp.qts

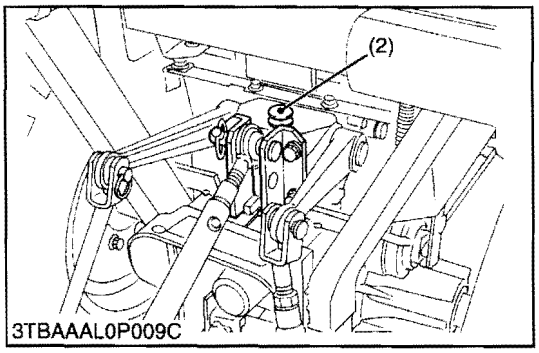
(1) Drain Plug
(2) Oil Inlet
(3) Dipstick

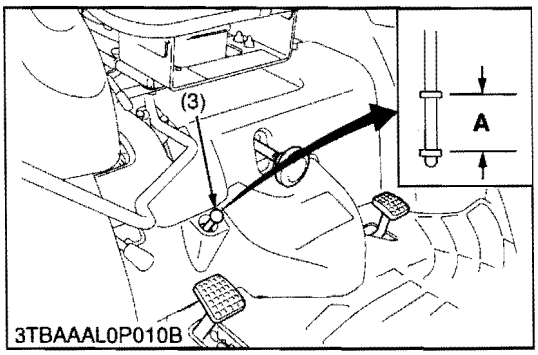
A : Proper Oil Level

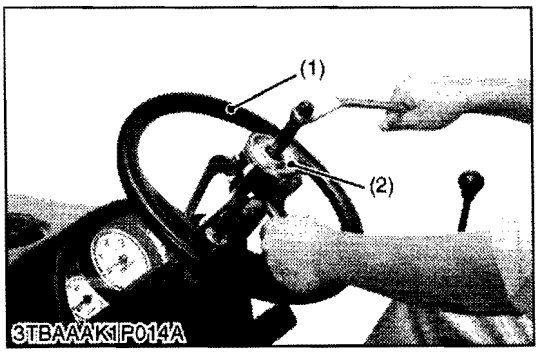
W1013752











Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1).
2. Drain the transmission fluid.
3. Reinstall the drain plug.

(When refilling)

- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ IMPORTANT

- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

(1) Drain Plug
(2) Filling Plug
(3) Dipstick

A : Proper Oil Level

W1013803

Steering Wheel

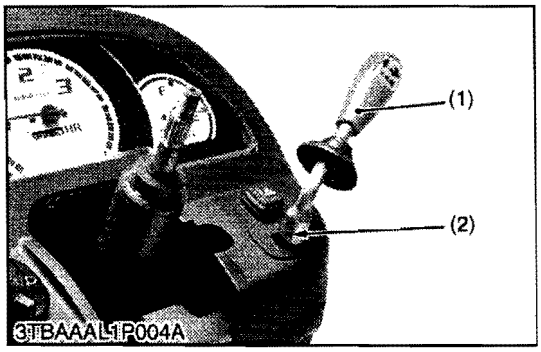
1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel (1) with a steering wheel puller (2).

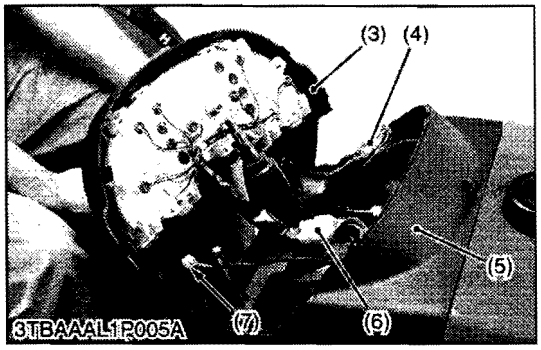
(When reassembling)

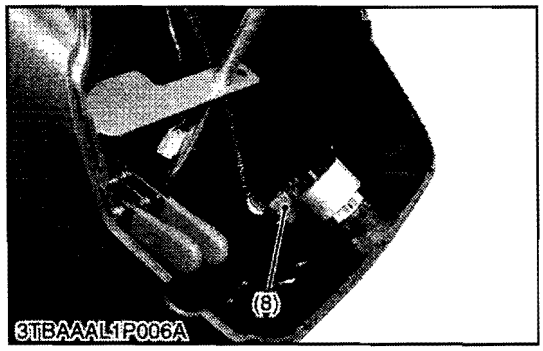
Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

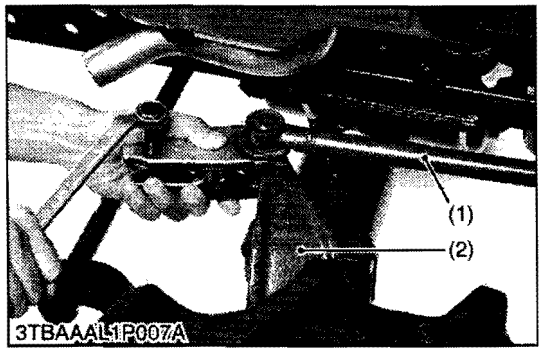
(1) Steering Wheel (2) Steering Wheel Puller

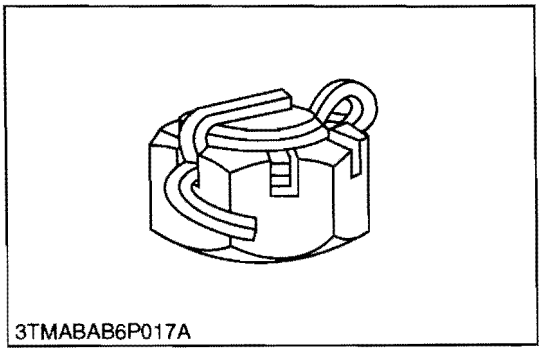
W1013886











Meter Panel and Panel Under Cover

1. Tap out the spring pin (2) and remove the hand accelerator lever (1).
2. Open the meter panel (3) and disconnect the hourmeter cable, meter panel connector (6), combination switch connector (4) and hazard switch connector (7). Then remove the meter panel (3).
3. Disconnect the main switch connector (8) and remove the panel under cover (5).

(1) Hand Accelerator Lever
(2) Spring Pin
(3) Meter Panel
(4) Combination Switch Connector
(5) Panel Under Cover
(6) Meter Panel Connector
(7) Hazard Switch Connector
(8) Main Switch Connector

W1108120

Drag Link

1. Remove the cotter pin and loosen the slotted nut.
2. Disconnect the drag link (1) with a pitman arm puller from the knuckle arm (2).

(When reassembling)

■ **IMPORTANT**

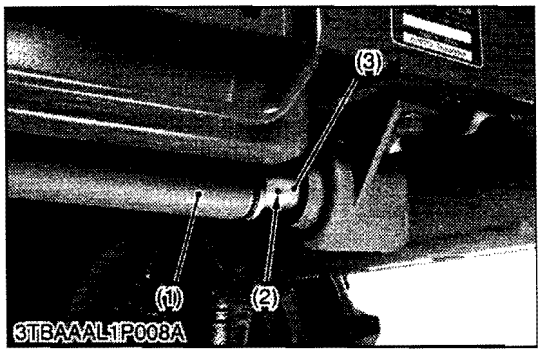
- **Do not loosen the slotted nut to align the hole.**
- **Install the cotter pin as shown in the figure.**

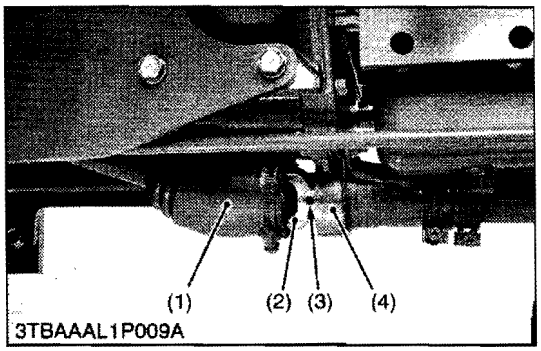
(Reference)

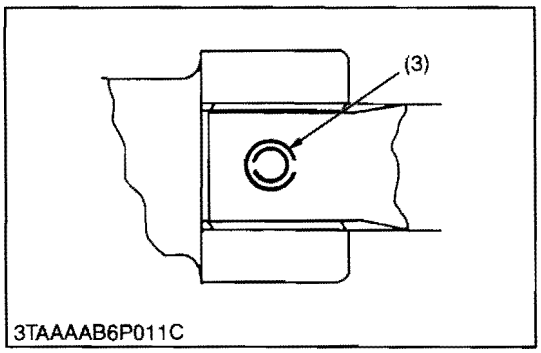
Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 lbf·ft

(1) Drag Link
(2) Knuckle Arm

W1028315







Propeller Shaft Cover and Coupling

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft and coupling.

(1) Propeller Shaft Cover
(2) Spring Pin
(3) Coupling

W1028559

Universal Joint and Bearing Holder

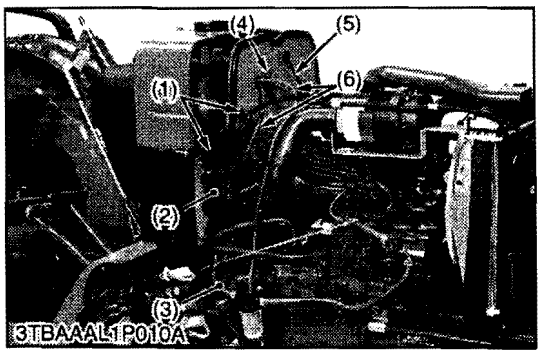
1. Loosen the clamp and slide the universal joint cover (1) to the rear.
2. Tap out the spring pins (3) and then slide the universal joint (2) to the rear.
3. Remove the bearing holder (4) with propeller shaft and universal joint.

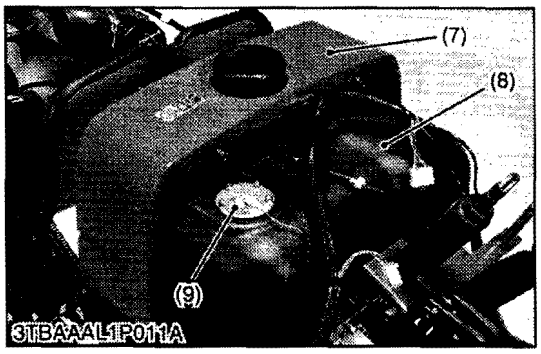
(When reassembling)

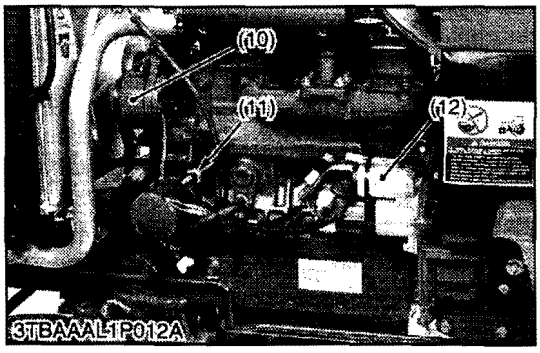
- Apply grease to the splines of the propeller shaft and universal joint.
- Replace the spring pins (3) with new one.
- When inserting the spring pins (3), face their splits in the direction parallel to the universal joint as shown in the figure.

(1) Universal Joint Cover
(2) Universal Joint
(3) Spring Pin
(4) Bearing Holder

W1028946





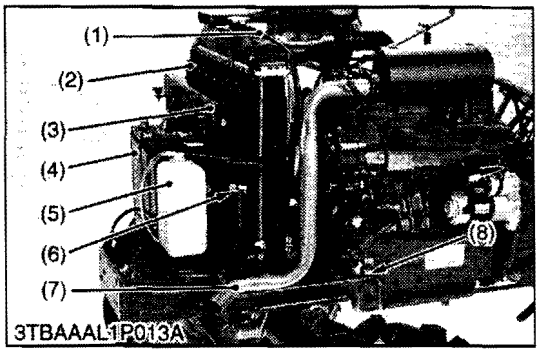


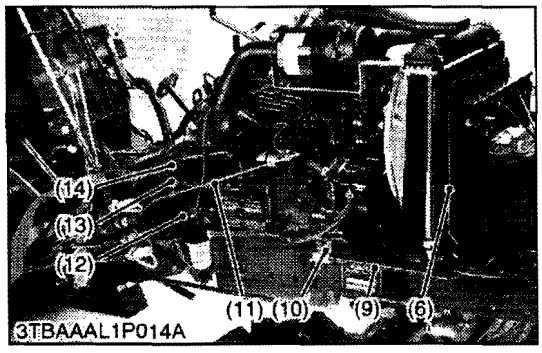
Fuel Tank and Wire Harness

1. Disconnect the fuel hose (3) at the fuel filter side, then drain fuel completely.
2. Remove the fuse box (2) and disconnect the wire harness clamp (1).
3. Remove the fuel tank frame stay bolt (4). Disconnect the overflow hoses (6) and pull out the hour meter cable (5).
4. Disconnect the lead wires for fuel gauge and disconnect the wire harness clamps.
5. Remove the fuel tank (8) with tank frame (7).
6. Disconnect the glow plug lead wire, thermo sensor lead wire, engine stop solenoid connector, engine oil pressure switch lead wire, dynamo connector and starter motor lead wire.

(1) Wire Harness Clamp
(2) Fuse Box
(3) Fuel Hose
(4) Bolt
(5) Hour Meter Cable
(6) Overflow Hose
(7) Tank Frame
(8) Fuel Tank
(9) Fuel Gauge
(10) Dynamo
(11) Engine Oil Pressure Switch
(12) Starter Motor

W1029197



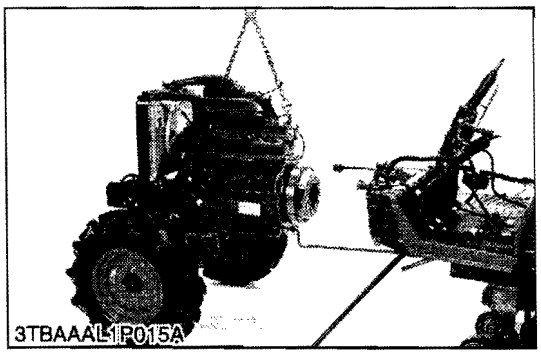


Battery, Recovery Tank, Battery Stay and Hydraulic Pipes

1. Remove the battery retainer.
2. Disconnect the positive cord and remove the battery (4).
3. Remove the recovery hose (1).
4. Remove the muffler pipe (7).
5. Remove the oil cooler pipe plate spring (6).
6. Remove the battery stay (3) with oil cooler (2).
7. Remove the oil cooler pipe clamp (8), (10). Then remove the oil cooler pipe (2).
8. Disconnect the accelerator rod (11).
9. Remove the power steering delivery pipe (14).
10. Remove the pipe clamp and the disconnect the 3-point hitch delivery pipe (13) and suction hose (12).

(1) Recovery Tank Hose
(2) Oil Cooler
(3) Battery Stay
(4) Battery
(5) Recovery Tank
(6) Oil Cooler Pipe Plate Spring
(7) Muffler Pipe
(8) Clamp
(9) Oil Cooler Pipe
(10) Clamp
(11) Accelerator Rod
(12) Suction Hose
(13) 3-Point Hitch Delivery Pipe
(14) Power Steering Delivery Pipe

W1029709



Separating the Engine from Clutch Housing

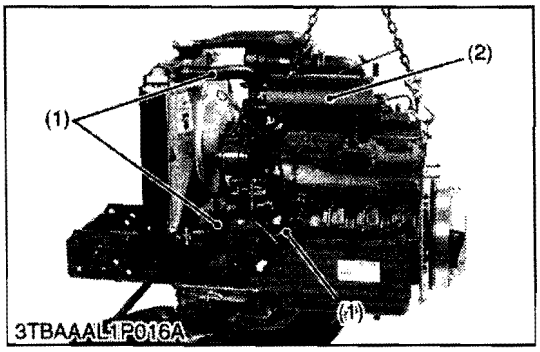
1. Place the jack under the center frame.
2. Hoist the engine by the chain at the engine hook.
3. Remove the engine mounting screws and separate the engine from the clutch housing.

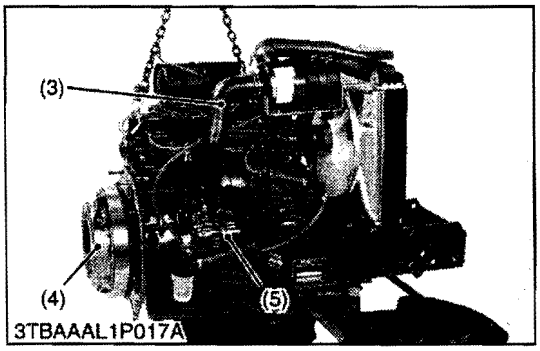
(When reassembling)

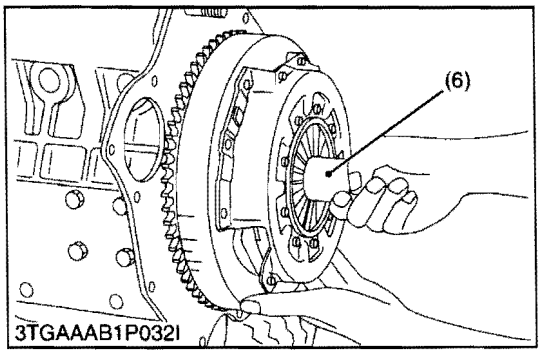
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine mounting M8 screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 lbf·ft
	Engine mounting M10 nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

W1030133







Outer Parts and Separating Front Axle Assembly

1. Remove the muffler (2) and air filter assembly (3).
2. Remove the hydraulic pump (5).
3. Remove the clutch assembly (4).
4. Disconnect the radiator hoses (1) and remove the radiator assembly.
5. Hoist the engine by the chain at the engine hook.
6. Remove the front axle frame mounting screws and separate the front axle assembly front the engine.

(When reassembling)

- Direct the shorter end of the clutch disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Insert the pressure plate noting the position of straight pins.

■ **IMPORTANT**

- **Be sure to align the center of disc and flywheel by inserting the clutch center tool (6).**

■ **NOTE**

- **Do not allow grease and oil on the clutch disc facing.**

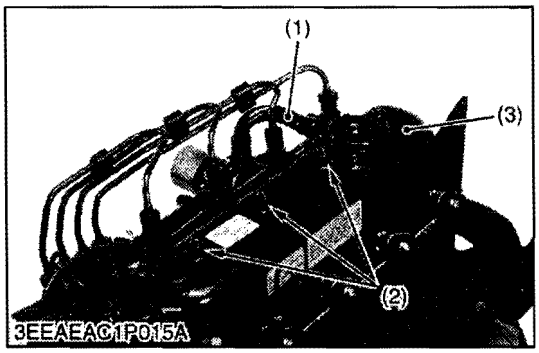
Tightening torque	Front axle frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Clutch cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

(1) Radiator Hose
(2) Muffler
(3) Air Filter Assembly
(4) Clutch Assembly
(5) Hydraulic Pump
(6) Clutch Center Tool

W1030796

[3] DISASSEMBLING AND ASSEMBLING

(1) Cylinder Head and Valve and Oil Pan



Cylinder Head Cover

1. Disconnect the breather hose (1).
2. Remove the head cover nut (2).
3. Remove the cylinder head cover (3).

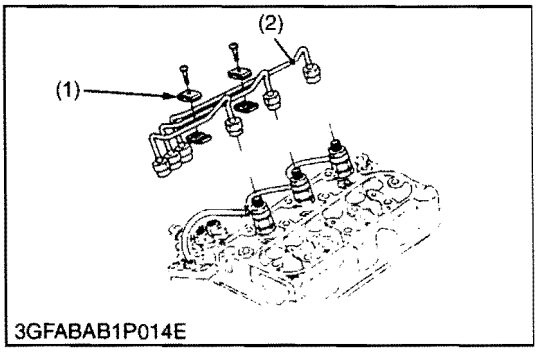
(When reassembling)

- Check to see if the cylinder head cover gasket is not defective.

Tightening torque	Cylinder head cover nut	6.9 to 8.8 N·m 0.7 to 0.9 kgf·m 5.1 to 6.5 lbf·ft

(1) Breather Hose
(2) Head Cover Nut
(3) Cylinder Head Cover

W1061520



Injection Pipes

1. Loosen the screws on the pipe clamp (1).
2. Detach the injection pipes (2).

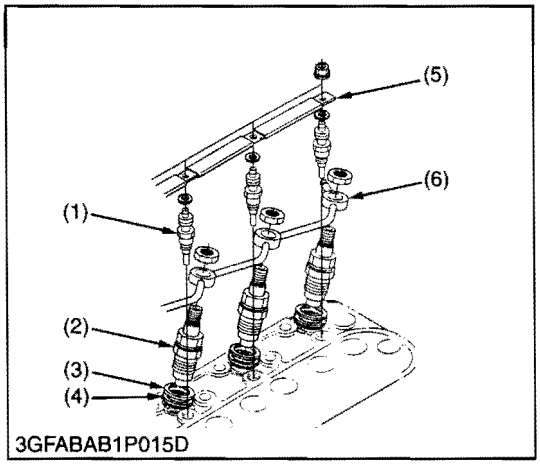
(When reassembling)

- Sent compressed air into the pipes to blow out dust. Then, reassemble the pipes in the reverse order.

Tightening torque	Injection pipe retaining nut	24.5 to 34.3 N·m 2.5 to 3.5 kgf·m 18.1 to 25.3 lbf·ft

(1) Pipe Clamp
(2) Injection Pipe

W1063561



Nozzle Holder Assembly and Glow Plug

1. Remove the overflow pipe assembly (6).
2. Remove the nozzle holder assemblies (2).
3. Remove the copper gasket (3) and heat seal (4).
4. Remove the lead (5) from the glow plugs.
5. Remove the glow plugs (1).

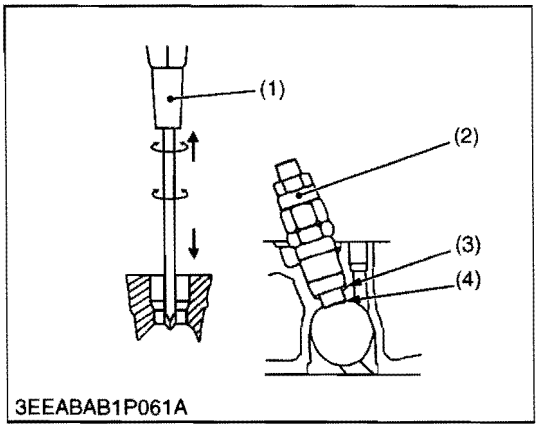
(When reassembling)

- Replace the copper gasket and heat seal with new one.

Tightening torque	Nozzle holder assembly	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft
	Overflow pipe assembly retaining nut	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft
	Glow plug	7.9 to 14 N·m 0.8 to 1.5 kgf·m 5.8 to 10 lbf·ft

(1) Glow Plug
(2) Nozzle Holder Assembly
(3) Copper Gasket
(4) Heat Seal
(5) Lead
(6) Overflow Pipe Assembly

W1014441



3EEABAB1P061A

Nozzle Heat Seal Service Removal Procedure

■ **IMPORTANT**

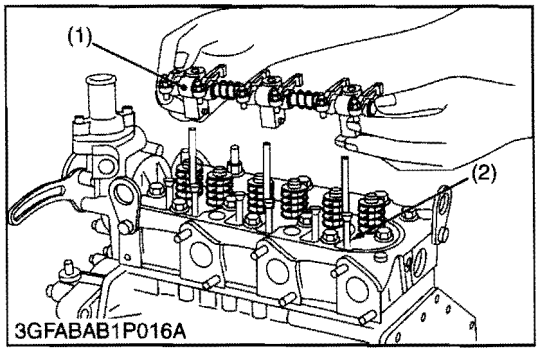
- **Use a plus (phillips head) screw driver that has a Dia. which is bigger than the heat seal hole (Approx. 6 mm (1/4 in.))**

1. Drive screw driver lightly into the heat seal hole.
2. Turn screw driver three or four times each way.
3. While turning the screw driver, slowly pull the heat seal out together with the injection nozzle gasket.

If the heat seal drops, repeat the above procedure. Heat seal and injection nozzle gasket must be changed when the injection nozzle is removed for cleaning or for service.

(1) Plus Screw Driver
(2) Injection Nozzle
(3) Injection Nozzle Packin
(4) Heat Seal

W1063709



3GFABAB1P016A

Rocker Arm and Push Rod

1. Remove the rocker arm bracket nut.
2. Detach the rocker arm assembly (1).
3. Remove the push rods (2).

(When reassembling)

- When putting the push rods (2) onto the tappets (3), check to see if their ends are properly engaged with the dimples.

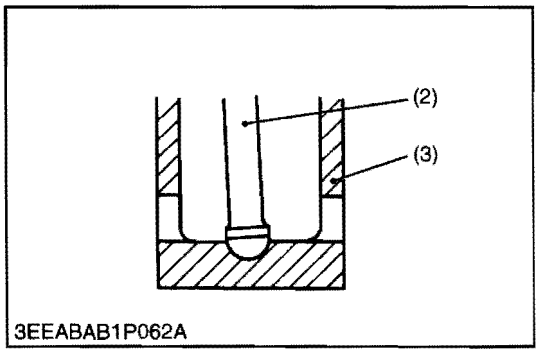
■ **IMPORTANT**

- **After installing the rocker arm, be sure to adjust the valve clearance.**

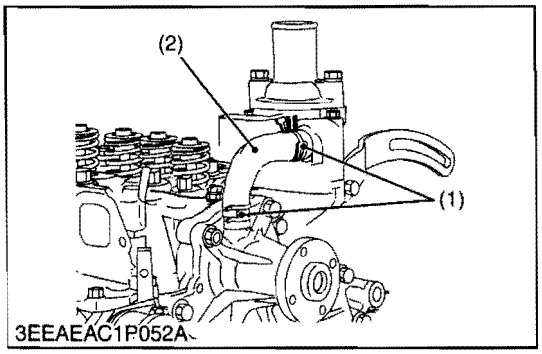
Tightening torque	Rocker arm bracket nut	21.6 to 26.5 N·m 2.2 to 2.7 kgf·m 15.9 to 19.5 lbf·ft

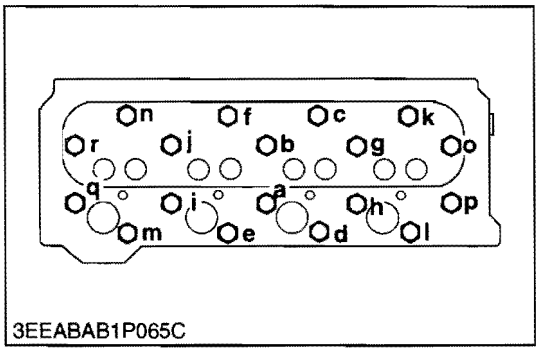
(1) Rocker Arm Assembly
(2) Push Rod
(3) Tappet

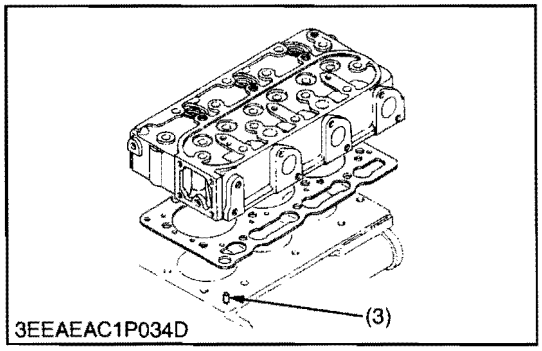
W1063857

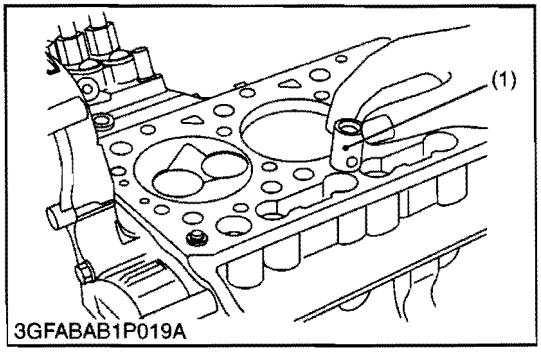


3EEABAB1P062A









Cylinder Head and Cylinder Head Gasket

1. Loosen the pipe clamps (1), and remove the water return pipe (2).
2. Remove the cylinder head screw in the order of (**r**) to (**a**) and remove the cylinder head.
3. Remove the cylinder head gasket.

(When reassembling)

- Replace the cylinder head gasket with new one.
- When mounting the gasket, set it to the pin pipe holes. Take care not to mount it reversely.
- The cylinder head should be free of scratches and dust.
- Install the cylinder head, using care not to damage the gasket.
- After applying engine oil to the thread of screws, tighten them in several steps and specified sequence (**a**) to (**r**).

■ **NOTE**

- **Do not use O-ring on the pin pipe.**
- **It is not necessary to retighten the cylinder head screw and to readjust valve clearance after engine warmed up.**

Tightening torque	Cylinder head screw	64 to 68 N·m 6.5 to 7.0 kgf·m 47 to 50 lbf·ft

(1) Clamp
(2) Return Pipe
(3) Pin Pipe

r to a : To Loosen
a to r : To Tighten

W10205250

Tappets

1. Remove the tappets (1) from the crankcase.

(When reassembling)

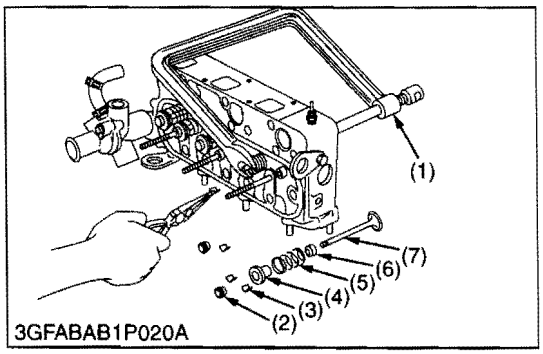
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

■ **IMPORTANT**

- **Do not change the combination of tappet and tappet guide.**

(1) Tappet

W10209700



Valves

1. Remove the valve caps (2).
2. Remove the valve spring collet (3), pushing the valve spring retainer (4) by valve spring replacer (1).
3. Remove the valve spring retainer (4), valve spring (5) and valve stem seal (6).
4. Remove the valve (7).

(When reassembling)

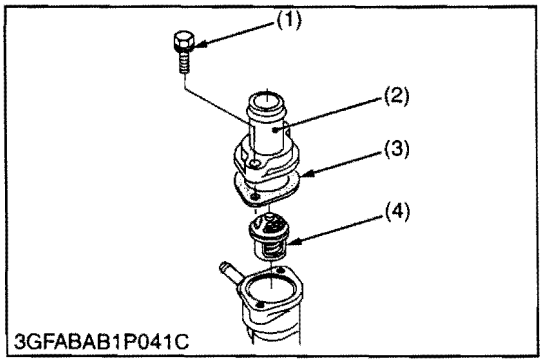
- Wash the valve stem seal and valve guide hole, and apply engine oil sufficiently.
- After installing the valve spring collets, lightly tap the stem to assure proper fit with a plastic hammer.

■ **IMPORTANT**

- **Do not change the combination of valve and valve guide.**

(1) Valve Spring Replacer
(2) Valve Cap
(3) Valve Spring Collet
(4) Valve Spring Retainer
(5) Valve Spring
(6) Valve Stem Seal
(7) Valve

W1064327



Thermostat Assembly

1. Remove the thermostat cover mounting screws (1), and remove the thermostat cover (2).
2. Remove the thermostat assembly (4).

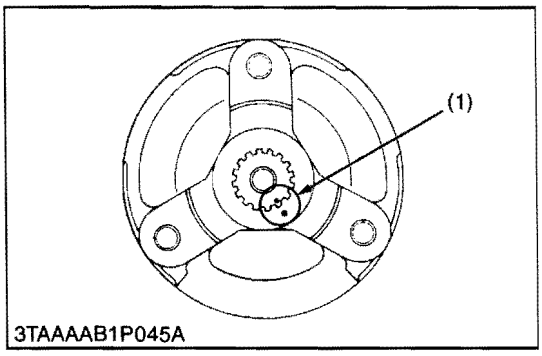
(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (3).

(1) Thermostat Cover Mounting Screw
(2) Thermostat Cover
(3) Thermostat Cover Gasket
(4) Thermostat Assembly

W1064475

(2) Gear Case



Fan Drive Pulley

1. Secure the flywheel to keep it from turning.
2. Remove the fan drive pulley screw.
3. Draw out the fan drive pulley with a puller.

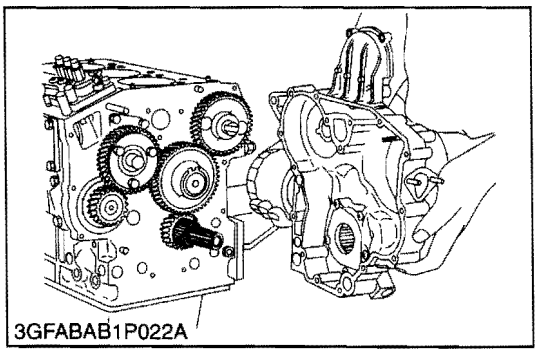
(When reassembling)

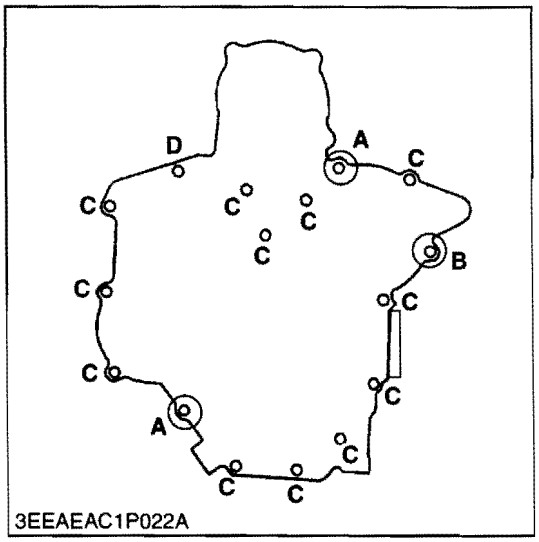
- Install the pulley to the crankshaft, aligning the mark (1) on them.
- Apply engine oil to the fan drive pulley retaining screws. And tighten them.

Tightening torque	Fan drive pulley screw	235.4 to 245.2 N·m 24.0 to 25.0 kgf·m 173.6 to 180.8 lbf·ft

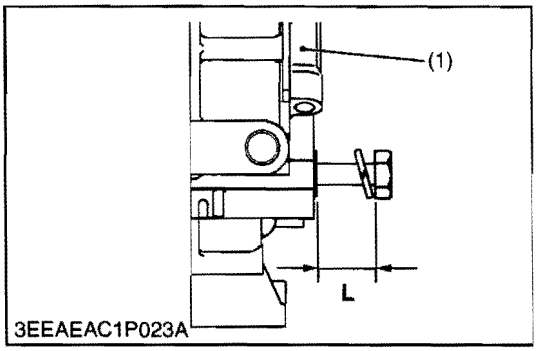
(1) Alignment Mark

W1064623

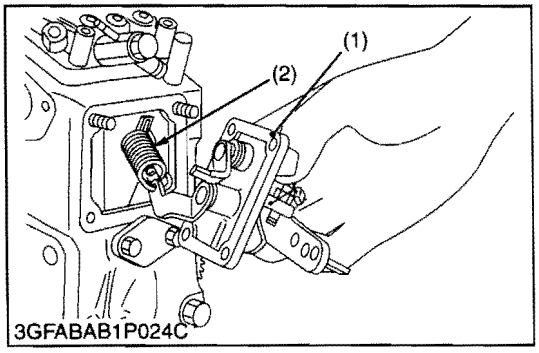

3GFABAB1P022A



3EEAEAC1P022A



3EEAEAC1P023A



3GFABAB1P024C

Gear Case

1. Remove the gear case.

(When reassembling)

- Grease thinly to the oil seal, and install it, ensuring the lip does not come off.
- Measure the length (L) when the gear case mounting bolt is inserted in the gear case bolt hole and judge the installation position of the mounting bolt when you do not understand the installation position of the mounting bolt.
  A : L= 18 mm (0.71 in.) (Pipe Pin Position)
  B : L= 13 mm (0.51 in.) (Water Pipe Mounting)
  C : L= 10 mm (0.39 in.)
  D : Nut
  L : Length between the mounting bolt and the gear case surface

(1) Gear Case

W1068707

Engine Stop Solenoid and Speed Control Plate

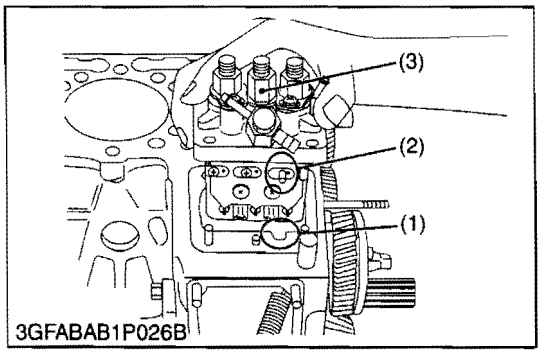
1. Remove the engine stop solenoid.
2. Disconnect the governor spring (2) from the speed control plate (1).
3. Remove the speed control plate.

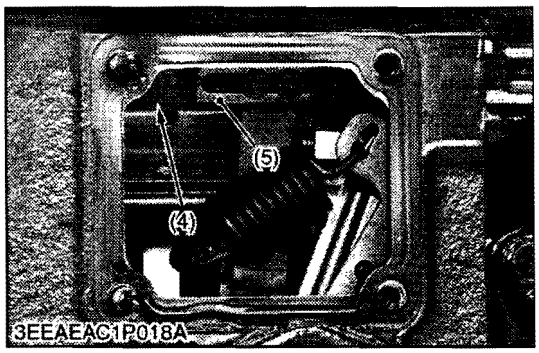
(When reassembling)

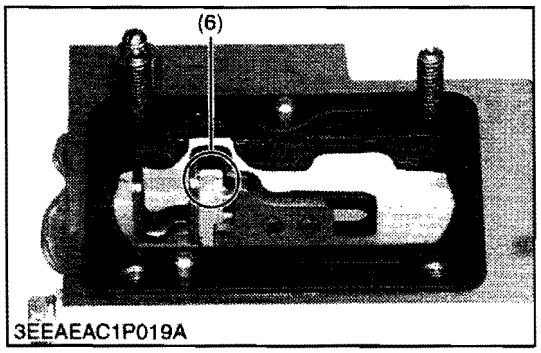
- Apply a liquid gasket (Three Bond 1215 or equivalent) to both sides of the solenoid cover gasket and control plate gasket.
- Be careful not to drop the governor springs into the crankcase.

(1) Speed Control Plate (2) Governor Spring

W1068858







Injection Pump

1. Disconnect the starter spring (4) on the thrust lever side (5).
2. Align the control rack pin (2) with the notch (1) on the crankcase, and remove the injection pump (3).
3. Remove the injection pump shims.
4. In principle, the injection pump should not be disassembled.

(When reassembling)

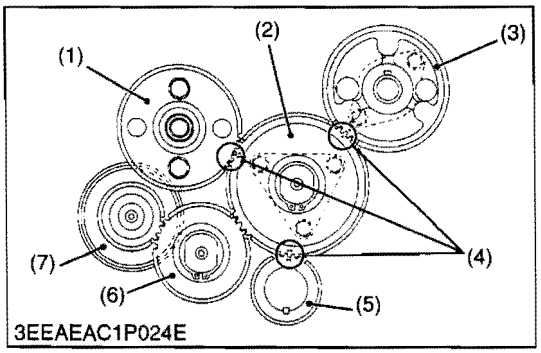
- When installing the injection pump, insert the control rack pin (2) firmly into the groove (6) of the thrust lever of fork lever.

■ **NOTE**

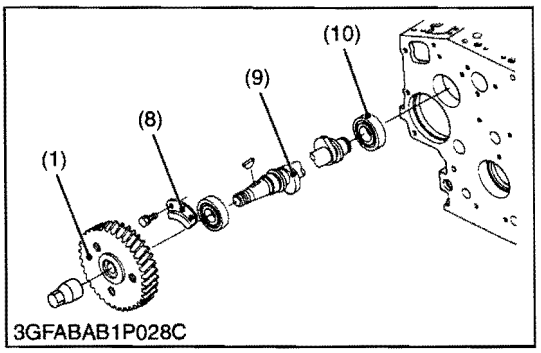
- **The sealant is applied to both sides of the soft metal gasket shim. The liquid gasket is not required for assembling.**
- **Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad (0.5 °).**
- **In disassembling and replacing, be sure to use the same number or new gasket shims with the same thickness.**

(1) Notch
(2) Control Rack Pin
(3) Injection Pump
(4) Start Spring
(5) Thrust Lever
(6) Groove

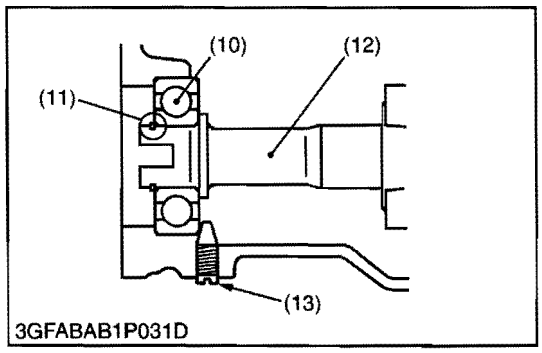
W1069029



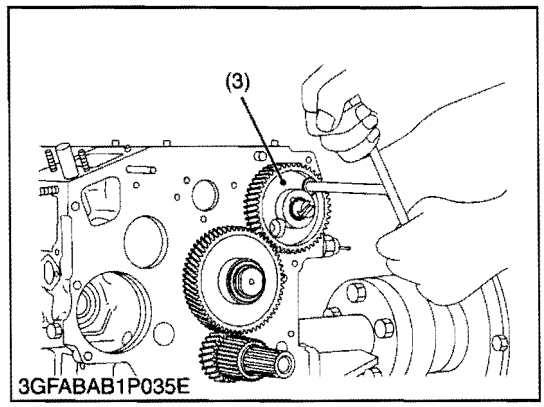
3EEAEAC1P024E



3GFABAB1P028C



3GFABAB1P031D



3GFABAB1P035E

Cam Gear, Idle Gear 1, 2 and Governor Gear

1. Remove the idle gear 2 (6) / idle gear 1 (2).
2. Remove the fuel camshaft stopper (8).
3. Draw out the fuel cam gear (1) with fuel camshaft (9).
4. Remove the camshaft stopper bolt.
5. Remove the cam gear (3) with camshaft.
6. Remove the external snap ring (11) from the governor shaft (12).
7. Remove the governor gear (7) with governor shaft (12).

■ **NOTE**

- **Three-lever type fork lever**
  To remove the governor shaft, follow the procedures in 5, 6 above and never remove fork lever and the max torque limiter.

(When reassembling)

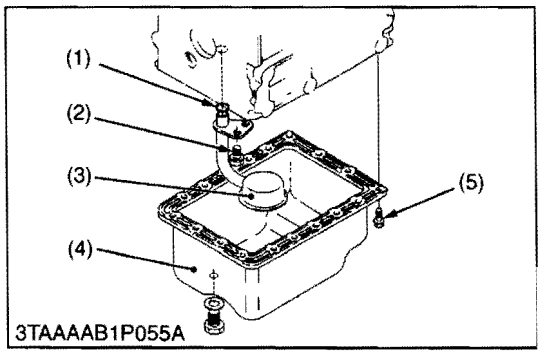
- Apply engine oil thinly to the fuel camshaft before installation.
- Make sure to assemble the external snap ring of the governor shaft.
- Check the governor shaft for smooth rotation.

■ **IMPORTANT**

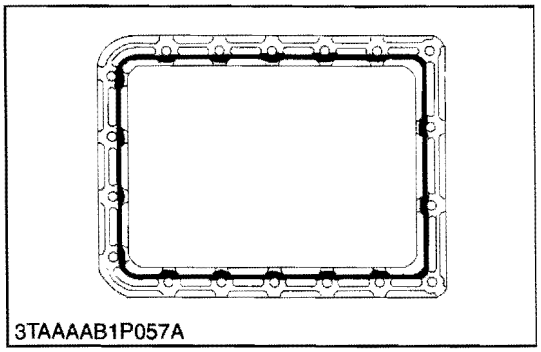
- **There is a model of idle gear 1 (2) and idle gear 2 (6) by the difference of the method of transmission the power to the governor gear (7).**
- **When replacing the ball bearing of governor shaft, securely fit the ball bearing (10) to the crankcase, apply an adhesive (Three Bond 1324B or equivalent) to the set screw (13), and fasten the screw until its tapered part contacts the circumferential end of the ball bearing.**
- **When installing the idle gear, be sure to align the alignment marks on each gears.**

(1) Fuel Cam Gear
(2) Idle Gear 1
(3) Cam Gear
(4) Alignment Mark
(5) Crank Gear
(6) Idle Gear 2
(7) Governor Gear
(8) Fuel Camshaft Stopper
(9) Fuel Camshaft
(10) Ball Bearing
(11) External Snap Ring
(12) Governor Shaft
(13) Set Screw

W1033942



3TAAAAB1P055A


3TAAAAB1P057A

Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws (5).
2. Remove the oil pan (4).
3. Remove the oil strainer (3).

(When reassembling)

- After cleaning the oil strainer, check to see that the filter mesh is clean, and install it.
- Visually check the O-ring (1), apply engine oil, and install it.
- Securely fit the O-ring to the oil strainer.
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.

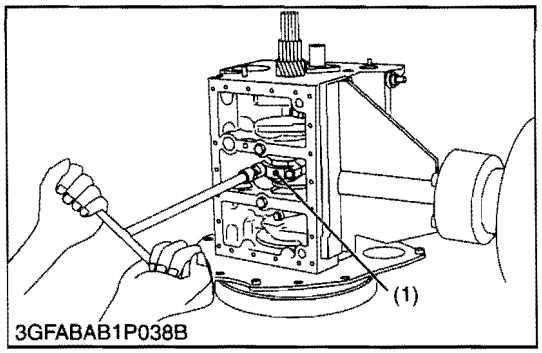
■ **IMPORTANT**

- **Scrape off the old adhesive completely. Wipe the sealing surface clean using waste cloth soaked with gasoline. Now apply new adhesive 3 to 5 mm (0.12 to 0.20 in.) thick all over the contact surface. Apply the adhesive also on the center of the flange as well as on the inner wall of each screw hole.**
- **Cut the nozzle of the "liquid gasket" container at its second notch. Apply "liquid gasket" about 5 mm (0.20 in.) thick. Within 20 minutes after the application of fluid sealant, reassemble the components. Wait then for about 30 minutes, and pour oil in the crankcase.**

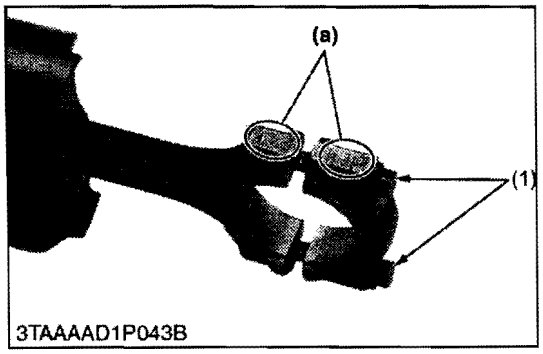
(1) O-ring
(2) Screw
(3) Oil Strainer
(4) Oil Pan
(5) Oil Pan Mounting Screws

W1069339

(3) Piston and Connecting Rod



3GFABAB1P038B



3TAAAAD1P043B

Connecting Rod

1. Remove the connecting rod cap.

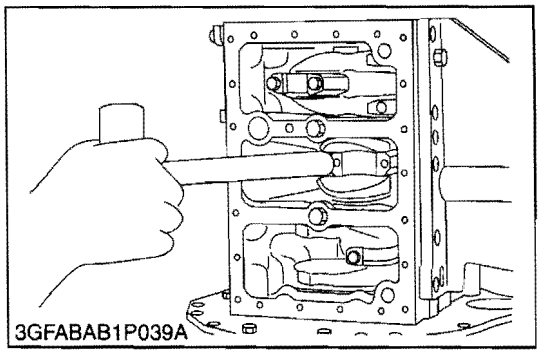
(When reassembling)

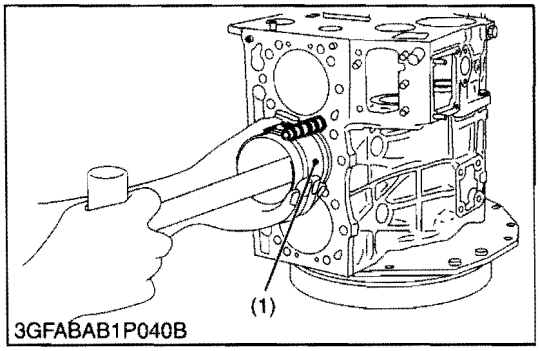
- Align the marks **(a)** with each other. (Face the marks toward the injection pump.).
- Apply engine oil to the connecting rod screws (1) and lightly screw it in by hand, then tighten it to the specified torque.
  If the connecting rod screw won't be screwed in smoothly, clean the threads.
  If the connecting rod screw (1) is still hard to screw in, replace it.

Tightening torque	Connecting rod screw	41.2 to 46.1 N·m 4.2 to 4.7 kgf·m 30.4 to 34.0 lbf·ft

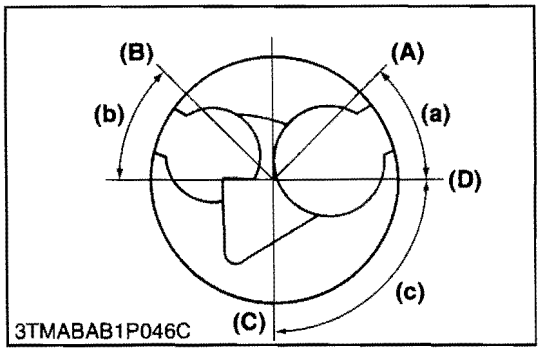
(1) Connecting Rod Screw
(a) Mark

W1069490


3GFABAB1P039A



3GFABAB1P040B



3TMABAB1P046C

Piston

1. Turn the flywheel and bring the piston to top dead center.
2. Draw out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.
3. Draw out the other piston in the same method as above.

(When reassembling)

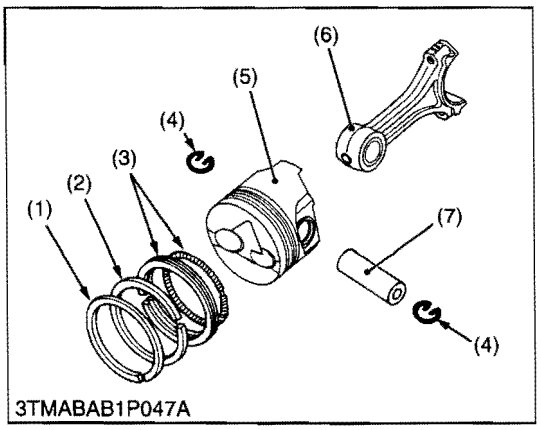
- Before inserting the piston into the cylinder, apply enough engine oil to the piston.
- When inserting the piston into the cylinder, face the mark on the connecting rod to the injection pump.

■ IMPORTANT

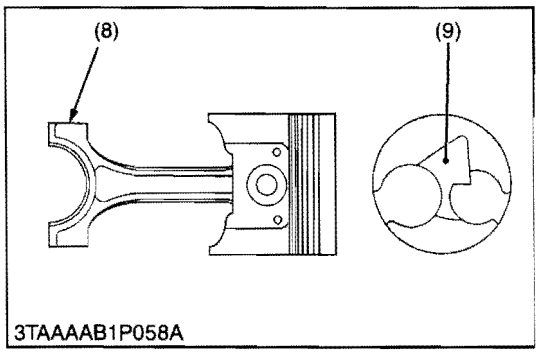
- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No.1 piston.**
- **When installing the piston into the cylinder, place the gaps of all the piston rings as shown in the figure.**
- **Carefully insert the piston using a piston ring compressor (1). Otherwise, their chrome-plated section may be scratched, causing trouble inside the cylinder.**

(1) Piston Ring Compressor
(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(a) 0.785 rad (45 °)
(b) 0.785 rad (45 °)
(c) 1.57 rad (90 °)

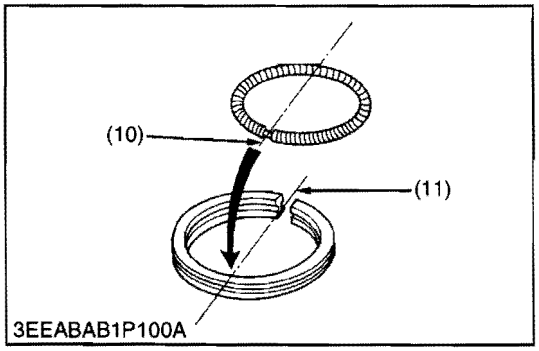
W1069641



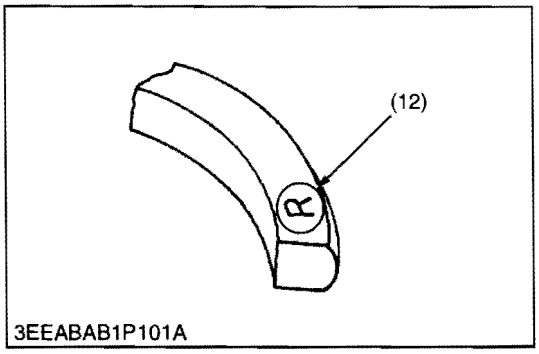
3TMABAB1P047A



3TAAAAB1P058A



3EEABAB1P100A



3EEABAB1P101A

Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (7), and separate the connecting rod (6) from the piston (5).

(When reassembling)

- When installing the ring, assemble the rings so that the manufacturer's mark (12) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin.
- When installing the connecting rod to the piston, immerse the piston in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin to the piston.
- When installing the connecting rod to the piston, align the mark (8) on the connecting rod to the fan-shaped concave (9).

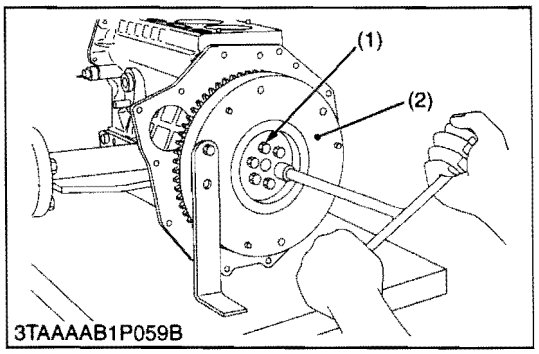
■ **NOTE**

- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

(1) Top Ring
(2) Second Ring
(3) Oil Ring
(4) Piston Pin Snap Ring
(5) Piston
(6) Connecting Rod
(7) Piston Pin
(8) Mark
(9) Fan-Shaped Concave
(10) Expander Joint
(11) Oil Ring Gap
(12) Manufacturer's Mark

W1069812

(4) Crankshaft



Flywheel

1. Secure the flywheel to keep it from turning, using a flywheel stopper.
2. Remove all flywheel screws (1) and then remove the flywheel (2).

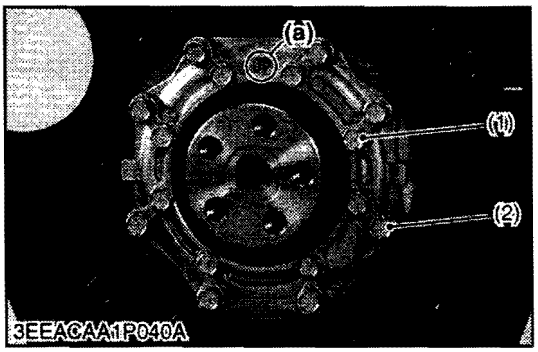
(When reassembling)

- Apply engine oil to the threads and the undercut surface of the flywheel screw and fit the screw.

Tightening torque	Flywheel screw	53.9 to 58.8 N·m 5.5 to 6.0 kgf·m 39.8 to 43.4 lbf·ft

(1) Flywheel Screw (2) Flywheel

W1069971



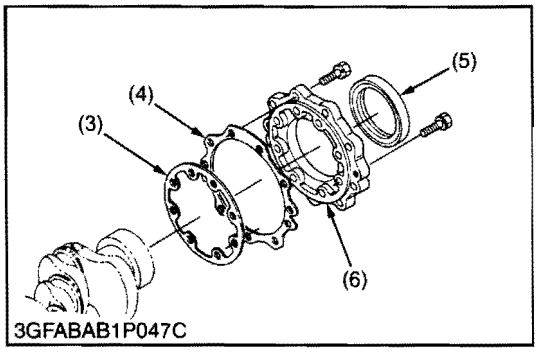
Bearing Case Cover

1. Remove the bearing case cover mounting screws.
2. Remove the bearing case cover (6).

(When reassembling)

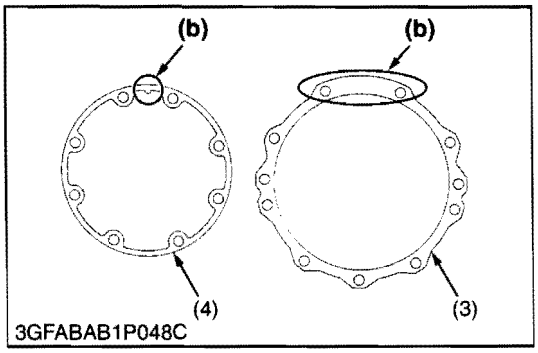
- Fit the bearing case gasket (3) and the bearing case cover gasket (4) with correct directions.
- Install the bearing case cover (6) to position the casting mark "UP" **(a)** on it upward.
- Apply engine oil to the oil seal (5) lip and take care that it is not rolled when installing.
- Tighten the bearing case cover mounting screws with even force on the diagonal line.

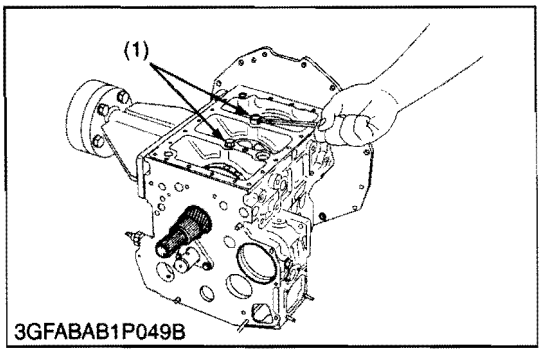
Tightening torque	Bearing case cover screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 lbf·ft



(1) Bearing Case Cover Mounting Screw (Inside)
(2) Bearing Case Cover Mounting Screw (Outside)
(3) Bearing Case Gasket
(4) Bearing Case Cover Gasket
(5) Oil Seal
(6) Bearing Case Cover
(a) Top Mark "UP"
(b) Upside

W1070122





Crankshaft Assembly

1. Remove the main bearing case screw 2 (1).
2. Pull out the crankshaft assembly.

■ **IMPORTANT**

- **Take care to protect crankshaft bearing 1 from scratches, caused by the crank gear, etc.. (Wrap the gear in vinyl tape, etc.).**

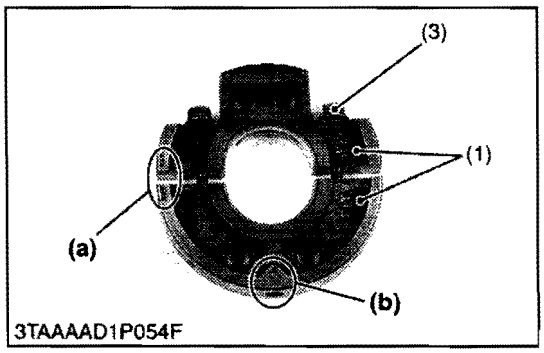
(When reassembling)

- Clean the oil passage of the crankshaft with compressed air.
- Apply oil to the main bearing case screw 2 (1).
- Install the crankshaft assembly, aligning the screw hole of main bearing case with the screw hole of crankcase.
- Clean the oil passage of the crankshaft with compressed air.

Tightening torque	Main bearing case screw 2	49.0 to 53.9 N·m 5.0 to 5.5 kgf·m 36.2 to 39.8 lbf·ft

(1) Main Bearing Case Screw 2

W1077473

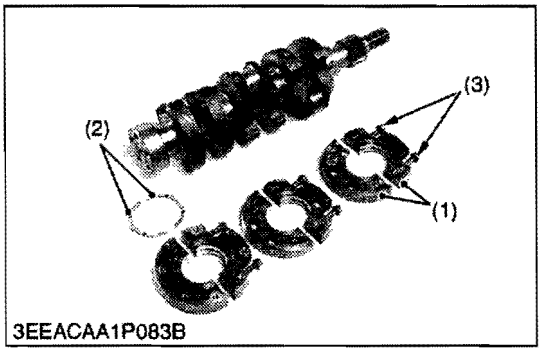


Main Bearing Case Assembly

1. Remove the two main bearing case screws 1 (3) of each main bearing cases.
2. Remove the main bearing case from crankshaft.

(When reassembling)

- Clean the oil passage in the main bearing cases.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in original positions. Since diameters of main bearing cases vary, install them in order to marking **(c)** **(A, B, C)** from the gear case side.
- Match the alignment numbers **(a)** on the main bearing case assembly 1.
- When installing the main bearing case 1 and 2, face the mark **"FLYWHEEL"** to the flywheel.
- Install the thrust bearing (2) with its oil groove facing outward.
- Confirm that the main bearing case moves smoothly after tightening the main bearing case screw 1 to the specified torque.



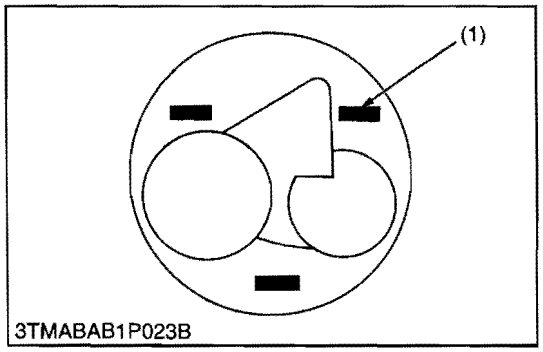
Tightening torque	Main bearing case screw 1	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

(1) Main Bearing Case Assembly 1
(2) Thrust Bearing
(3) Main Bearing Case Screw 1
(a) Alignment Number
(b) Marking (A, B, C)

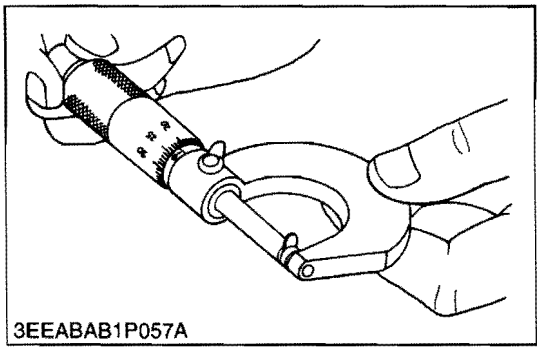
W1077625

[4] SERVICING

(1) Cylinder Head and Valves



3TMABAB1P023B


3EEABAB1P057A

Top Clearance

1. Remove the cylinder head. (Do not attempt to remove the cylinder head gasket.).
2. Move the piston up, and stick a strip of fuse [1.5 mm dia. (0.059 in. dia.), 5 to 7 mm long (0.197 to 0.276 in. long)] on the piston head at three positions with grease so as to avoid the intake and exhaust valves and the combustion chamber ports.
3. Lower the piston, and install the cylinder head and tighten the cylinder head screws to the specified torque.
4. Turn the flywheel until the piston exceeds its top dead center.
5. Remove the cylinder head, and measure the thickness of the squeezed fuses.
6. If the measurement is not within the factory specifications, check the oil clearance between the crankpin and crankpin bearing and between the piston pin and small end bushing.

■ **NOTE**

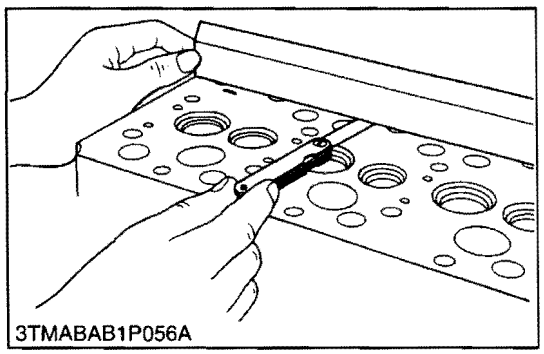
- **After checking the top clearance, be sure to assemble the cylinder head with a new cylinder head gasket.**

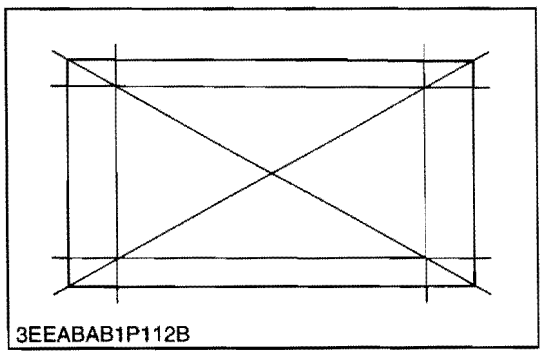
Top clearance	Factory spec.	0.55 to 0.70 mm 0.0217 to 0.0276 in.

Tightening torque	Cylinder head screw	63.7 to 68.6 N·m 6.5 to 7.0 kgf·m 47.0 to 50.6 lbf·ft

(1) Fuse

W1077773


3TMABAB1P056A


3EEABAB1P112B

Cylinder Head Surface Flatness

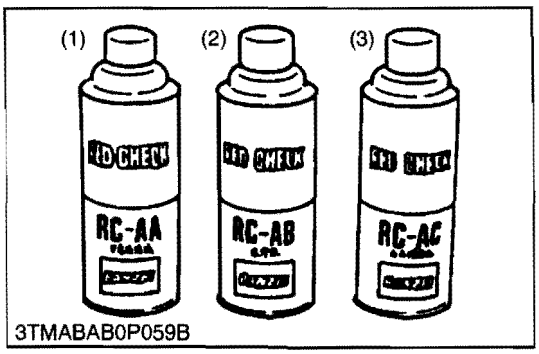
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal lines as shown in the figure.
3. Measure the clearance with a thickness gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ **IMPORTANT**

- **Do not place the straightedge on the combustion chamber.**
- **Be sure to check the valve recessing after correcting.**

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.

W1077921

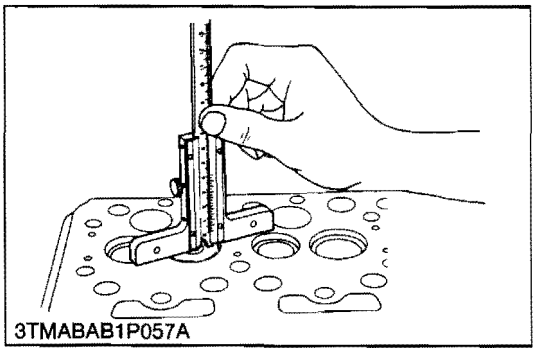


Cylinder Head Flaw

1. Prepare an air spray red check.
2. Clean the surface of the cylinder head with the detergent (2).
3. Spray the cylinder head surface with the red permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface with the detergent (2).
5. Spray on the cylinder head surface with the white developer (3).
6. If flawed, it can be identified as red marks.

(1) Red Permeative Liquid
(2) Detergent
(3) White Developer

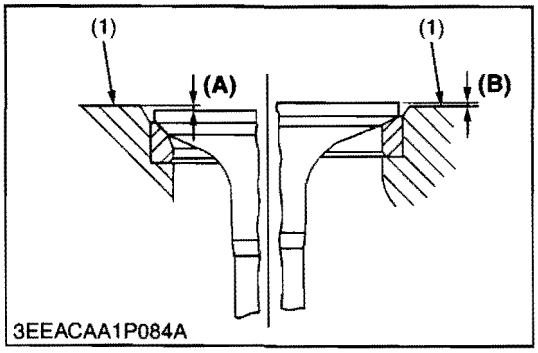
W1078069



Valve Recessing

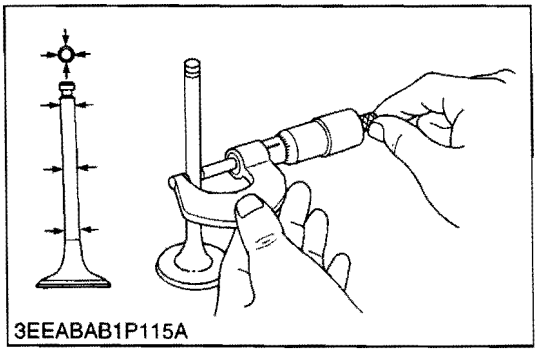
1. Clean the cylinder head surface, valve face and valve seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
5. If it still exceeds the allowable limit after replacing the valve, replace the cylinder head.

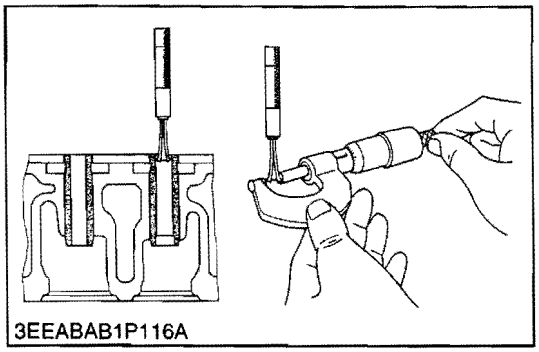
Valve recessing (Intake and Exhaust)	Factory spec.	0.05 (protrusion) to 0.25 (recessing) mm 0.0020 (protrusion) to 0.0098 (recessing) in.
	Allowable limit	0.40 (recessing) mm 0.0157 (recessing) in.

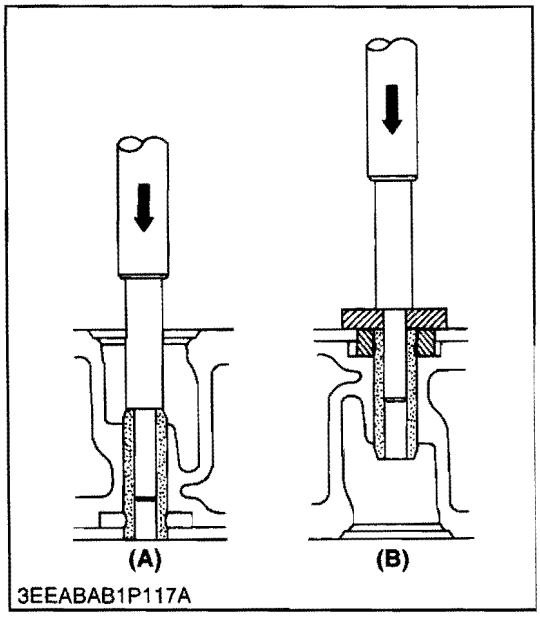


(1) Cylinder Head Surface
(A) Recessing
(B) Protrusion

W1078230


3EEABAB1P115A


3EEABAB1P116A



3EEABAB1P117A

Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. with a small hole gauge, and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

Clearance between valve stem and valve guide	Factory spec.	0.035 to 0.065 mm 0.0014 to 0.0025 in.
	Allowable limit	0.10 mm 0.0039 in.

Valve stem O.D.	Factory spec.	6.960 to 6.975 mm 0.2741 to 0.2746 in.
Valve guide I.D.	Factory spec.	7.010 to 7.025 mm 0.2760 to 0.2765 in.

W1078386

Replacing Valve Guide

(When removing)

1. Press out the used valve guide using a valve guide replacing tool. (See page **"SPECIAL TOOLS"**.)

(When installing)

1. Clean a new valve guide and valve guide bore, and apply engine oil to them.
2. Press in a new valve guide using a valve guide replacing tool.
3. Ream precisely the I.D. of the valve guide to the specified dimension.

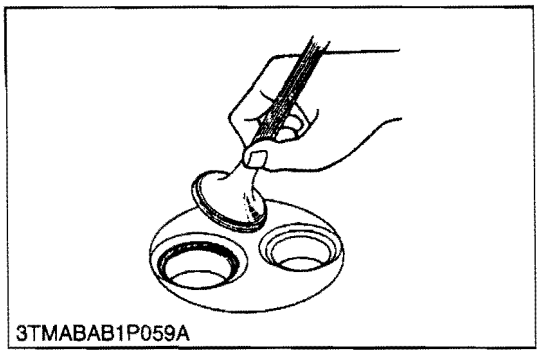
Valve guide I.D. (Intake and Exhaust)	Factory spec.	7.010 to 7.025 mm 0.2760 to 0.2765 in.

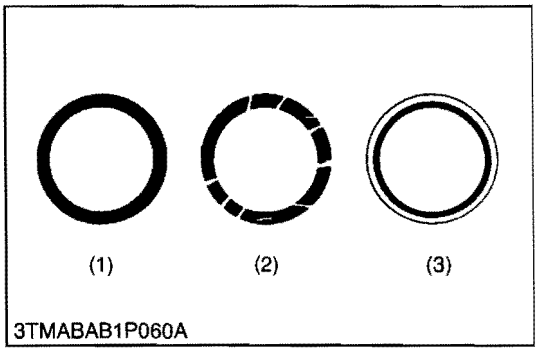
■ **IMPORTANT**

- **Do not hit the valve guide with a hammer during replacement.**

(A) When removing **(B) When installing**

W1078534


3TMABAB1P059A



3TMABAB1P060A

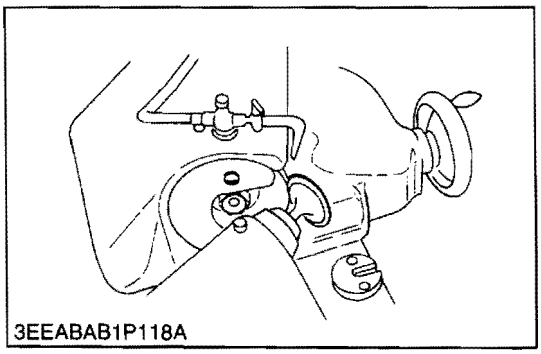
Valve Seating

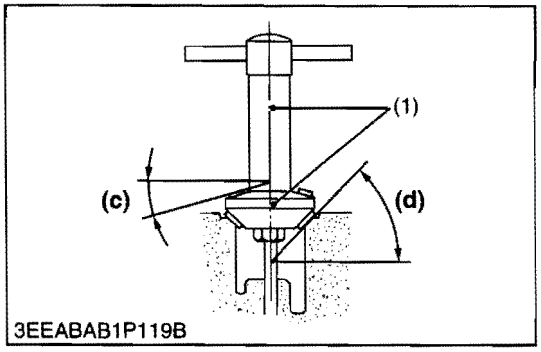
1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
3. If the valve contact does not comply with the reference value, replace the valve or correct the contact of valve seating.

Valve seat width	Factory spec.	2.12 mm 0.0835 in.

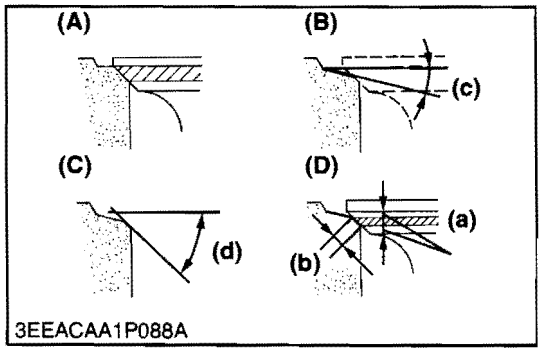
(1) Correct
(2) Incorrect
(3) Incorrect

W1078682


3EEABAB1P118A



3EEABAB1P119B



3EEACAA1P088A

Correcting Valve and Valve Seat

■ **NOTE**

- **Before correcting the valve and seat, check the valve stem and the I.D. of valve guide section, and repair them if necessary.**
- **After correcting the valve seat, be sure to check the valve recessing.**

1) Correcting Valve

1. Correct the valve with a valve refacer.

Valve face angle	Factory spec.	IN.	1.047 rad 60 °
		EX.	0.785 rad 45 °

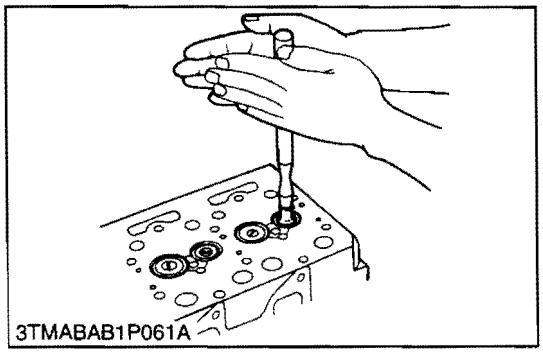
2) Correcting Valve Seat

1. Slightly correct the seat surface with a 0.785 rad (45 °) / 1.047 rad (60 °) valve seat cutter.
2. Fitting the valve, check the contact position of the valve face and seat surface with prussian blue. (Visual check) [If the valve has been used for a long period, the seat tends to come in contact with the upper side of the valve face.]
3. Grind the upper surface of the seat with a 0.523 rad (30 °) valve seat cutter until the valve seat touches to the center of the valve face (so that **(a)** equals **(b)** as shown in the figure)
4. Grind the seat with a 0.262 rad (15 °) valve seat cutter again, and visually recheck the contact between the valve and seat.
5. Repeat steps 3 and 4 until the correct contact is achieved.
6. Continue lapping until the seated rate becomes more than 70 % of the total contact area.

Valve seat angle	Factory spec.	IN.	1.047 rad 60 °
		EX.	0.785 rad 45 °

(1) Valve Seat Cutter
(A) Check Contact
(B) Correct Seat Width
(C) Correct Seat Surface
(D) Check Contact
(a) Identical Dimensions
(b) Valve Seat Width
(c) 0.262 rad (15 °)
(d) 0.785 rad (45 °)

W1078830


3TMABAB1P061A

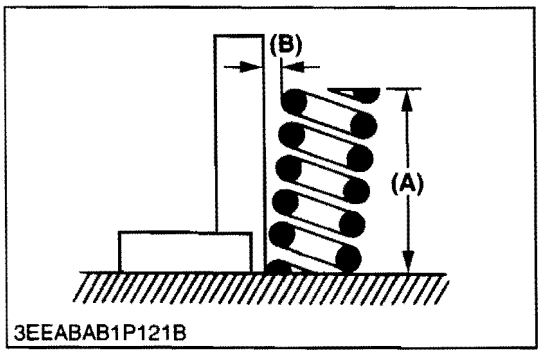
Valve Lapping

1. Apply compound evenly to the valve lapping surface.
2. Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver.
3. After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.
4. Apply prussian blue to the contact surface to check the seated rate. If it is less than 70 %, repeat valve lapping again.

■ **IMPORTANT**

- **When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.**

W1085127



3EEABAB1P121B

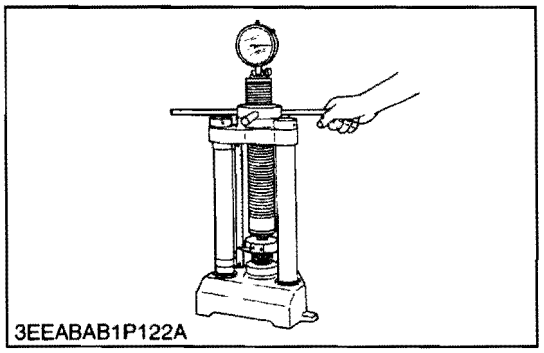
Free Length and Tilt of Valve Spring

1. Measure the free length **(A)** of valve spring with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the valve spring on a surface plate, place a square on the side of the valve spring.
3. Check to see if the entire side is in contact with the square. Rotate the valve spring and measure the maximum tilt **(B)**. If the measurement exceeds the allowable limit, replace it.
4. Check the entire surface of the valve spring for scratches. If there is any defect, replace it.

Free length **(A)**	Factory spec.	37.0 to 37.5 mm 1.457 to 1.476 in.
	Allowable limit	36.5 mm 1.437 in.
Tilt **(B)**	Allowable limit	1.0 mm 0.039 in.

(A) Free Length **(B) Tilt**

W1085283

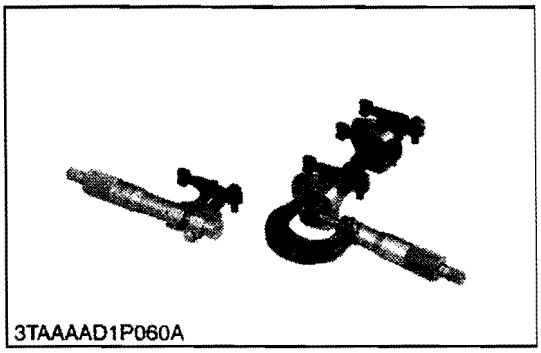

3EEABAB1P122A

Valve Spring Setting Load

1. Place the valve spring on a tester and compress it to the same length it is actually compressed in the engine.
2. Read the compression load on the gauge.
3. If the measurement is less than the allowable limit, replace it.

Setting load / Setting length	Factory spec.	117.4 N / 31.0 mm 11.97 kgf / 31.0 mm 26.4 lbf / 1.22 in.
	Allowable limit	100.0 N / 31.0 mm 10.2 kgf / 31.0 mm 22.5 lbf / 1.22 in.

W1085431

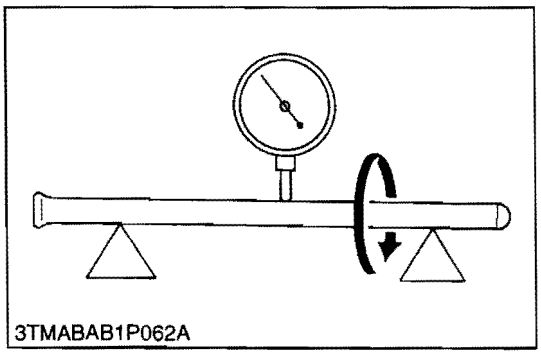

3TAAAAD1P060A

Oil Clearance between Rocker Arm and Rocker Arm Shaft

1. Measure the rocker arm shaft O.D. with an outside micrometer.
2. Measure the rocker arm I.D. with an inside micrometer, and then calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the rocker arm and measure the oil clearance again. If it still exceeds the allowable limit, replace also the rocker arm shaft.

Oil clearance between rocker arm and rocker arm shaft	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.00177 in.
	Allowable limit	0.10 mm 0.0039 in.
Rocker arm shaft O.D.	Factory spec.	11.973 to 11.984 mm 0.4714 to 0.4718 in.
Rocker arm I.D.	Factory spec.	12.000 to 12.018 mm 0.4724 to 0.4731 in.

W1085579

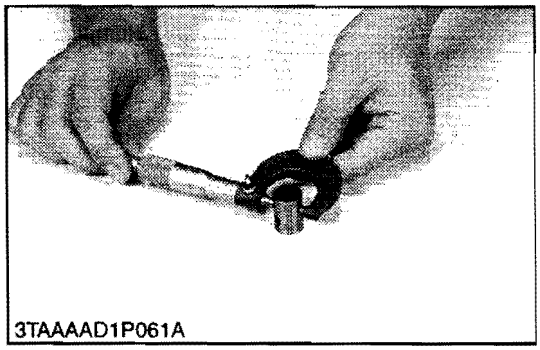

3TMABAB1P062A

Push Rod Alignment

1. Place the push rod on V blocks.
2. Measure the push rod alignment.
3. If the measurement exceeds the allowable limit, replace the push rod.

Push rod alignment	Allowable limit	0.25 mm 0.0098 in.

W1085727


3TAAAAD1P061A

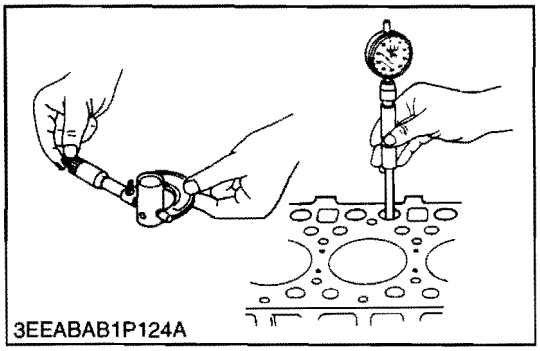
Oil Clearance between Tappet and Tappet Guide Bore

1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

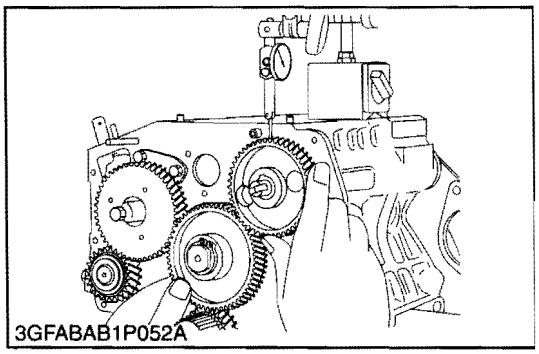
Oil clearance between tappet and tappet guide bore	Factory spec.	0.020 to 0.062 mm 0.0008 to 0.0024 in.
	Allowable limit	0.07 mm 0.0028 in.

Tappet O.D.	Factory spec.	19.959 to 19.980 mm 0.7858 to 0.7866 in.
Tappet guide bore I.D.	Factory spec.	20.000 to 20.021 mm 0.7874 to 0.7882 in.

W1085895


3EEABAB1P124A

(2) Idle Gear and Camshaft

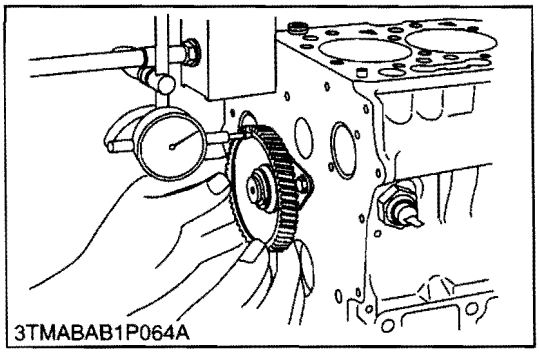

3GFABAB1P052A

Idle Gear Backlash

1. Set a dial indicator (lever type) with its tip on the gear tooth.
2. Move the gear to measure the backlash, holding its mating gear.
3. If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.
4. If the oil clearance isn't proper, replace the gear.

Backlash between idle gear 1 and crank gear	Factory spec.	0.032 to 0.115 mm 0.0013 to 0.0045 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between idle gear 1 and cam gear	Factory spec.	0.036 to 0.114 mm 0.0014 to 0.0045 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between idle gear 1 and injection pump gear	Factory spec.	0.034 to 0.116 mm 0.0013 to 0.0046 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between injection pump gear and governor gear	Factory spec.	0.030 to 0.117 mm 0.0012 to 0.0046 in.
	Allowable limit	0.15 mm 0.0059 in.
Idle gear 2 and governor gear	Factory spec.	0.030 to 0.117 mm 0.0012 to 0.0046 in.
	Allowable limit	0.15 mm 0.0059 in.

W1086051

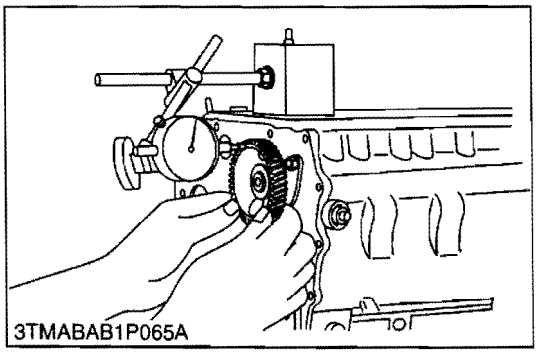

3TMABAB1P064A

Idle Gear 1 and 2 Side Clearance

1. Set a dial indicator with its tip on the idle gear.
2. Measure the side clearance by moving the idle gear to the front and rear.
3. If the measurement exceeds the allowable limit, replace the idle gear collar.

Idle gear 1 and 2 side clearance	Factory spec.	0.20 to 0.51 mm 0.0079 to 0.0201 in.
	Allowable limit	0.80 mm 0.0315 in.

W1086199

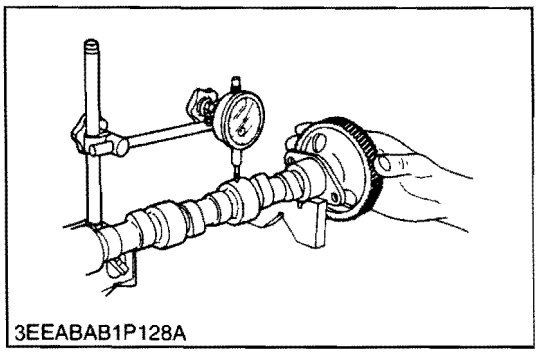

3TMABAB1P065A

Camshaft Side Clearance

1. Set a dial indicator with its tip on the camshaft.
2. Measure the side clearance by moving the cam gear to the front and rear.
3. If the measurement exceeds the allowable limit, replace the camshaft stopper.

Camshaft side clearance	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0087 in.
	Allowable limit	0.30 mm 0.0118 in.

W1086347

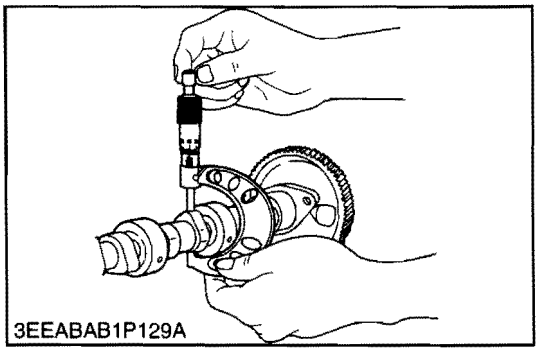

3EEABAB1P128A

Camshaft Alignment

1. Support the camshaft with V blocks on the surface plate at both end journals.
2. Set a dial indicator with its tip on the intermediate journal.
3. Measure the camshaft alignment.
4. If the measurement exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.

W1086495

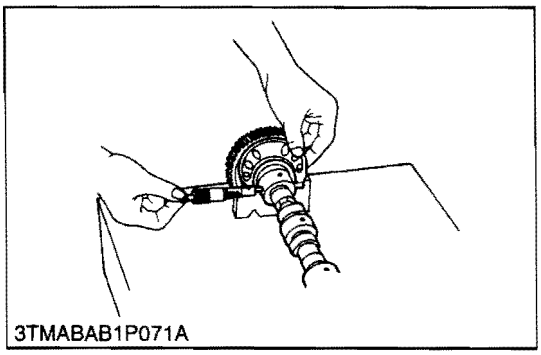

3EEABAB1P129A

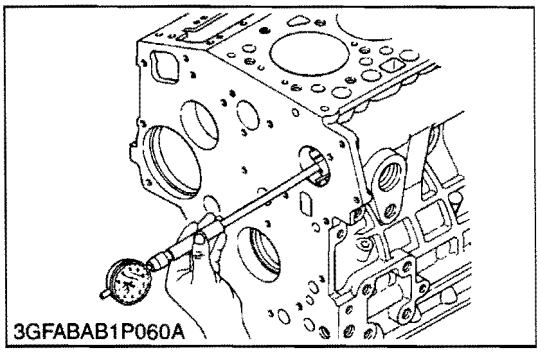
Cam Height

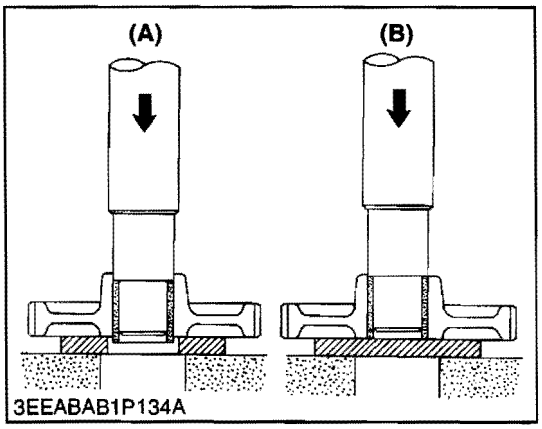
1. Measure the height of the cam at its highest point with an outside micrometer.
2. If the measurement is less than the allowable limit, replace the camshaft.

Cam height of intake	Factory spec.	28.80 mm 1.1339 in.
	Allowable limit	28.75 mm 1.1319 in.
Cam height of exhaust	Factory spec.	29.00 mm 1.1417 in.
	Allowable limit	28.95 mm 1.1398 in.

W1092812

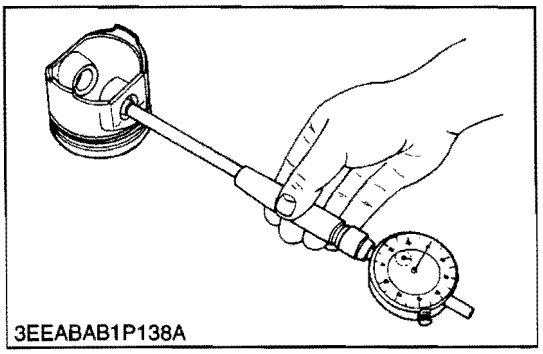

3TMABAB1P071A


3GFABAB1P060A



3EEABAB1P134A

(3) Piston and Connecting Rod


3EEABAB1P138A

Oil Clearance of Camshaft Journal

1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with a inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.00197 to 0.00358 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal O.D.	Factory spec.	35.934 to 35.950 mm 1.4147 to 1.4153 in.
Camshaft bearing I.D. (Cylinder block bore I.D.)	Factory spec.	36.000 to 36.025 mm 1.4173 to 1.4183 in.

W1092968

Replacing Idle Gear Bushing

(When removing)

1. Press out the used idle gear bushing using an idle gear bushing replacing tool. (See page **"SPECIAL TOOLS"**.)

(When installing)

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Press in a new bushing using an idle gear bushing replacing tool, until it is flush with the end of the idle gear.

(A) When removing **(B) When installing**

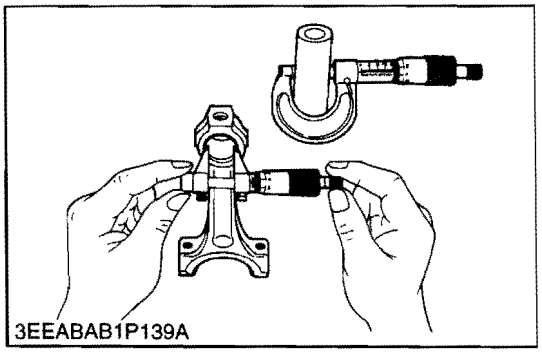
W1093116

Piston Pin Bore I.D.

1. Measure the piston pin bore I.D. in both the horizontal and vertical directions with a cylinder gauge.
2. If the measurement exceeds the allowable limit, replace the piston.

Piston pin bore I.D.	Factory spec.	22.000 to 22.013 mm 0.8661 to 0.8667 in.
	Allowable limit	22.03 mm 0.8673 in.

W1093264


3EEABAB1P139A

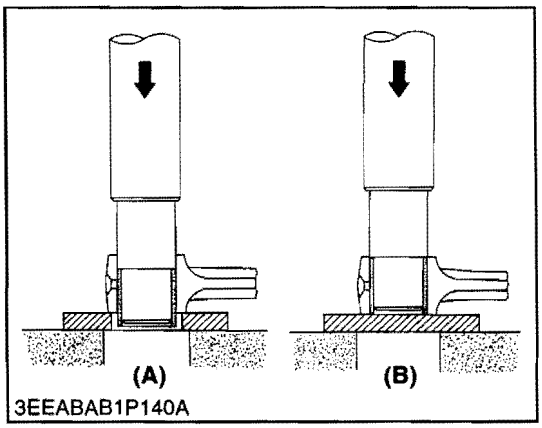
Oil Clearance between Piston Pin and Small End Bushing

1. Measure the piston pin O.D. where it contacts the bushing with an outside micrometer.
2. Measure the small end bushing I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

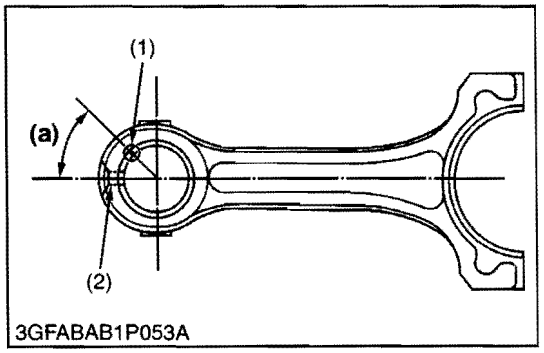
Oil clearance between piston pin and small end bushing	Factory spec.	0.014 to 0.038 mm 0.00055 to 0.00150 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	22.002 to 22.011 mm 0.8662 to 0.8666 in.
Small end bushing I.D.	Factory spec.	22.025 to 22.040 mm 0.8671 to 0.8677 in.

W1093412



3EEABAB1P140A



3GFABAB1P053A

Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool. (See page **"SPECIAL TOOLS"**.)

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Insert a new bushing onto the tool and press-fit it with a press so that the seam (1) of bushing positions as shown in the figure, until it is flush with the connecting rod.
3. Drill a hole to the bushing with aligning the oil hole (2) of connecting rod. (Refer to the figure.)

■ **NOTE**

- **Be sure to chamfer the oil hole circumference with an oil stone.**

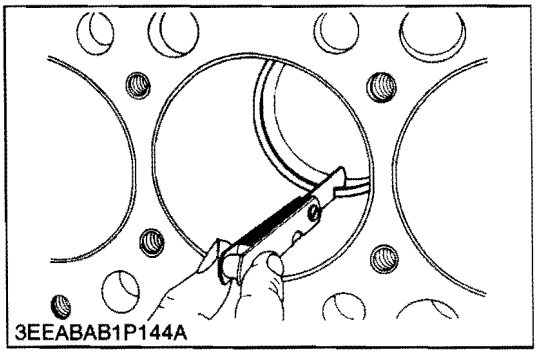
Oil clearance between piston pin and small end bushing (Spare parts)	Factory spec.	0.015 to 0.075 mm 0.00059 to 0.00295 in.
	Allowable limit	0.15 mm 0.0059 in.

Small end bushing I.D. (Spare parts)	Factory spec.	22.026 to 22.077 mm 0.7885 to 0.7904 in.

(1) Seam
(2) Oil Hole

(A) When removing
(B) When installing
(a) 0.785 rad (45 °)

W1093573

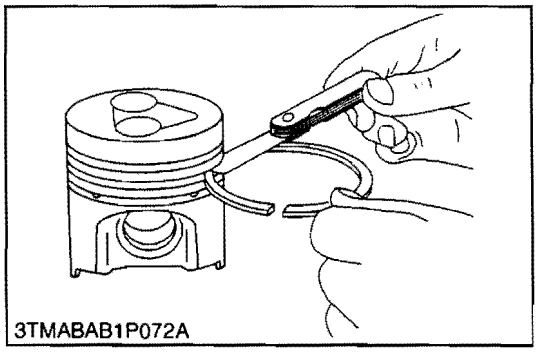


Piston Ring Gap

1. Insert the piston ring into the lower part of the cylinder (the least worn out part) with piston.
2. Measure the ring gap with a thickness gauge.
3. If the measurement exceeds the allowable limit, replace the piston ring.

Piston ring gap	Top ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
		Allowable limit	1.25 mm 0.0492 in.
	Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
		Allowable limit	1.25 mm 0.0492 in.
	Oil ring	Factory spec.	0.25 to 0.40 mm 0.0098 to 0.0157 in.
		Allowable limit	1.25 mm 0.0492 in.

W1093729

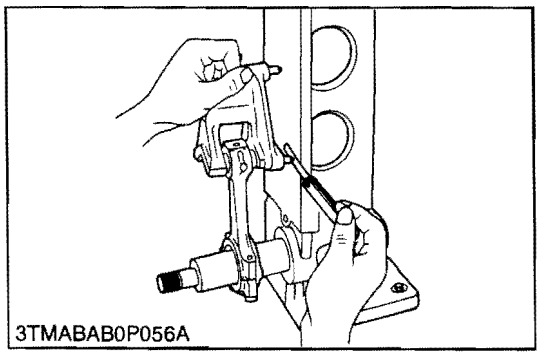


Clearance between Piston Ring and Piston Ring Groove

1. Clean the rings and the ring grooves, and install each ring in its groove.
2. Measure the clearance between the ring and the groove with a thickness gauge.
3. If the clearance exceeds the allowable limit, replace the piston ring.
4. If the clearance still exceeds the allowable limit with new ring, replace the piston.

Clearance between piston ring and piston ring groove	Second ring	Factory spec.	0.085 to 0.112 mm 0.0033 to 0.0044 in.
		Allowable limit	0.20 mm 0.0079 in.
	Oil ring	Factory spec.	0.02 to 0.055 mm 0.0008 to 0.0021 in.
		Allowable limit	0.15 mm 0.0059 in.

W1093877


3TMABAB0P056A

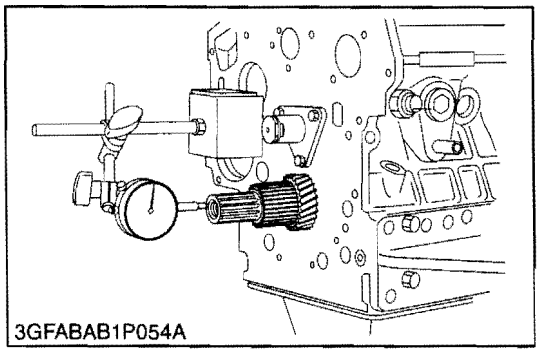
Connecting Rod Alignment

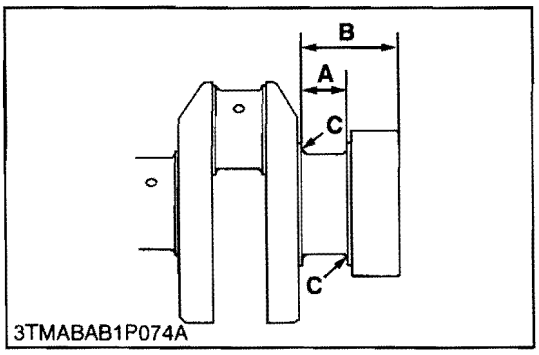
1. Remove the crankpin bearing, and install the connecting rod cap.
2. Install the piston pin in the connecting rod.
3. Install the connecting rod on the connecting rod alignment tool.
4. Put a gauge over the piston pin, and move it against the face plate.
5. If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.
6. If the measurement exceeds the allowable limit, replace the connecting rod.

Space between gauge pin face plate	Allowable limit	0.05 mm 0.0020 in.

W1094025

(4) Crankshaft


3GFABAB1P054A



3TMABAB1P074A

Crankshaft Side Clearance

1. Set a dial indicator with its tip on the end of the crankshaft.
2. Measure the side clearance by moving the crankshaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the thrust bearings.
4. If the same size bearing is useless because of the crankshaft journal wear, replace it with an oversize one referring to the table and figure.

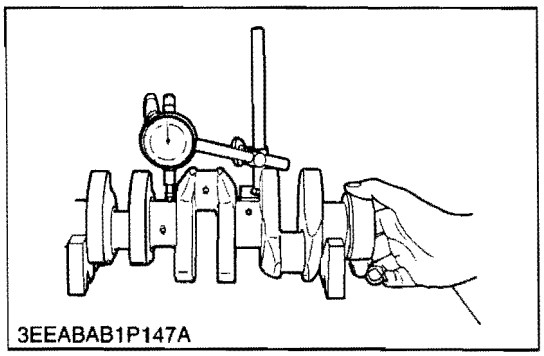
Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.0197 in.

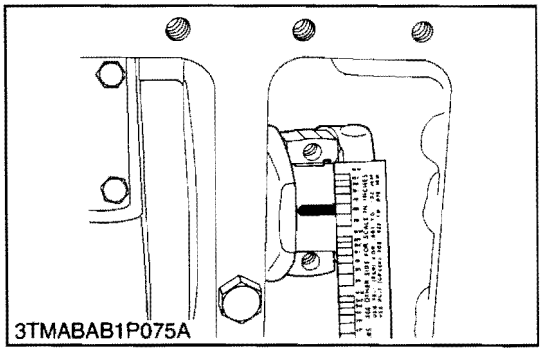
(Reference)

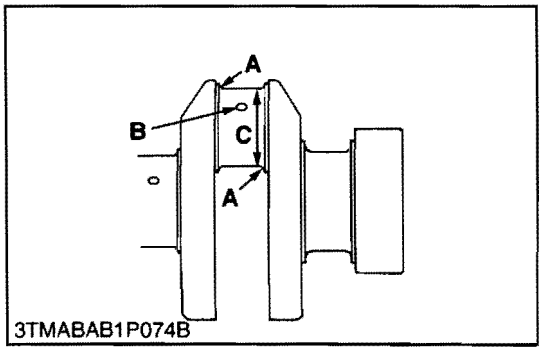
- Oversize dimensions of crankshaft journal

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	28.20 to 28.25 mm 1.1102 to 1.1122 in.	28.40 to 28.45 mm 1.1181 to 1.1201 in.
Dimension **B**	51.5 to 51.7 mm 2.028 to 2.035 in.	51.6 to 51.8 mm 2.031 to 2.039 in.
Dimension **C**	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius	2.3 to 3.7 mm radius 0.091 to 0.106 in. radius
The crankshaft journal must be fine-finished to higher than ▽▽▽.		(0.8-S)

W10317070


3EEABAB1P147A


3TMABAB1P075A



3TMABAB1P074B

Crankshaft Alignment

1. Support the crankshaft with V blocks on the surface plate at both end journals.
2. Set a dial indicator with its tip on the intermediate journal.
3. Measure the crankshaft alignment.
4. If the measurement exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.

W1099507

Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage on the center of the crankpin.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.
4. Measure the amount of the flattening with the scale, and get the oil clearance.
5. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.
6. If the same size bearing is useless because of the crankpin wear, replace it with an undersize one referring to the table and figure.

■ **NOTE**

- **Never insert the plastigage into the crankpin oil hole.**
- **Be sure not to move the crankshaft while the connecting rod screws are tightened.**

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.029 to 0.091 mm 0.0011 to 0.0036 in.
	Allowable limit	0.20 mm 0.0079 in.

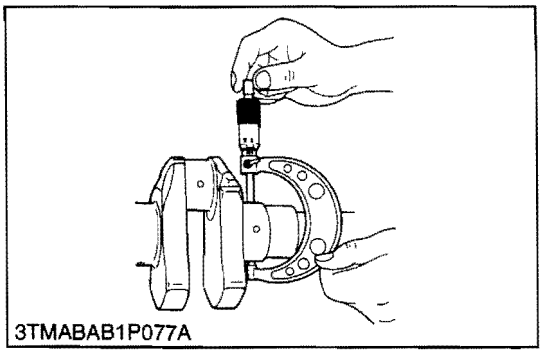
Crankpin O.D.	Factory spec.	39.959 to 39.975 mm 1.5732 to 1.5738 in.
Crankpin bearing I.D.	Factory spec.	40.004 to 40.050 mm 1.5750 to 1.5768 in.

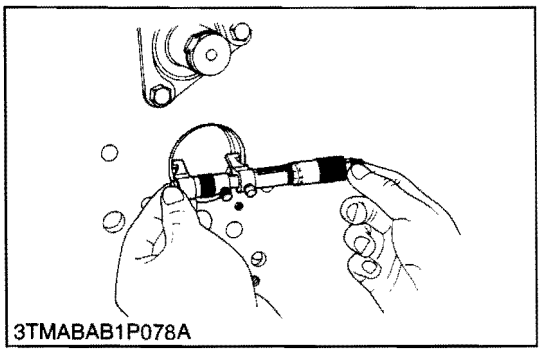
(Reference)

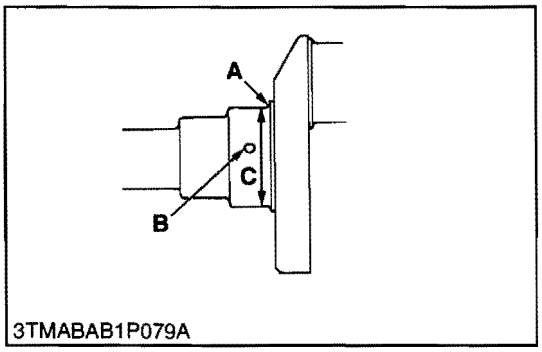
- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
Dimension **B**	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension **C**	39.759 to 39.775 mm dia. 1.5653 to 1.5659 in. dia.	39.559 to 39.575 mm dia. 1.5574 to 1.5581 in. dia.
The crankpin must be fine-finished to higher than ▽▽▽▽ (0.8-S)		

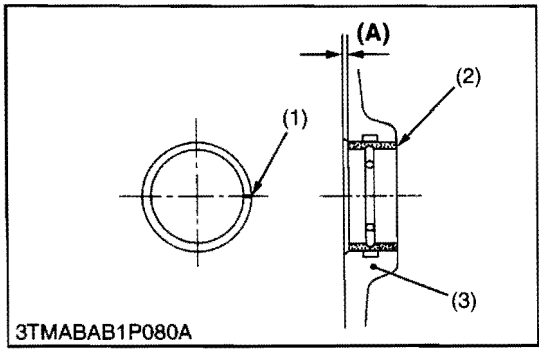
W10331060


3TMABAB1P077A


3TMABAB1P078A



3TMABAB1P079A



3TMABAB1P080A

Oil Clearance between Crankshaft Journal and Crankshaft Bearing 1

1. Measure the O.D. of the crankshaft front journal with an outside micrometer.
2. Measure the I.D. of the crankshaft bearing 1 with an inside micrometer, and calculate the oil clearance.
3. If the clearance exceeds the allowable limit, replace the crankshaft bearing 1.
4. If the same size bearing is useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory spec.	0.034 to 0.114 mm 0.0013 to 0.0045 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	47.934 to 47.950 mm 1.8872 to 1.8878 in.
Crankshaft bearing 1 I.D.	Factory spec.	47.984 to 48.048 mm 1.8891 to 1.8916 in.

(Reference)

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	2.3 to 2.7 mm radius 0.0906 to 0.1063 in. radius	2.3 to 2.7 mm radius 0.0906 to 0.1063 in. radius
Dimension **B**	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension **C**	47.734 to 47.750 mm dia. 1.8793 to 1.8799 in. dia.	47.534 to 47.550 mm dia. 1.8714 to 1.8720 in. dia.
The crankshaft journal must be fine-finished to higher than ▽▽▽▽ (0.8-S)		

W10337170

Replacing Crankshaft Bearing 1

(When removing)

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool. (See page **"SPECIAL TOOLS"**.)

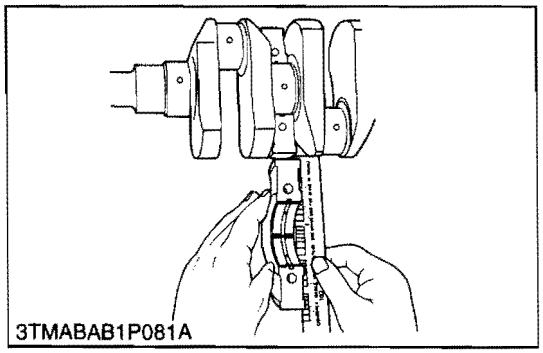
(When installing)

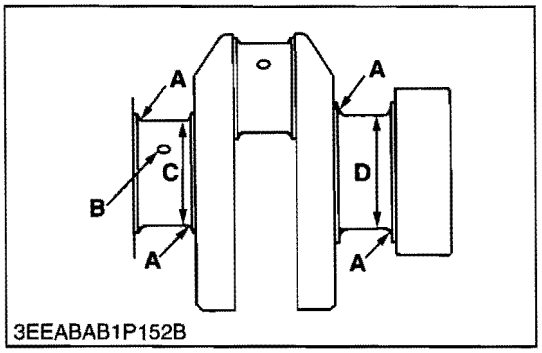
1. Clean a new crankshaft bearing 1 and crankshaft journal bore, and apply engine oil to them.
2. Using a crankshaft bearing 1 replacing tool, press in a new bearing 1 (2) so that its seam (1) directs toward the exhaust manifold side. (See figure.)

Dimension **(A)**	Factory spec.	0.0 to 0.3 mm 0.0 to 0.0118 in.

(1) Seam
(2) Crankshaft Bearing 1
(3) Cylinder Block

W1099959


3TMABAB1P081A



3EEABAB1P152B

Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2 (Crankshaft Bearing 3)

1. Put a strip of plastigage on the center of the journal.
2. Install the bearing case and tighten the baring case screws 1 to the specified torque, and remove the bearing case again.
3. Measure the amount of the flattening with the scale and get the oil clearance.
4. If the clearance exceeds the allowable limit, replace the crankshaft bearing 2 and crankshaft bearing.
5. If the same size bearing is useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

■ **NOTE**

- **Be sure not to move the crankshaft while the bearing case screws are tightened.**

Oil clearance between crankshaft journal and crankshaft bearing 2	Factory spec.	0.034 to 0.095 mm 0.0013 to 0.0037 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D. (Intermediate)	Factory spec.	47.934 to 47.950 mm 1.8872 to 1.8878 in.
Crankshaft bearing 2 I.D.	Factory spec.	47.984 to 48.029 mm 1.8891 to 1.8909 in.

Oil clearance between crankshaft journal and crankshaft bearing 3	Factory spec.	0.034 to 0.098 mm 0.0013 to 0.0039 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D. (Flywheel side)	Factory spec.	51.921 to 51.940 mm 2.0441 to 2.0449 in.
Crankshaft bearing 3 I.D.	Factory spec.	51.974 to 52.019 mm 2.0462 to 2.0480 in.

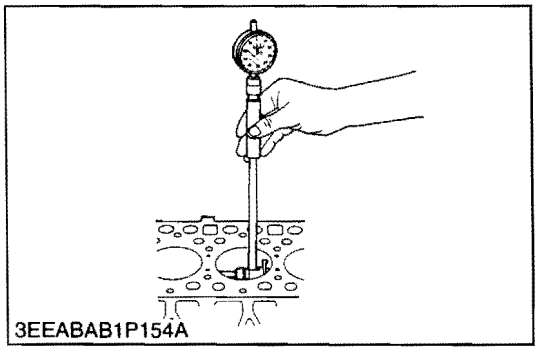
(Reference)

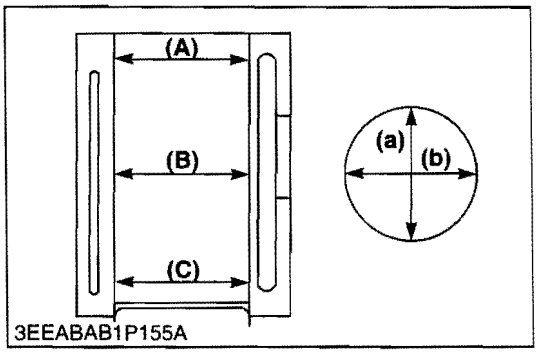
- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	2.3 to 2.7 mm radius 0.0906 to 0.1063 in. radius	2.3 to 2.7 mm radius 0.0906 to 0.1063 in. radius
Dimension **B**	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension **C**	47.734 to 47.750 mm dia. 1.8793 to 1.8799 in. dia.	47.534 to 47.550 mm dia. 1.8714 to 1.8720 in. dia.
Dimension **D**	51.721 to 51.740 mm dia. 2.0362 to 2.0370 in. dia.	51.521 to 51.540 mm dia. 2.0284 to 2.0291 in. dia.
The crankshaft journal must be fine-finished to higher than ▽▽▽ (0.8-S)		

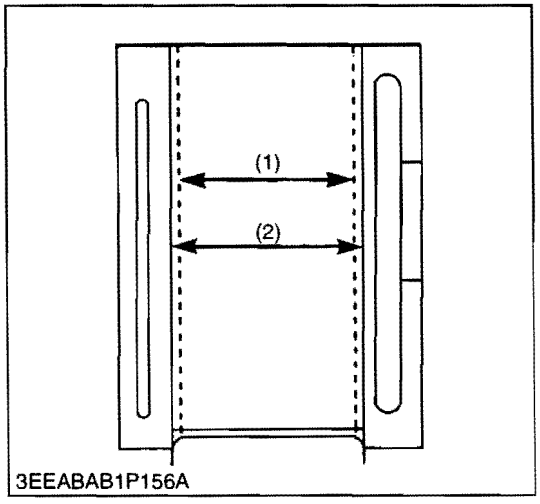
W10340750

(5) Cylinder


3EEABAB1P154A



3EEABAB1P155A



3EEABAB1P156A

Cylinder Wear

1. Measure the I.D. of the cylinder at the six positions (see figure) with a cylinder gauge to find the maximum and minimum I.D.'s.
2. Get the difference (Maximum wear) between the maximum and the minimum I.D.'s.
3. If the wear exceeds the allowable limit, bore and hone to the oversize dimension. (Refer to "Correcting Cylinder".)
4. Visually check the cylinder wall for scratches. If deep scratches are found, the cylinder should be bored. (Refer to "Correcting Cylinder".)

Cylinder I.D.	Factory spec.	78.000 to 78.019 mm 3.0709 to 3.0716 in.
Maximum wear	Allowable limit	0.15 mm 0.0059 in.

(A) Top
(B) Middle
(C) Bottom (Skirt)
(a) Right-angled to Piston Pin
(b) Piston Pin Direction

W1100268

Correcting Cylinder

When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension.

Cylinder I.D.	Factory spec.	78.500 to 78.519 mm 3.0906 to 3.0913 in.
Maximum wear	Allowable limit	0.15 mm 0.0059 in.
Finishing	Horn to 1.2 to 2.0 µm Rmax. ▽▽▽▽ (0.000047 to 0.000079 in. Rmax.)	

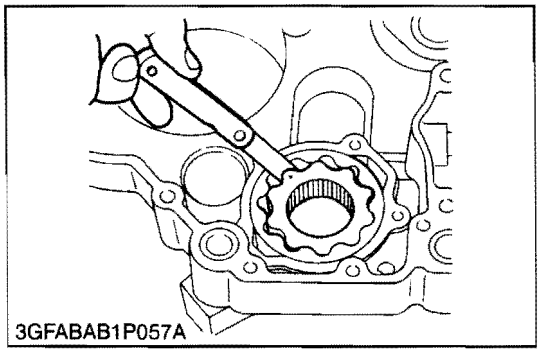
■ **NOTE**

- **When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.**

(1) Cylinder I.D. [Before Correction]
(2) Cylinder I.D. [Oversize]

W1100424

(6) Oil Pump

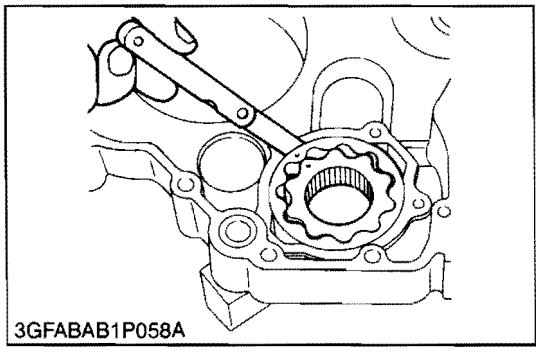

3GFABAB1P057A

Rotor Lobe Clearance

1. Measure the clearance between the outer rotor and the pump body with a thickness gauge.
2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Rotor lobe clearance	Factory spec.	0.06 to 0.18 mm 0.0024 to 0.0071 in.

W1100572

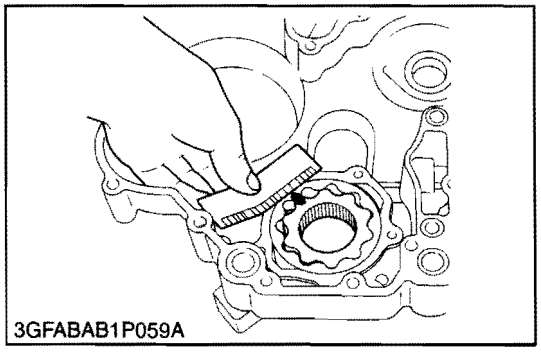

3GFABAB1P058A

Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a thickness gauge.
2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.100 to 0.180 mm 0.0039 to 0.0071 in.

W1100720


3GFABAB1P059A

Clearance between Rotor and Cover

1. Put a strip of plastigage onto the rotor face with grease.
2. Install the cover and tighten the screws.
3. Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

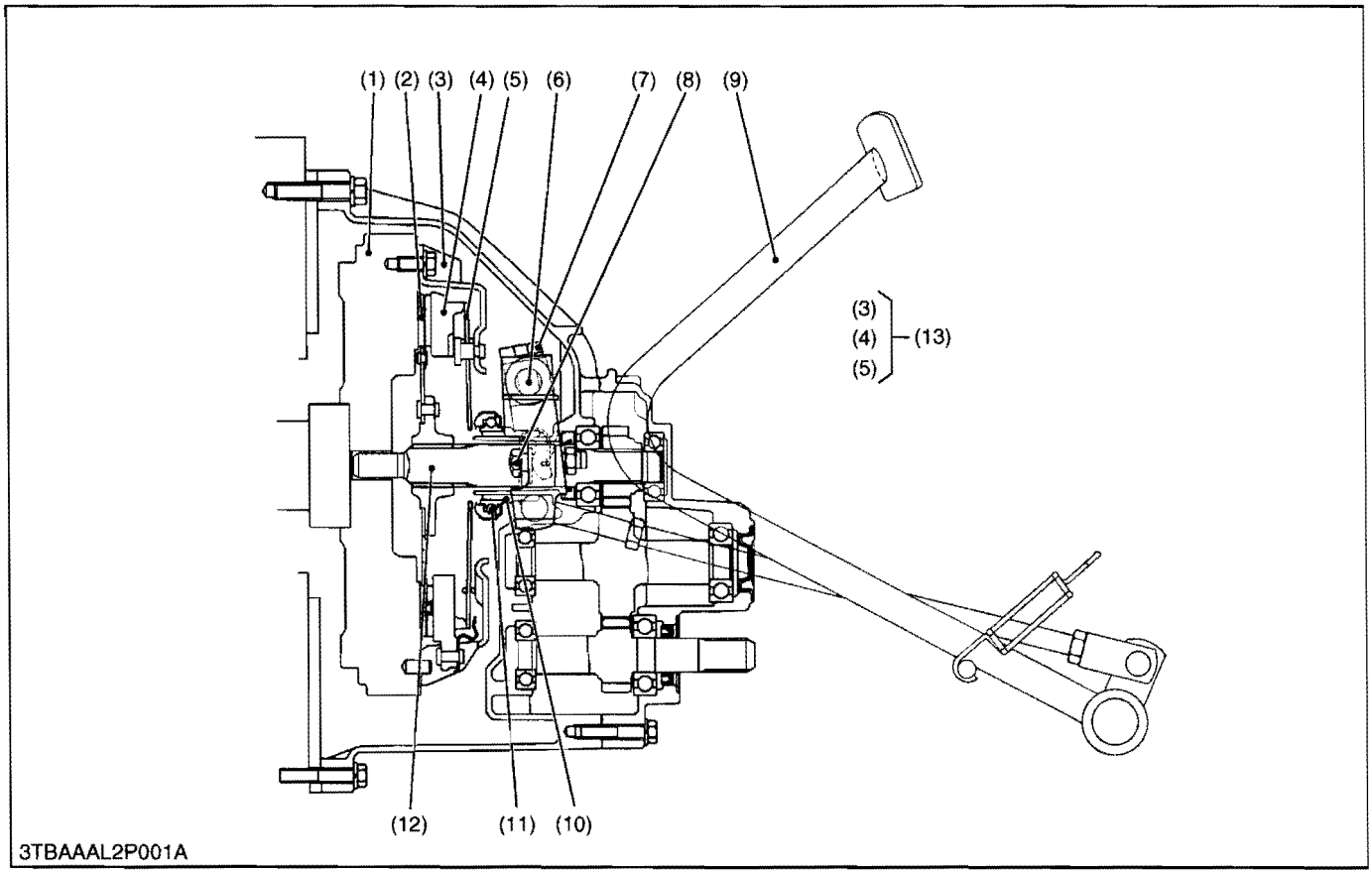
Clearance between rotor and cover	Factory spec.	0.025 to 0.075 mm 0.0010 to 0.0030 in.

W1100868

MECHANISM

CONTENTS

1. LINKAGE MECHANISM

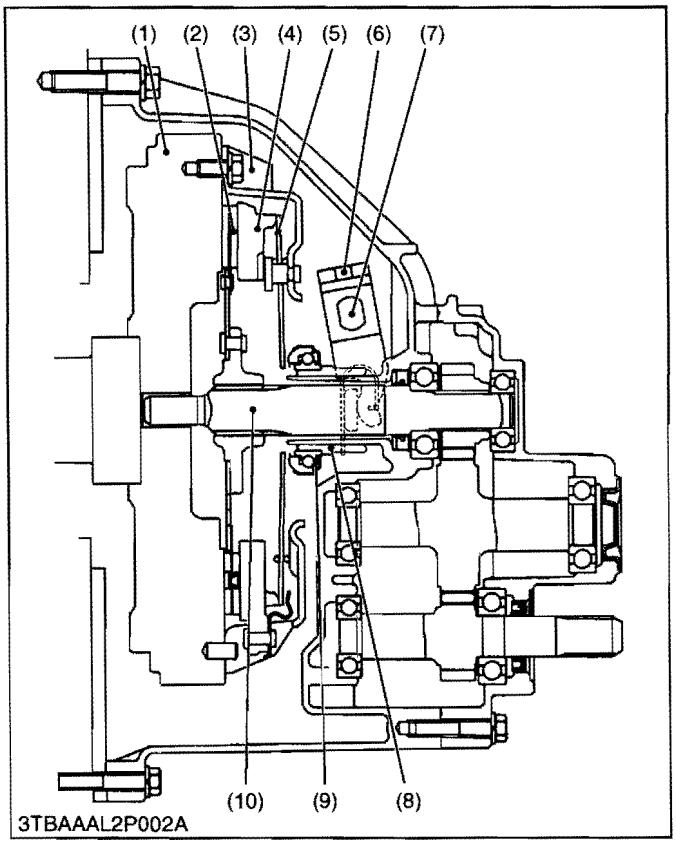


(1) Engine Flywheel
(2) Clutch Disc
(3) Clutch Cover
(4) Pressure Plate
(5) Diaphragm Spring
(6) Clutch Rod
(7) Clutch Release Fork
(8) Clutch Adjusting Bolt
(9) Clutch Pedal
(10) Clutch Release Hub
(11) Clutch Release Bearing
(12) Clutch Shaft
(13) Pressure Plate Assembly

Engine torque is transmitted to the pressure plate assembly (13) via the flywheel (1) which is connected to the engine crankshaft. Therefore, the clutch cover constantly runs with engine. The clutch disc (2) is located between the flywheel (1) and the pressure plate (4) of pressure plate assembly. Torque is transmitted to the clutch disc (2) by the pressure created by diaphragm spring (5) installed in pressure plate assembly. Then, the torque is transmitted to the transmission via the clutch shaft (12).

When the pedal (9) is depressed, the clutch release hub (10) and the clutch release bearing (11) move towards the flywheel and push the fingers of the diaphragm spring (5). In other words, this movement pulls the pressure plate (4) up and disengages the clutch.

2. OPERATION



3TBAAAL2P002A

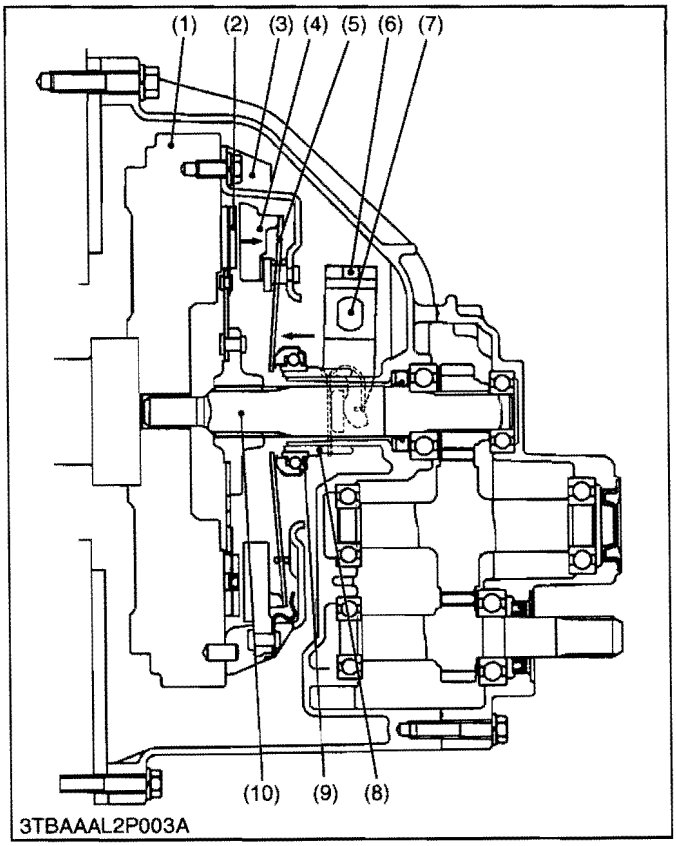
■ Clutch "Engaged"

When the clutch pedal is not depressed, the clutch release bearing (9) and the fingers of diaphragm spring (5) are not connected to each other.

Accordingly, the pressure plate (4) is tightly pressed against the flywheel (1) by the diaphragm spring (5). As a result, rotation of the flywheel (1) is transmitted to the transmission through the clutch shaft (10) due to the frictional force among the flywheel (1), clutch disc (2) and pressure plate (4).

(1) Flywheel
(2) Clutch Disc
(3) Clutch Cover
(4) Pressure Plate
(5) Diaphragm Spring
(6) Release Fork
(7) Clutch Rod
(8) Release Hub
(9) Release Bearing
(10) Clutch Shaft

W1012907



3TBAAAL2P003A

■ Clutch "Disengaged"

When the clutch pedal is depressed, the clutch pedal rod is pulled to move the clutch rod (7). Then, the release fork (6) pushes the release hub (8) and release bearing (9) toward the flywheel. Simultaneously, the release bearing (9) pushes the diaphragm spring (5).

As the pressure plate (4) is pulled by the diaphragm spring (5), the frictional force among the flywheel (1), clutch disc (2) and pressure plate (4) disappears.

Therefore, rotation of the flywheel (1) is not transmitted to the clutch disc (2), and then the rotation of the clutch shaft (10) stops.

(1) Flywheel
(2) Clutch Disc
(3) Clutch Cover
(4) Pressure Plate
(5) Diaphragm Spring
(6) Release Fork
(7) Clutch Rod
(8) Release Hub
(9) Release Bearing
(10) Clutch Shaft

W1013100

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Clutch Drags	Clutch pedal free travel excessive	Adjust	2-S4
	Dust on clutch disc generated from clutch disc facing	Remove rust	2-S11
	Release fork broken	Replace	2-S11
	Clutch disc or pressure plate warped	Replace	2-S11
	Wire ring of the pressure plate worn or broken	Replace (Pressure plate assembly)	2-S11
Clutch Slips	Clutch pedal free travel too small	Adjust	2-S4
	Clutch disc excessively worn	Replace	2-S11
	Grease or oil on clutch disc facing	Replace	2-S11
	Clutch disc or pressure plate warped	Replace	2-S11
	Diaphragm spring weaken or broken	Replace	2-S11
	Wire ring of the pressure plate worn or broken	Replace (Pressure plate assembly)	2-S11
Chattering	Grease or oil on clutch disc facing	Replace	2-S11
	Clutch disc or pressure plate warped	Replace	2-S11
	Clutch disc boss spline worn or rusted	Replace or remove rest	2-S11
	Clutch shaft bent or spline worn	Replace	2-S11
	Pressure plate or flywheel face cracked or scored	Replace	1-S36, 2-S11
	Diaphragm spring strength uneven or diaphragm spring broken	Replace	2-S11
Rattle During Running	Clutch disc boss spline worn	Replace	2-S11
	Bearing worn or sticking	Replace	2-S11
Clutch Squeaks	Bearing sticking or dry	Replace	2-S11
	Clutch disc excessively worn	Replace	2-S11
Vibration	Clutch shaft bent	Replace	2-S11
	Clutch disc rivet worn or broken	Replace	2-S11
	Clutch parts broken	Replace	–

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free travel on Clutch Pedal	20 to 30 mm 0.8 to 1.2 in.	–
	Distance "**A**"	5.5 to 6.0 mm 0.22 to 0.24 in.	–
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	–	2.0 mm 0.079 in.
Clutch Disc	Disc Surface to Rivet Top (Depth)	–	0.30 mm 0.012 in.
Pressure Plate	Flatness	–	0.2 mm 0.008 in.

W1013874

3. TIGHTENING TORQUES

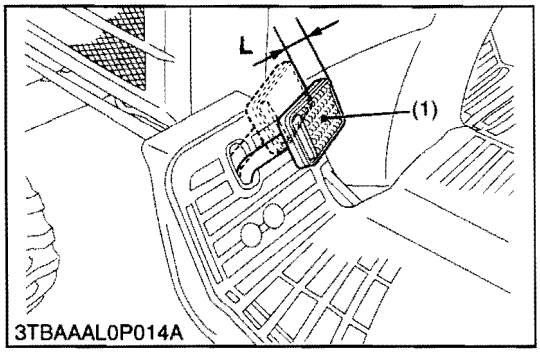
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

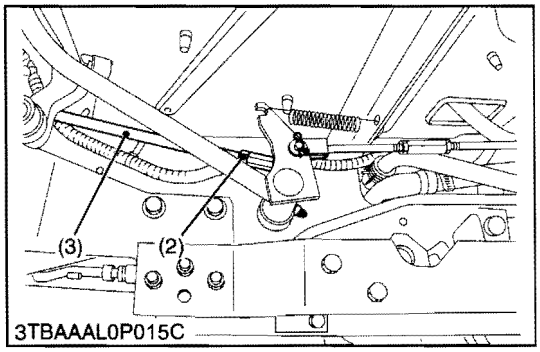
Item	N·m	kgf·m	lbf·ft
Steering wheel mounting nut	30 to 49	3.0 to 5.0	22 to 36
Power steering delivery pipe nut	65 to 75	6.7 to 7.6	48 to 55
Oil cooler pipe 2 nut	34 to 39	3.5 to 3.9	25 to 28
Drag link slotted nut	18 to 35	1.9 to 3.5	14 to 25
Clutch housing and engine mounting screw (M8)	18 to 21	1.8 to 2.1	13 to 15
Clutch housing and engine mounting nut (M10)	48 to 55	4.9 to 5.7	36 to 41
Clutch mounting screw	24 to 27	2.4 to 2.8	18 to 20

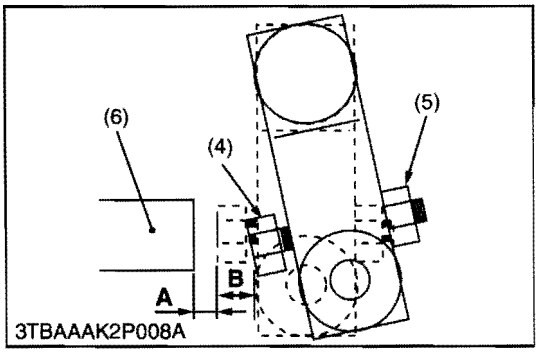
W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING







Checking Clutch Pedal Free Travel

CAUTION

- **When checking, park the tractor on flat ground, apply the parking brake, stop the engine and remove the key.**

1. Slightly depress the clutch pedal (1) and measure free travel at top of pedal stroke **"L"**.
2. If adjustment is needed, loosen the lock nut (2) and turn the clutch rod (3) to adjust the rod length within acceptable limits.
3. Retighten the lock nut (2).
4. After adjusting it, move the clutch pedal (1) by just the stroke **"L"** (Free Travel).
   While keeping the condition, measure distance **"A"** between the stopper bolt (4) and the clutch housing (6).
5. If the measurement not within the factory specifications, adjust it with the clutch pedal stopper bolt (4).

■ NOTE

- **After adjustment, fix the stopper bolt with the lock nut (3).**

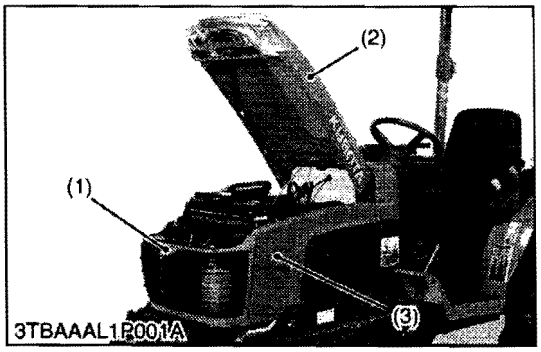
Clutch pedal free travel **"L"** on top of clutch pedal (Reference) Clutch pedal free travel on stopper bolt stroke **"B"** 1.5 to 2.1 mm (0.059 to 0.083 in.)		20 to 30 mm 0.8 to 1.2 in.
Distance **"A"**	Factory spec.	5.5 to 6.0 mm 0.22 to 0.24 in.

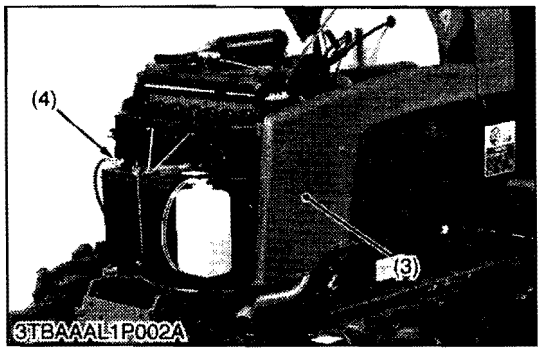
(1) Clutch Pedal
(2) Lock Nut
(3) Clutch Rod
(4) Stopper Bolt
(5) Lock Nut for Stopper Bolt
(6) Clutch Housing

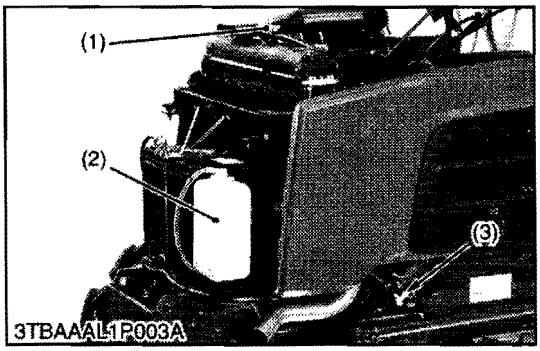
W1027653

[2] PREPARATION

(1) Separating Engine from Clutch Housing







Bonnet, Front Grille, Side Cover and Battery Negative Cord

1. Open the bonnet (2) and remove the front grille (1).
2. Disconnect the negative cord (4).
3. Disconnect the head light connectors and remove the bonnet (2).
4. Remove the side covers (3).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the negative cord first. When connecting, positive cord first.**

(1) Front Grille
(2) Bonnet
(3) Side Cover
(4) Battery Negative Code

W1107733

Draining Coolant

⚠ **CAUTION**

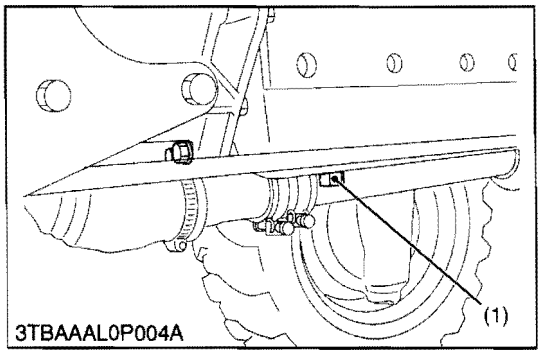
- **Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**

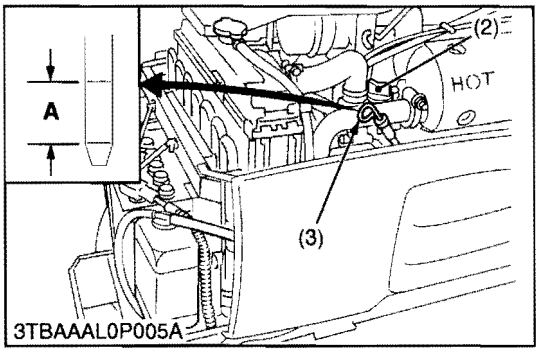
1. Loosen the drain cock (3) from the radiator hose to drain coolant.
2. Remove the radiator cap (1) to drain coolant completely.

Coolant capacity (with recovery tank)	4.5 L 4.8 U.S.qts 4.0 Imp.qts

(1) Radiator Cap
(2) Recovery Tank
(3) Drain Cock

W1011747





Draining Engine Oil

1. Place an oil pan underneath the engine.
2. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
3. Screw in the drain plug (1).

(When refilling)

- Fill with the new oil up to the upper notch on the dipstick.

■ **IMPORTANT**

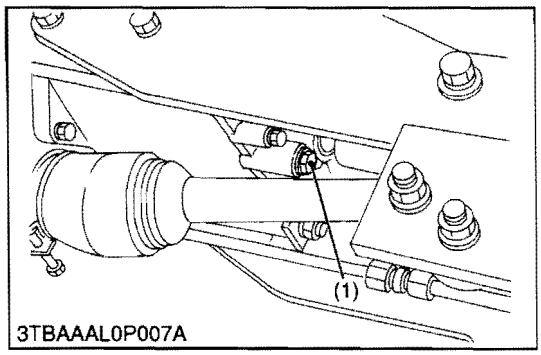
- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)**

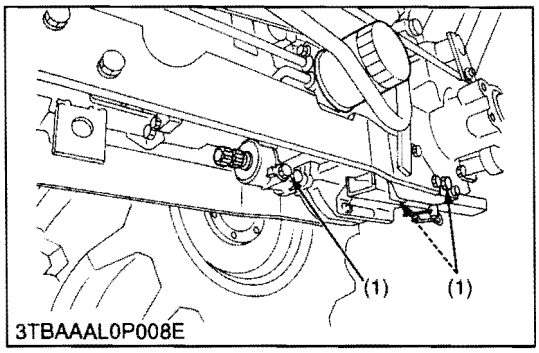
Engine oil capacity	5.4 L 5.7 U.S.qts 4.8 Imp.qts

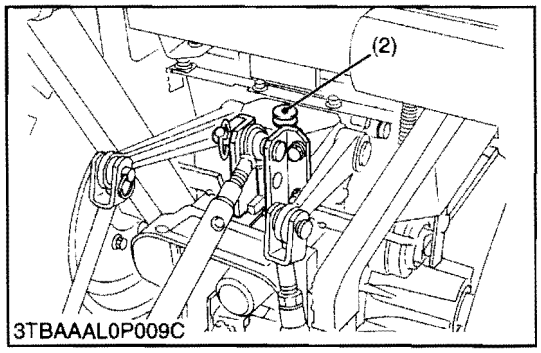
(1) Drain Plug
(2) Oil Inlet
(3) Dipstick

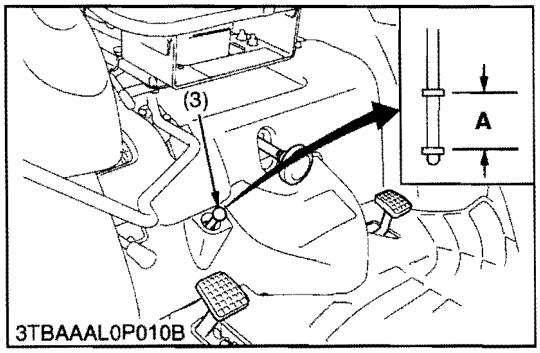
A : Proper Oil Level

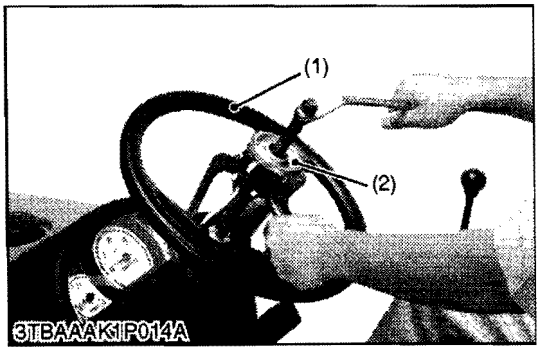
W1011866











Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1).
2. Drain the transmission fluid.
3. Reinstall the drain plug.

(When refilling)

- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ IMPORTANT

- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

(1) Drain Plug
(2) Filling Plug
(3) Dipstick

A : Proper Oil Level

W1013803

Steering Wheel

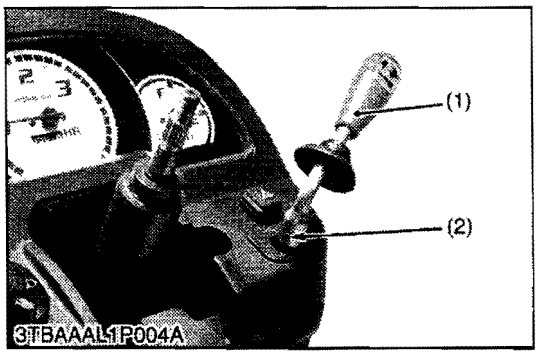
1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel (1) with a steering wheel puller (2).

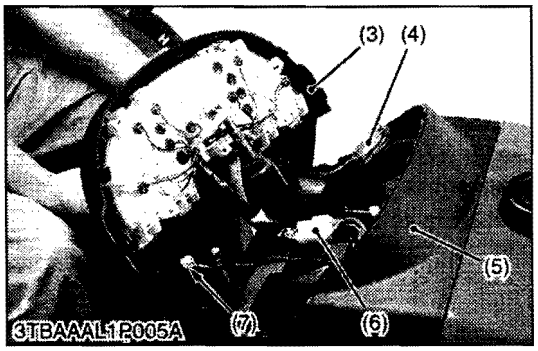
(When reassembling)

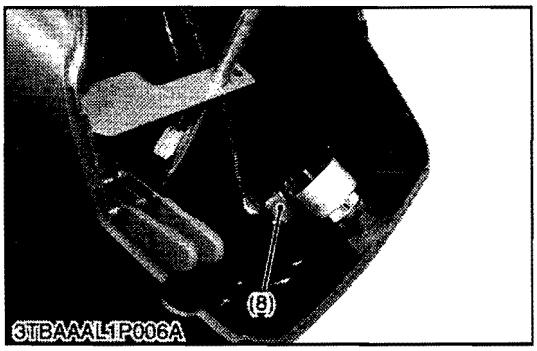
Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

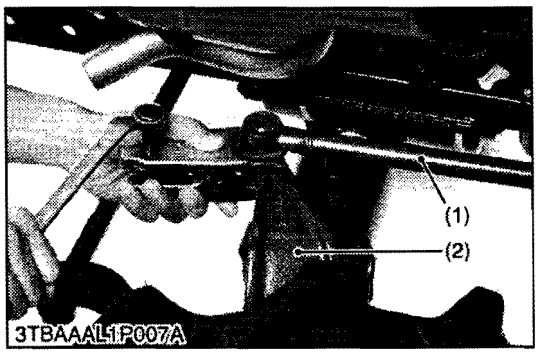
(1) Steering Wheel (2) Steering Wheel Puller

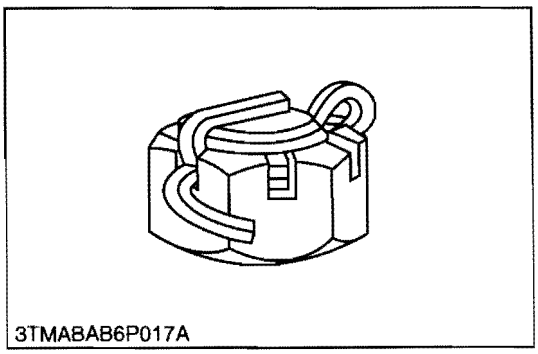
W1012230











Meter Panel and Panel Under Cover

1. Tap out the spring pin (2) and remove the hand accelerator lever (1).
2. Open the meter panel (3) and disconnect the hourmeter cable, meter panel connector (6), combination switch connector (4) and hazard switch connector (7). Then remove the meter panel (3).
3. Disconnect the main switch connector (8) and remove the panel under cover (5).

(1) Hand Accelerator Lever
(2) Spring Pin
(3) Meter Panel
(4) Combination Switch Connector
(5) Panel Under Cover
(6) Meter Panel Connector
(7) Hazard Switch Connector
(8) Main Switch Connector

W1108120

Drag Link

1. Remove the cotter pin and loosen the slotted nut.
2. Disconnect the drag link (1) with a pitman arm puller from the knuckle arm (2).

(When reassembling)

■ **IMPORTANT**

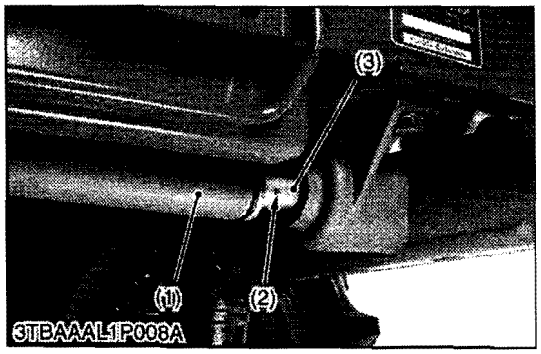
- **Do not loosen the slotted nut to align the hole.**
- **Install the cotter pin as shown in the figure.**

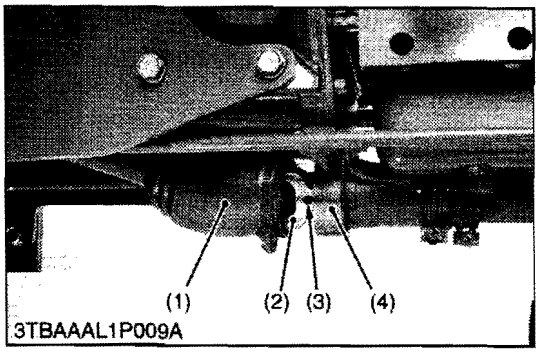
(Reference)

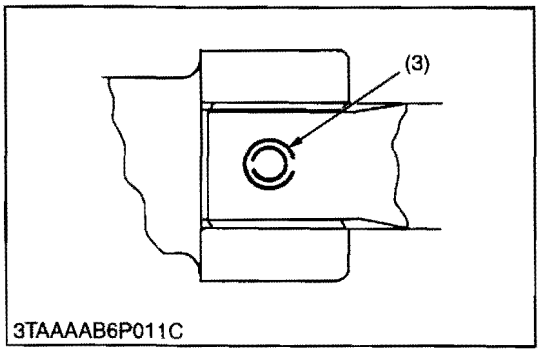
Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 lbf·ft

(1) Drag Link
(2) Knuckle Arm

W1012470







Propeller Shaft Cover and Coupling

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft and coupling.

(1) Propeller Shaft Cover
(2) Spring Pin
(3) Coupling

W1028559

Universal Joint and Bearing Holder

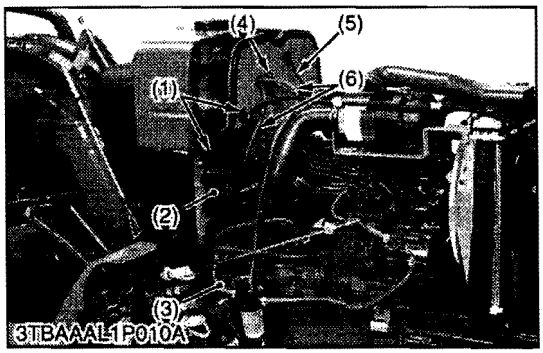
1. Loosen the clamp and slide the universal joint cover (1) to the rear.
2. Tap out the spring pins (3) and then slide the universal joint (2) to the rear.
3. Remove the bearing holder (4) with propeller shaft and universal joint.

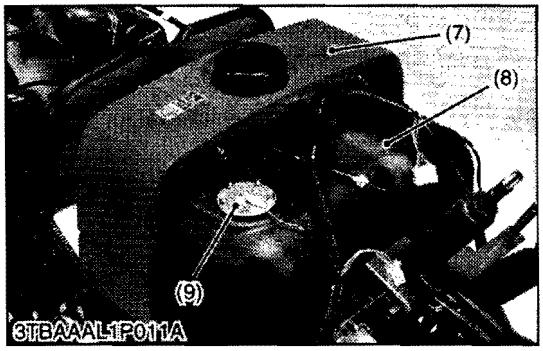
(When reassembling)

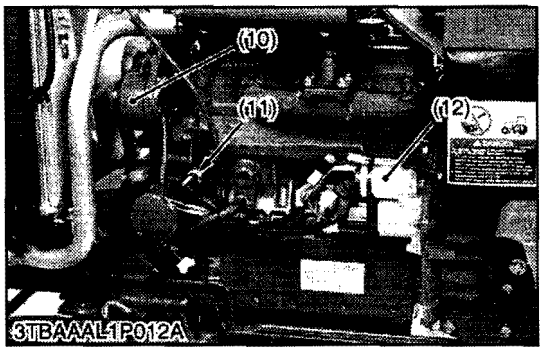
- Apply grease to the splines of the propeller shaft and universal joint.
- Replace the spring pins (3) with new one.
- When inserting the spring pins (3), face their splits in the direction parallel to the universal joint as shown in the figure.

(1) Universal Joint Cover
(2) Universal Joint
(3) Spring Pin
(4) Bearing Holder

W1012741





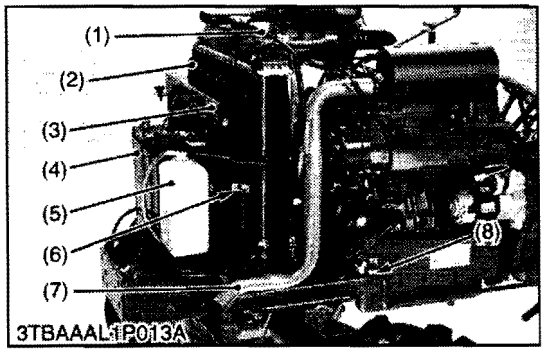


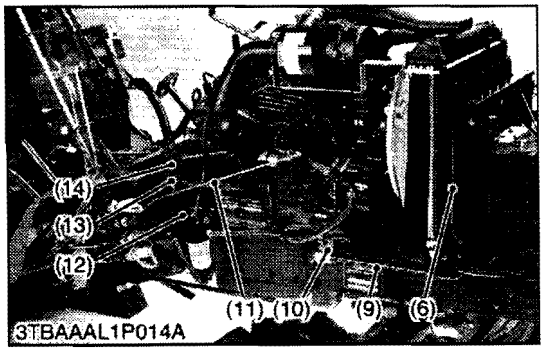
Fuel Tank and Wire Harness

1. Disconnect the fuel hose (3) at the fuel filter side, then drain fuel completely.
2. Remove the fuse box (2) and disconnect the wire harness clamp (1).
3. Remove the fuel tank frame stay bolt (4). Disconnect the overflow hoses (6) and pull out the hour meter cable (5).
4. Disconnect the lead wires for fuel gauge and disconnect the wire harness clamps.
5. Remove the fuel tank (8) with tank frame (7).
6. Disconnect the glow plug lead wire, thermo sensor lead wire, engine stop solenoid connector, engine oil pressure switch lead wire, dynamo connector and starter motor lead wire.

(1) Wire Harness Clamp
(2) Fuse Box
(3) Fuel Hose
(4) Bolt
(5) Hour Meter Cable
(6) Overflow Hose
(7) Tank Frame
(8) Fuel Tank
(9) Fuel Gauge
(10) Dynamo
(11) Engine Oil Pressure Switch
(12) Starter Motor

W1029197



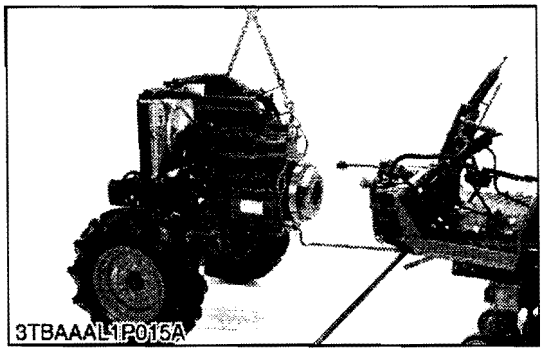


Battery, Recovery Tank, Battery Stay and Hydraulic Pipes

1. Remove the battery retainer.
2. Disconnect the positive cord and remove the battery (4).
3. Remove the recovery hose (1).
4. Remove the muffler pipe (7).
5. Remove the oil cooler pipe plate spring (6).
6. Remove the battery stay (3) with oil cooler (2).
7. Remove the oil cooler pipe clamp (8), (10). Then remove the oil cooler pipe (2).
8. Disconnect the accelerator rod (11).
9. Remove the power steering delivery pipe (14).
10. Remove the pipe clamp and the disconnect the 3-point hitch delivery pipe (13) and suction hose (12).

(1) Recovery Tank Hose
(2) Oil Cooler
(3) Battery Stay
(4) Battery
(5) Recovery Tank
(6) Oil Cooler Pipe Plate Spring
(7) Muffler Pipe
(8) Clamp
(9) Oil Cooler Pipe
(10) Clamp
(11) Accelerator Rod
(12) Suction Hose
(13) 3-Point Hitch Delivery Pipe
(14) Power Steering Delivery Pipe

W1013066



Separating the Engine from Clutch Housing

1. Place the jack under the center frame.
2. Hoist the engine by the chain at the engine hook.
3. Remove the engine mounting screws and separate the engine from the clutch housing.

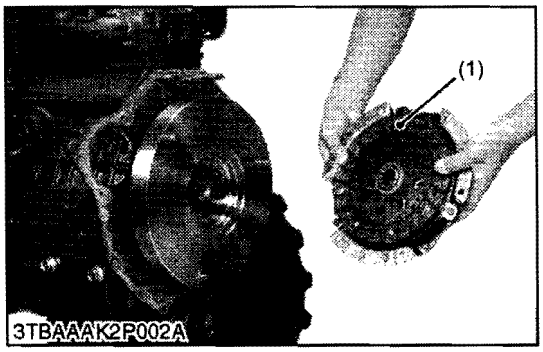
(When reassembling)

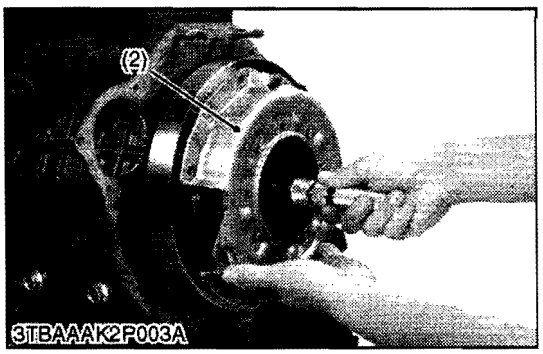
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the engine and clutch housing.

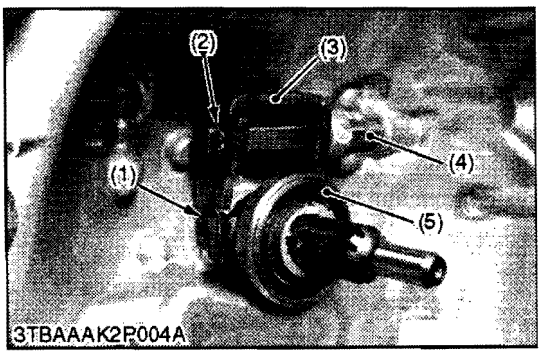
Tightening torque	Engine mounting M8 screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 lbf·ft
	Engine mounting M10 nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

W1014201

[3] DISASSEMBLING AND ASSEMBLING







Separating the Clutch Assembly

1. Remove the clutch assembly (2) from the flywheel.

(When reassembling)

- Direct the shorter end of the clutch disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Install the pressure plate, noting the position of straight pins.

■ IMPORTANT

- **Align the center of clutch disc and flywheel by inserting the clutch center tool.**

■ NOTE

- **Do not allow grease and oil on the clutch disc facing.**

Tightening torque	Clutch mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Clutch Disc
(2) Clutch Assembly

W1014406

Clutch Rod and Clutch Release Fork

1. Remove the clutch pedal rod.
2. Remove the external snap ring (2) at the end of clutch rod (4) and remove the clutch release fork (3) and release bearing (5) with release hub.

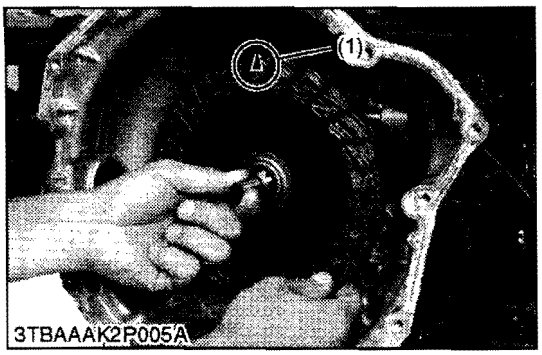
(When reassembling)

- Set the clutch release fork and release hub with set spring (1) in the correct direction.

(1) Set Spring
(2) External Snap Ring
(3) Clutch Release Fork
(4) Clutch Rod
(5) Release Bearing

W1014653

[4] SERVICING



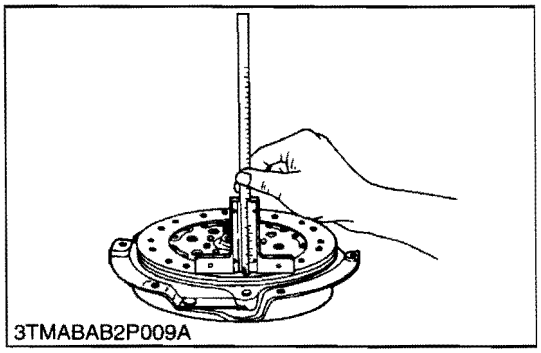
Backlash between Clutch Disc and Clutch Shaft

1. Mount the clutch disc onto the propeller shaft.
2. Hold the propeller shaft so that it does not rotate.
3. Slightly move the disc and measure the displacement around disc edge.
4. If the measurement exceeds the allowable limit, replace clutch disc.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

(1) Paint Marking

W1014886

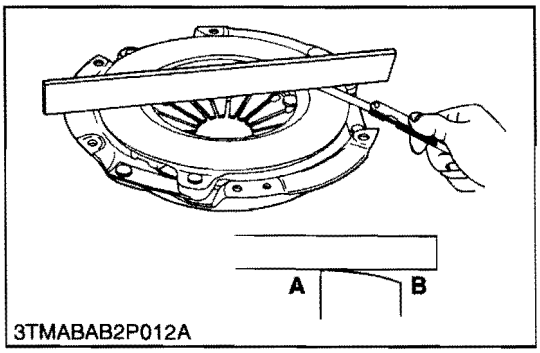


Clutch Disc Wear

1. Measure the depth from clutch disc surface to the top of rivet at least 10 points with a depth gauge.
2. If the depth is less than the allowable limit, replace the disc.
3. If oil is sticking to clutch disc, or disc surface is carbonized, replace the clutch disc.

Disc surface to rivet top (Depth)	Allowable limit	0.30 mm 0.012 in.

W1015024



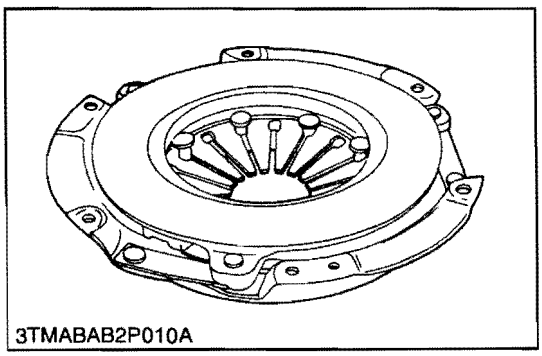
Pressure Plate Flatness

1. Place a straightedge on the pressure plate and measure clearance with a feeler gauge at several points.
2. If the clearance exceeds the allowable limit, replace it.
3. When the pressure plate is worn around its outside and its inside surface only is in contact with the straightedge, replace even if the clearance is within allowable limit.

Clearance between pressure plate and straightedge	Allowable limit	0.2 mm 0.008 in.

A : Inside **B : Outside**

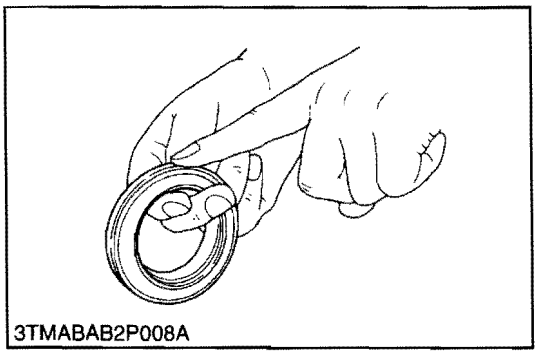
W1015146



Checking Pressure Plate and Diaphragm

1. Check the pressure plate and if scratched on its surface, correct with sandpaper or replace it.
2. Check the diaphragm for crack and scratches. If defects are found, replace it.

W1015312


3TMABAB2P008A

Checking Clutch Release Bearing

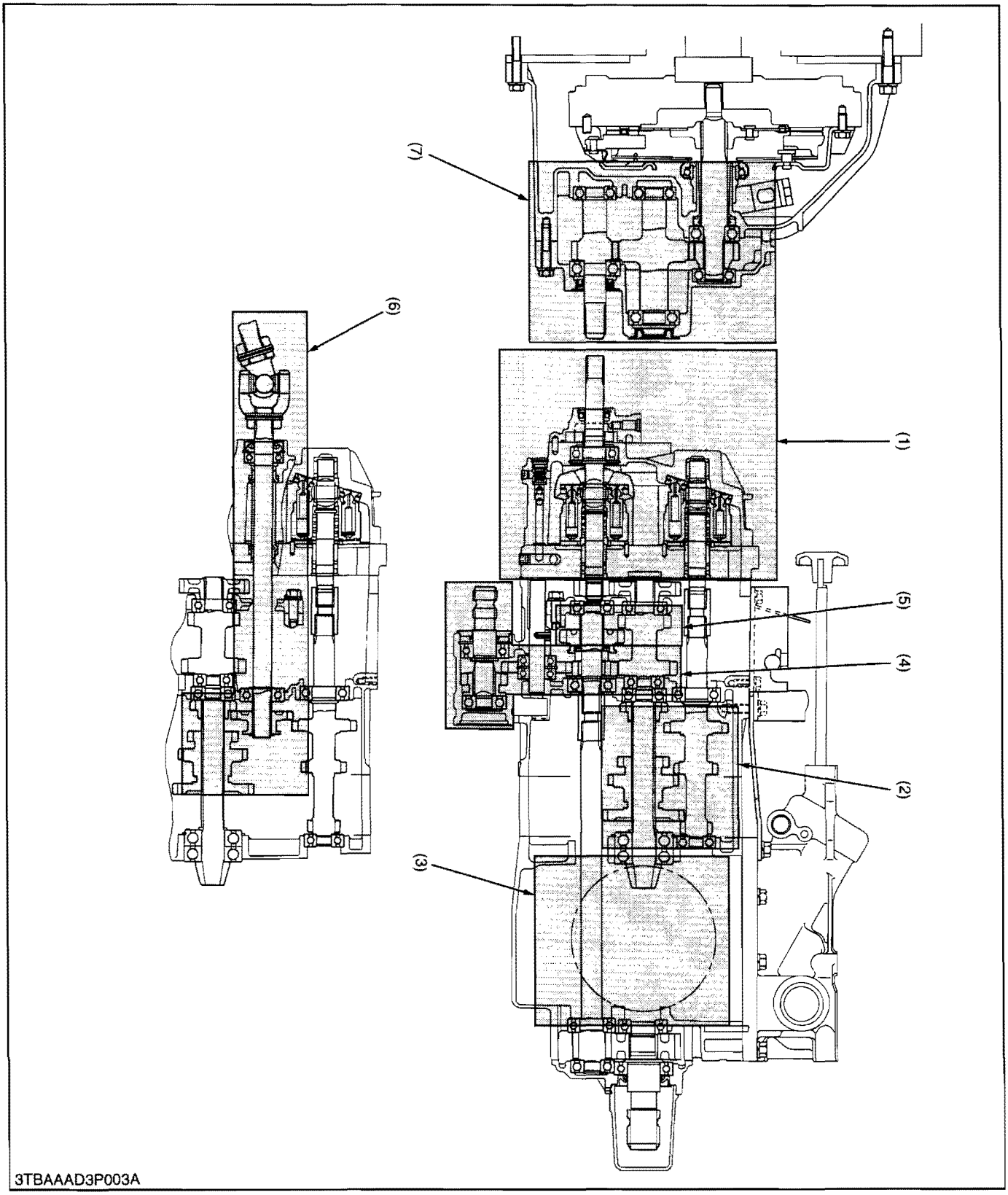
1. Check the clutch release bearing. If surface is worn excessively, or abnormal sounds occur, replace it.

W1015411

MECHANISM

CONTENTS

1. STRUCTURE

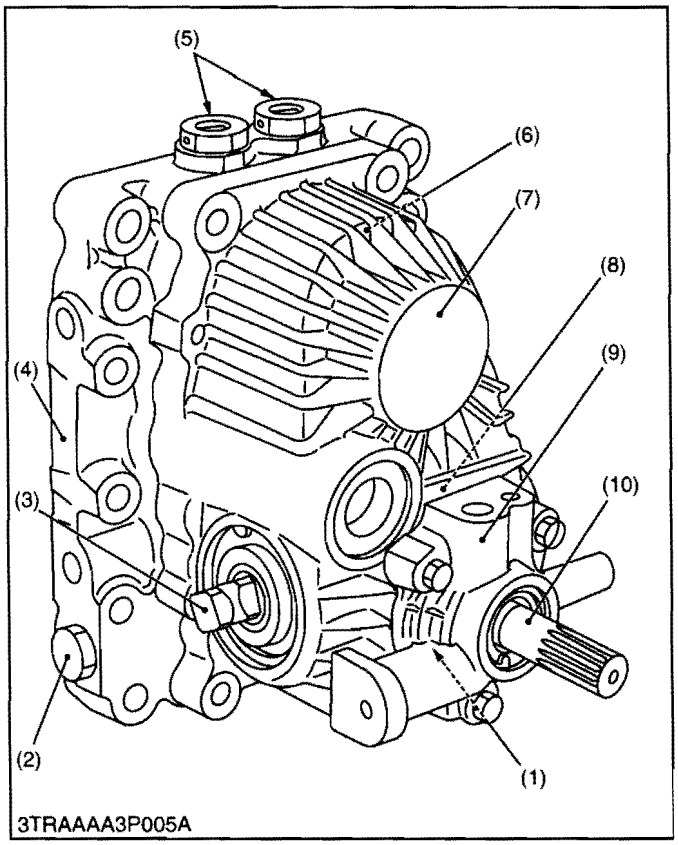


(1) Hydrostatic Transmission Section
(2) Range Gear Shift Section
(3) Differential Gear Section
(4) Mid-PTO Shift Section
(5) Rear-PTO Shift Section
(6) Front Wheel Drive Section
(7) Clutch Housing Section

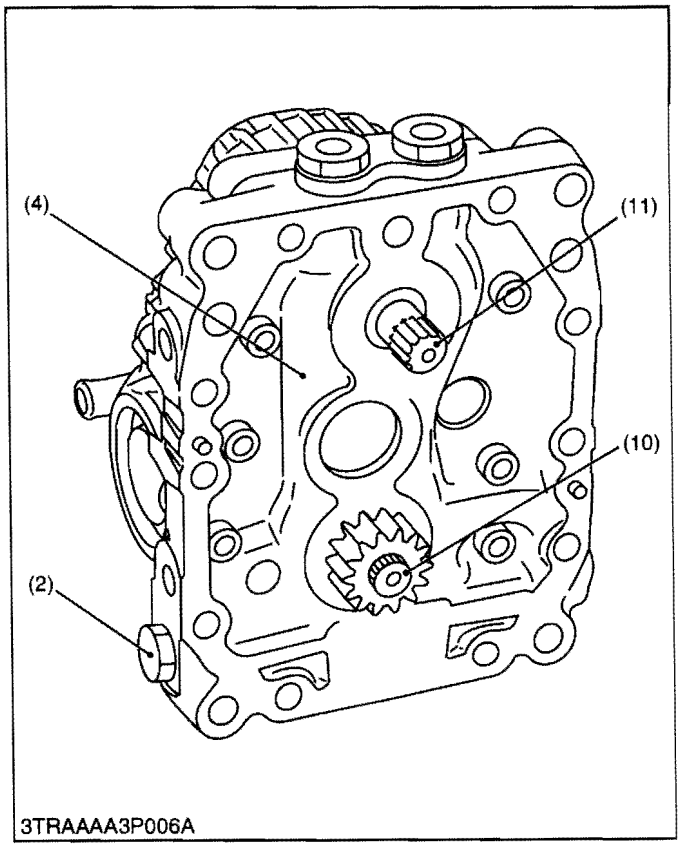
2. POWER TRAIN FOR TRAVELLING SYSTEM

[1] HYDROSTATIC TRANSMISSION

(1) Structure



3TRAAAA3P005A

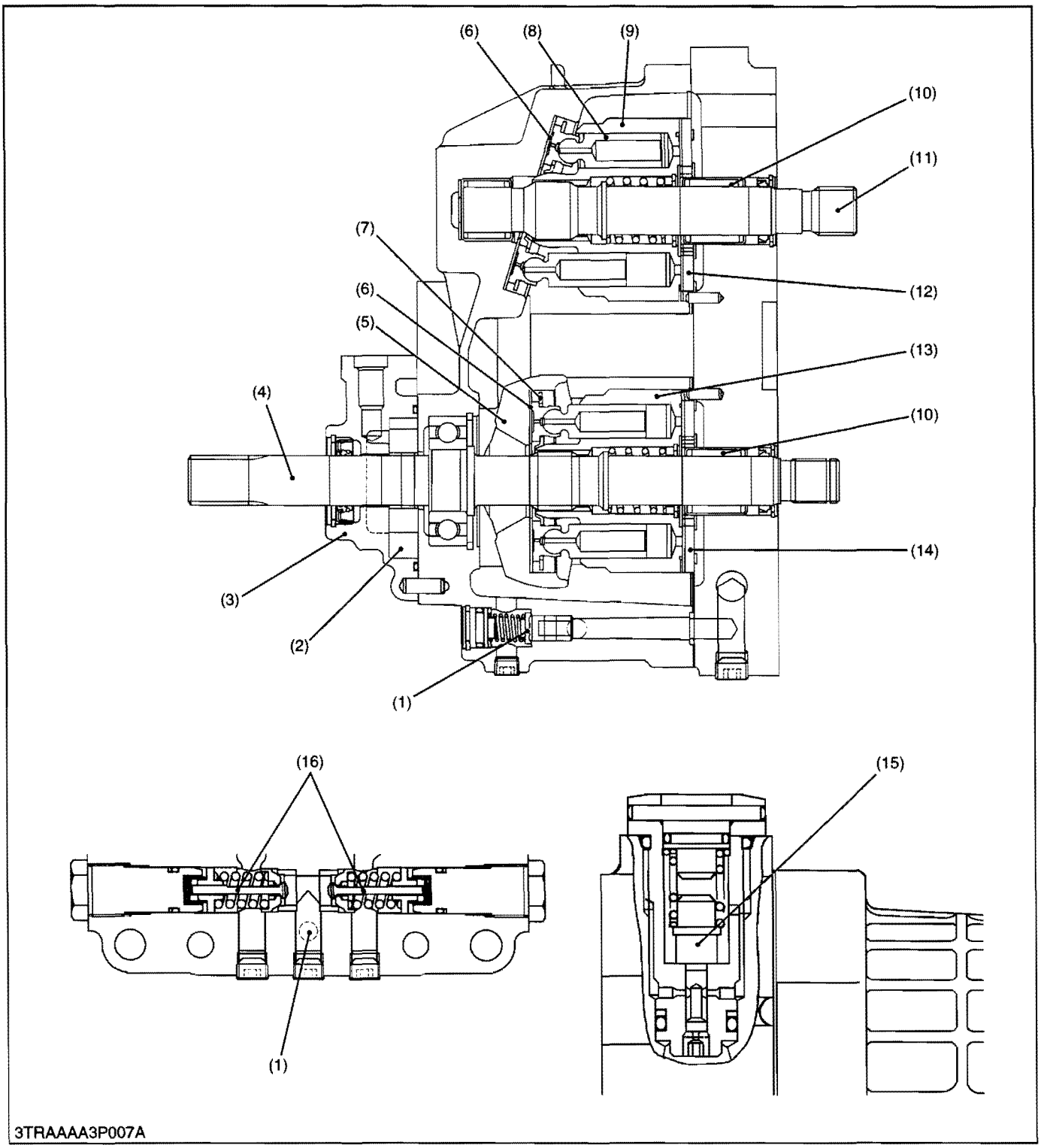


3TRAAAA3P006A

Hydrostatic transmission is composed of variable displacement piston pump, fixed displacement piston motor, charge pump and valve system.

(1) Charge Relief Valve
(2) Check and High Pressure Relief Valve
(3) Trunnion Shaft
(4) Center Section
(5) Neutral Valve
(6) Fixed Displacement Piston Motor
(7) Housing
(8) Variable Displacement Piston Pump
(9) Charge Pump
(10) Input Shaft (Pump Shaft)
(11) Output Shaft

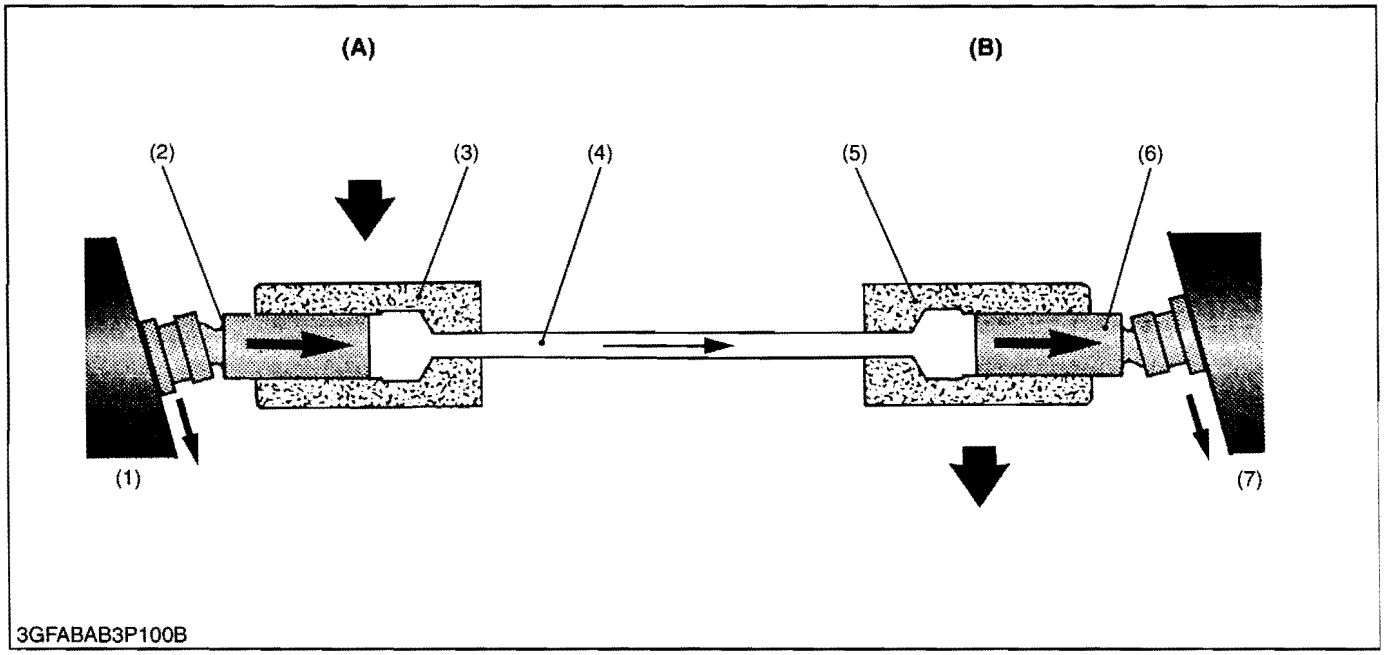
W1012895



3TRAAAA3P007A

(1) Charge Relief Valve
(2) Charge Pump
(3) Charge Pump Case
(4) Pump Shaft
(5) Variable Swashplate
(6) Thrust Collar
(7) Retainer Plate
(8) Piston
(9) Cylinder Block (Motor)
(10) Motor Shaft
(11) Motor Shaft
(12) Valve Plate (Motor)
(13) Cylinder Block (Pump)
(14) Valve Plate (Pump)
(15) Neutral Valve
(16) Check and High Pressure Relief Valve

(2) Pump and Motor



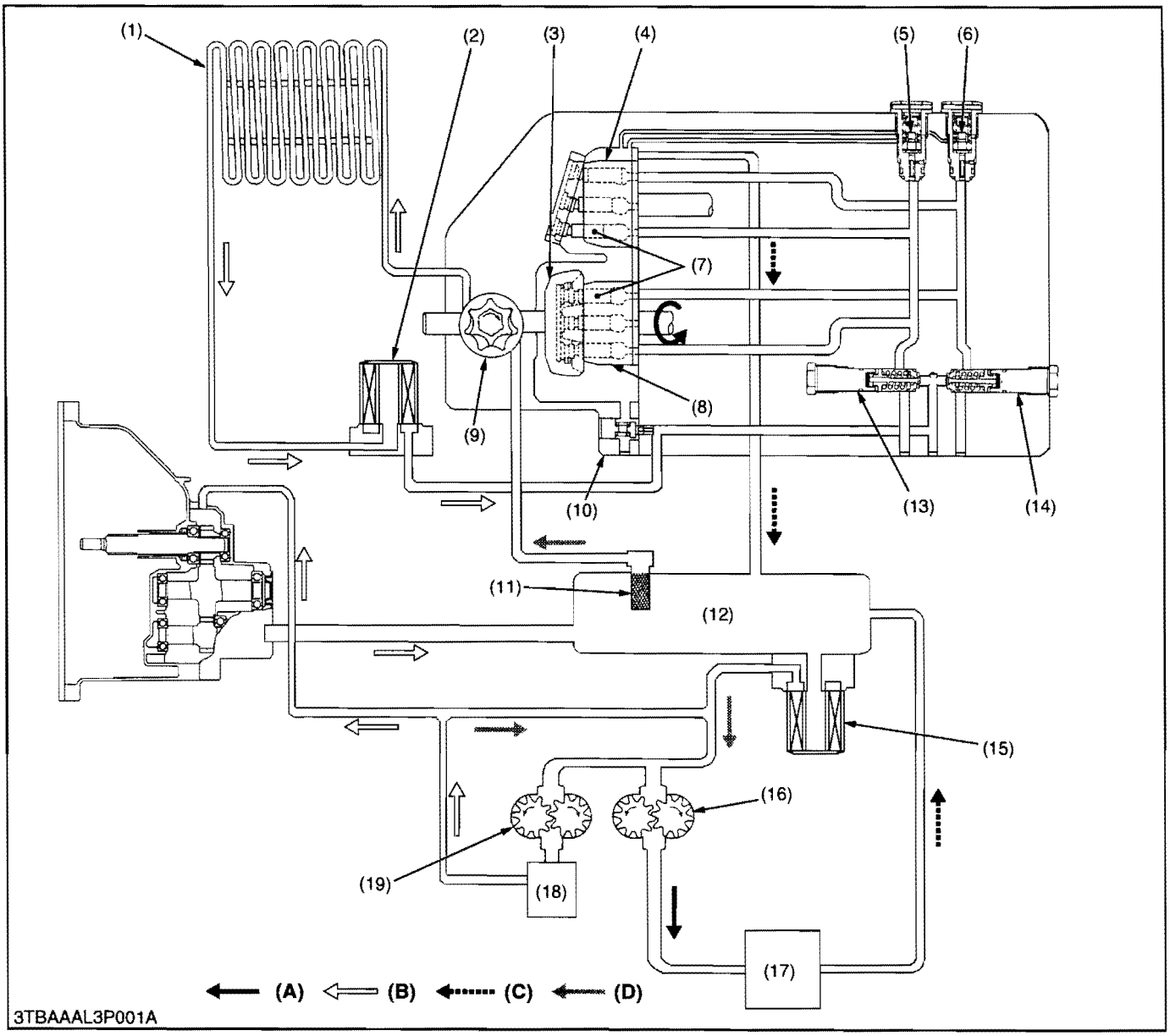
(1) Swashplate
(2) Piston
(3) Cylinder
(4) Oil
(5) Cylinder
(6) Piston
(7) Swashplate
(A) Pump
(B) Motor

Pump and motor cylinder, each containing pistons, are connected by lines. Cylinders and lines are filled with oil. Pistons ride against swashplates located in pump and motor.

In the pump, as the cylinder rotates, pistons move across the sloping face of swashplate and slide in or out of their cylinder bores. The oil, forced out by the pump pistons, causes the motor pistons to slide out of their cylinder bores.

In the motor, sliding out of the cylinder and moving across the sloping face of swashplate, the pistons rotate the cylinder.

(3) Oil Flow and Valves



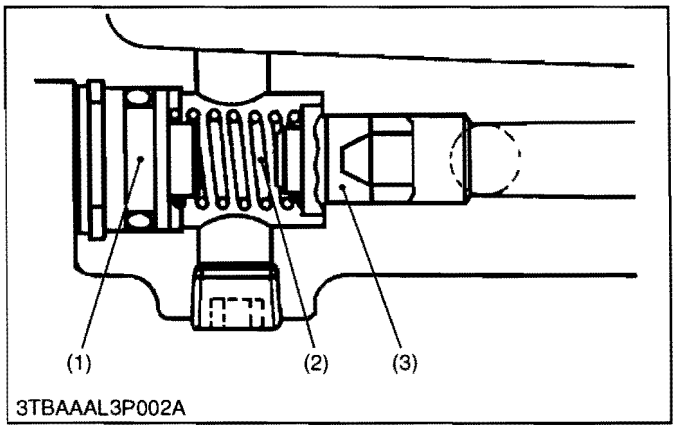
(1) Oil Cooler
(2) Oil Filter Cartridge (for HST)
(3) Swashplate
(4) Cylinder Block (Motor)
(5) Neutral Valve (Forward)
(6) Neutral Valve (Reverse)
(7) Piston
(8) Cylinder Block (Pump)
(9) Charge Pump
(10) Charge Relief Valve
(11) Oil Strainer
(12) Oil Tank
(13) Check and High Pressure Relief Valve (Forward)
(14) Check and High Pressure Relief Valve (Reverse)
(15) Oil Filter Cartridge
(16) Hydraulic Pump (25.3 L/min, 6.68 U.S.gal/min, 5.57 Imp.gal/min)
(17) Hydraulic Control Valve
(18) Power Steering
(19) Hydraulic Pump (12.2 L/min, 3.22 U.S.gal/min, 2.68 Imp.gal/min)

(A) High Pressure Oil
(B) Low Pressure Oil
(C) Free Oil
(D) Suction Oil

The pump and motor are joined in a closed hydraulic loop and most of oil circulates within the main oil circuit. A little oil lubricates and oozes out from the clearance between the moving parts of the case. Then oil in the main oil circuit of the HST needs to be supplied a want.

So all of oil fed from charge pump flow to hydrostatic transmission for charging and cooling.

The charge oil aids smooth operation of pistons for pump and motor. The charge oil passes through the oil cooler and oil filter cartridge to charge relief valve port. The rest of oil passes through the charge relief valve into the HST housing. And overflow oil from HST housing return to the transmission case.



3TBAAAL3P002A

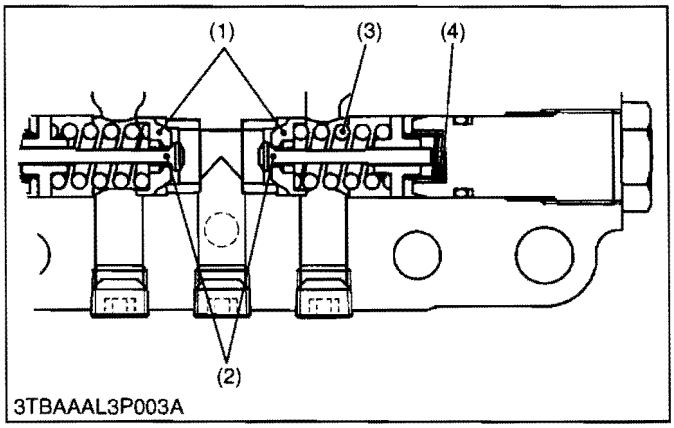
■ Charge Relief Valve

While pumped and filtered oil flows into the main oil circuit through the check and high pressure relief valves, and excessive oil passes to the housing through the charge relief valve.

Oil temperature	Valve operating pressure
50 °C (122 °F)	500 to 800 kPa 5.1 to 8.2 kgf/cm^2 73 to 116 psi

(1) Plug
(2) Spring
(3) Charge Relief Poppet

W1014036



3TBAAAL3P003A

■ Check and High Pressure Relief Valve

The check and high pressure relief valves monitor the oil pressure in each line of the main oil circuit.

In neutral, both valves are open and charging oil enters into the main oil circuit through the valves.

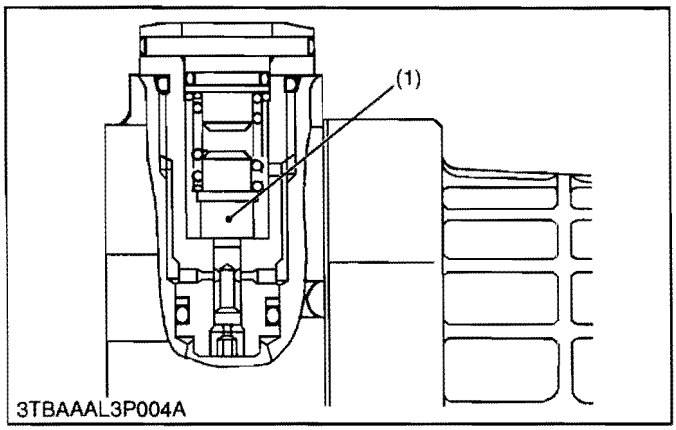
At normal operation, the check valve in the high pressure side is closed and it pushes and opens the another one.

When excessively high pressure is built up in one line, the high pressure relief valve located in this line is open and the oil flows into another line.

Oil temperature	Valve operating pressure
50 °C (122 °F)	30.9 to 31.9 MPa 315 to 325 kgf/cm^2 4480 to 4622 psi

(1) Check Valve Seat
(2) Relief Poppet
(3) Relief Spring
(4) Check Spring

W1014169



3TBAAAL3P004A

■ Neutral Valve

The neutral valves in the main oil circuit lines are open and pass the oil to the case when in neutral, and the oil pressure in their lines becomes low. And when the oil pressure in the high pressure line increases to a specified pressure, the neutral valve closes.

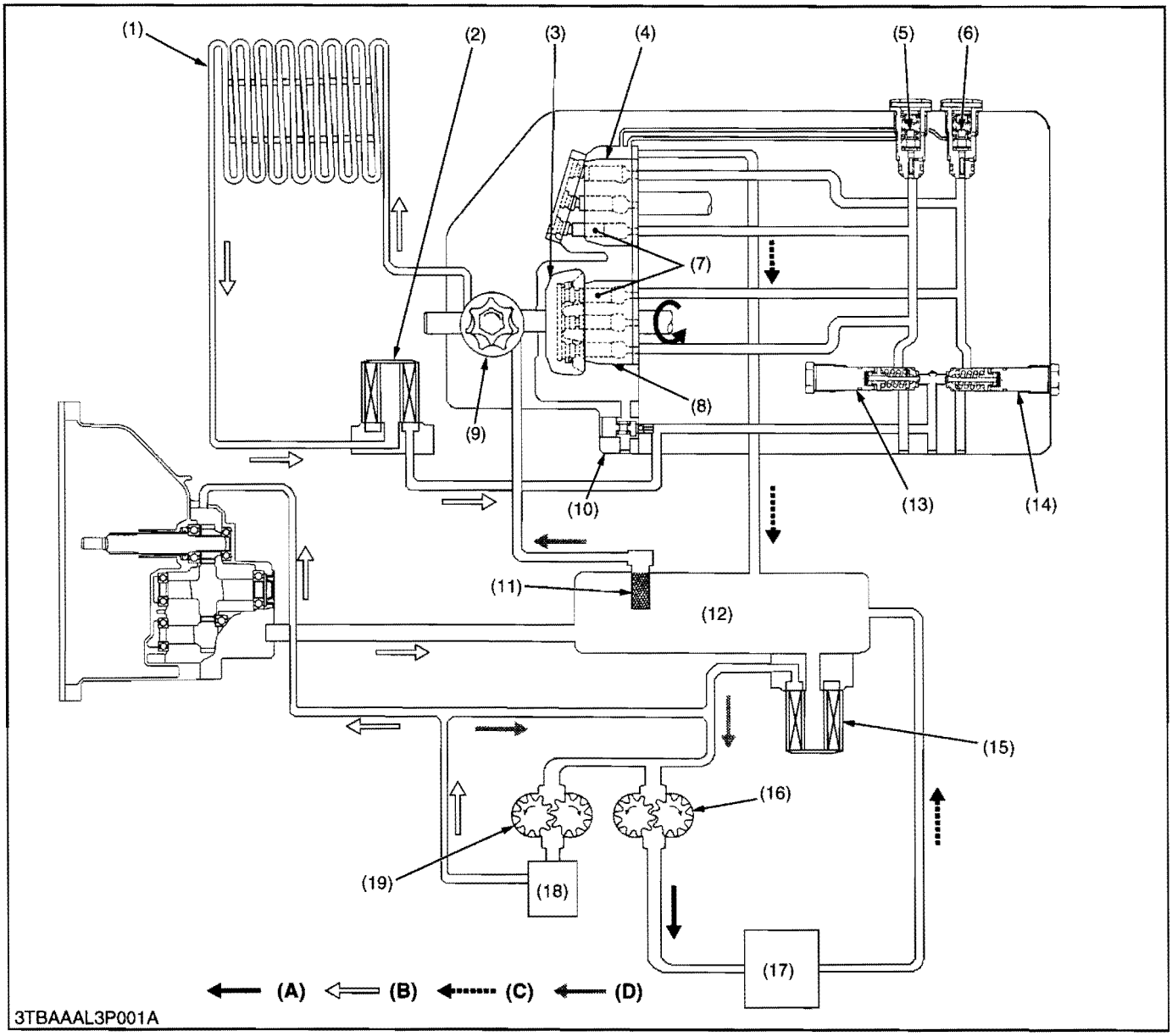
Oil temperature	Valve operating pressure	
50 °C (122 °F)	Close	7.36 to 9.81 MPa 75 to 100 kgf/cm^2 1067 to 1422 psi
	Open	1.47 to 2.45 MPa 15 to 25 kgf/cm^2 213 to 356 psi

(1) Neutral Valve

W1014262

(4) Operation

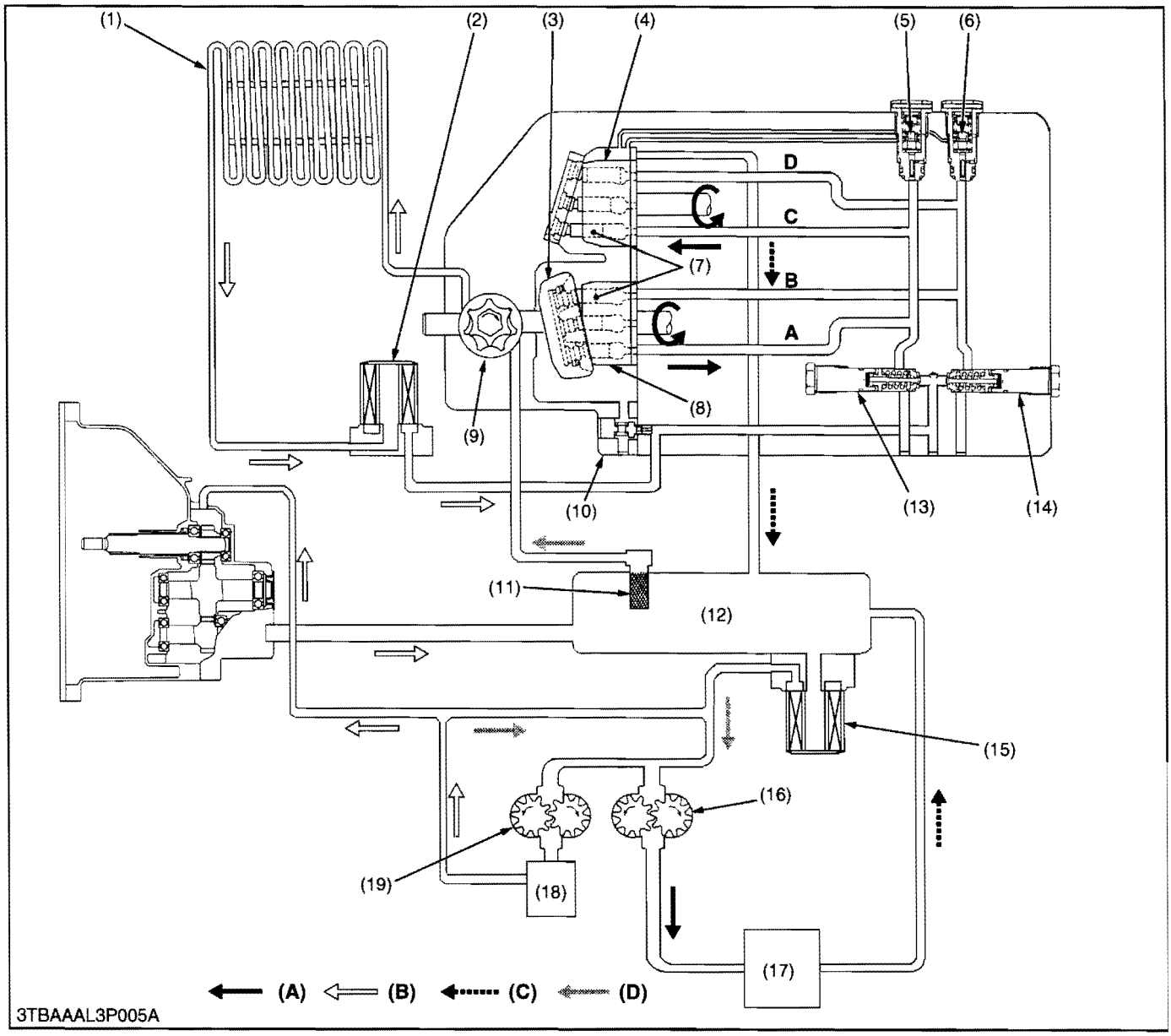
■ Neutral



(1) Oil Cooler
(2) Oil Filter Cartridge (for HST)
(3) Swashplate
(4) Cylinder Block (Motor)
(5) Neutral Valve (Forward)
(6) Neutral Valve (Reverse)
(7) Piston
(8) Cylinder Block (Pump)
(9) Charge Pump
(10) Charge Relief Valve
(11) Oil Strainer
(12) Oil Tank
(13) Check and High Pressure Relief Valve (Forward)
(14) Check and High Pressure Relief Valve (Reverse)
(15) Oil Filter Cartridge
(16) Hydraulic Pump (25.3 L/min, 6.68 U.S.gal/min, 5.57 Imp.gal/min)
(17) Hydraulic Control Valve
(18) Power Steering
(19) Hydraulic Pump (12.2 L/min, 3.22 U.S.gal/min, 2.68 Imp.gal/min)
(A) High Pressure Oil
(B) Low Pressure Oil
(C) Free Oil
(D) Suction Oil

When the speed control pedal is in neutral, the variable swashplate is at right angles to the pump pistons and they only rotate with cylinder block without reciprocating. Since the oil is not being pumped to the motor, the cylinder block in the motor is stationary and the output shaft does not move.

■ Forward



(1) Oil Cooler
(2) Oil Filter Cartridge (for HST)
(3) Swashplate
(4) Cylinder Block (Motor)
(5) Neutral Valve (Forward)
(6) Neutral Valve (Reverse)
(7) Piston
(8) Cylinder Block (Pump)
(9) Charge Pump
(10) Charge Relief Valve
(11) Oil Strainer
(12) Oil Tank
(13) Check and High Pressure Relief Valve (Forward)
(14) Check and High Pressure Relief Valve (Reverse)
(15) Oil Filter Cartridge
(16) Hydraulic Pump (25.3 L/min, 6.68 U.S.gal/min, 5.57 Imp.gal/min)
(17) Hydraulic Control Valve
(18) Power Steering
(19) Hydraulic Pump (12.2 L/min, 3.22 U.S.gal/min, 2.68 Imp.gal/min)

(A) High Pressure Oil
(B) Low Pressure Oil
(C) Free Oil
(D) Suction Oil
A : A Port
B : B Port
C : C Port
D : D Port

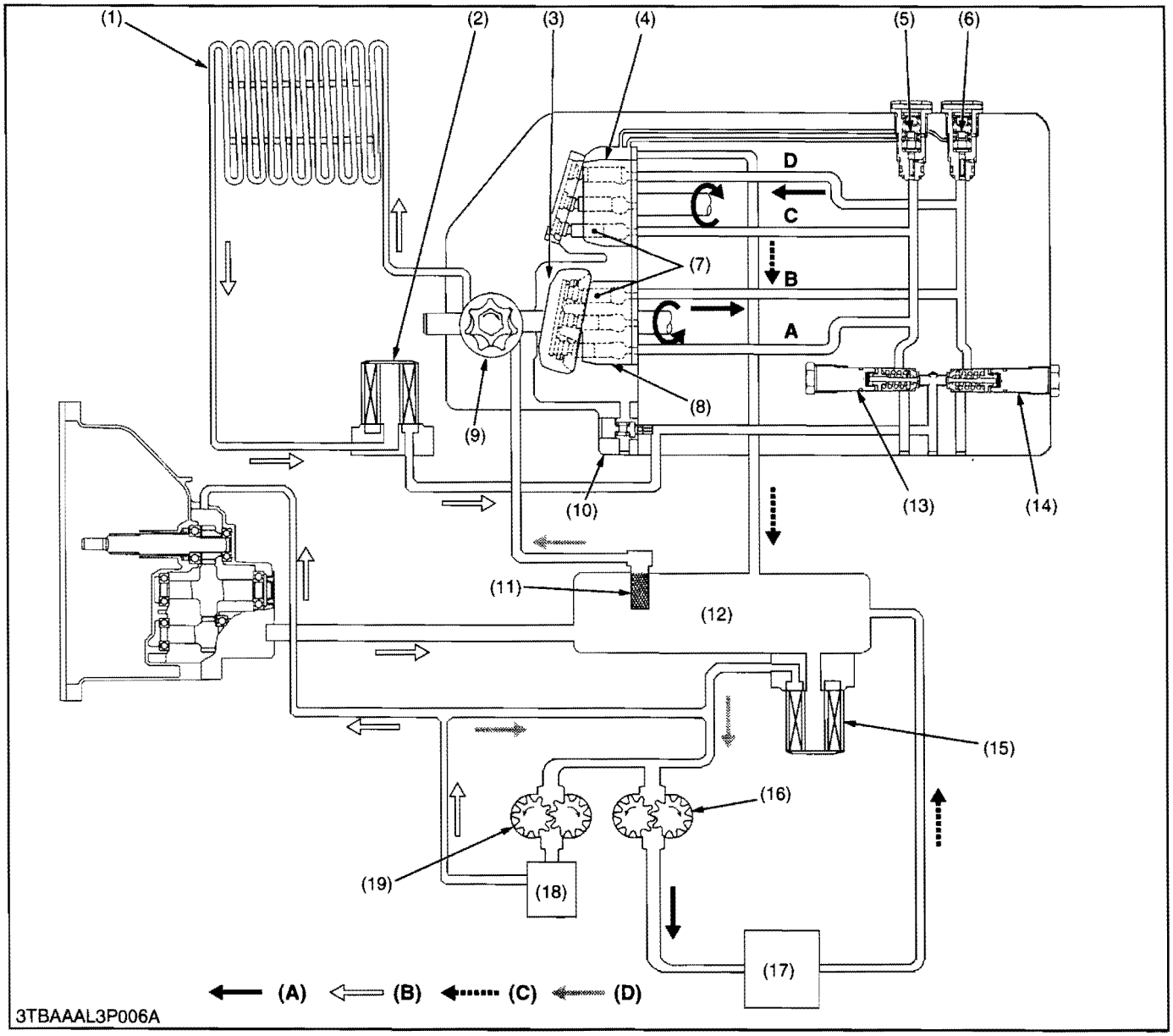
When the speed control pedal is stepped on and in forward, the variable swashplate is tilted as shown in figure above.

As the pump cylinder block rotates with the input shaft, oil is forced out of pump port **A** at high pressure. As pressure oil enters motor port **C**, the pistons, which align with port **C**, are pushed against the swashplate and slide down the inclined surface.

Then the output shaft rotates with the motor cylinder block. This drives the machine forward and the angle of pump swashplate determines the output shaft speed.

As the motor cylinder block continues to rotate, oil is forced out of motor port **D** at low pressure and returns to the pump.

■ Reverse



(1) Oil Cooler
(2) Oil Filter Cartridge (for HST)
(3) Swashplate
(4) Cylinder Block (Motor)
(5) Neutral Valve (Forward)
(6) Neutral Valve (Reverse)
(7) Piston
(8) Cylinder Block (Pump)
(9) Charge Pump
(10) Charge Relief Valve
(11) Oil Strainer
(12) Oil Tank
(13) Check and High Pressure Relief Valve (Forward)
(14) Check and High Pressure Relief Valve (Reverse)
(15) Oil Filter Cartridge
(16) Hydraulic Pump (25.3 L/min, 6.68 U.S.gal/min, 5.57 Imp.gal/min)
(17) Hydraulic Control Valve
(18) Power Steering
(19) Hydraulic Pump (12.2 L/min, 3.22 U.S.gal/min, 2.68 Imp.gal/min)

(A) High Pressure Oil
(B) Low Pressure Oil
(C) Free Oil
(D) Suction Oil
A : A Port
B : B Port
C : C Port
D : D Port

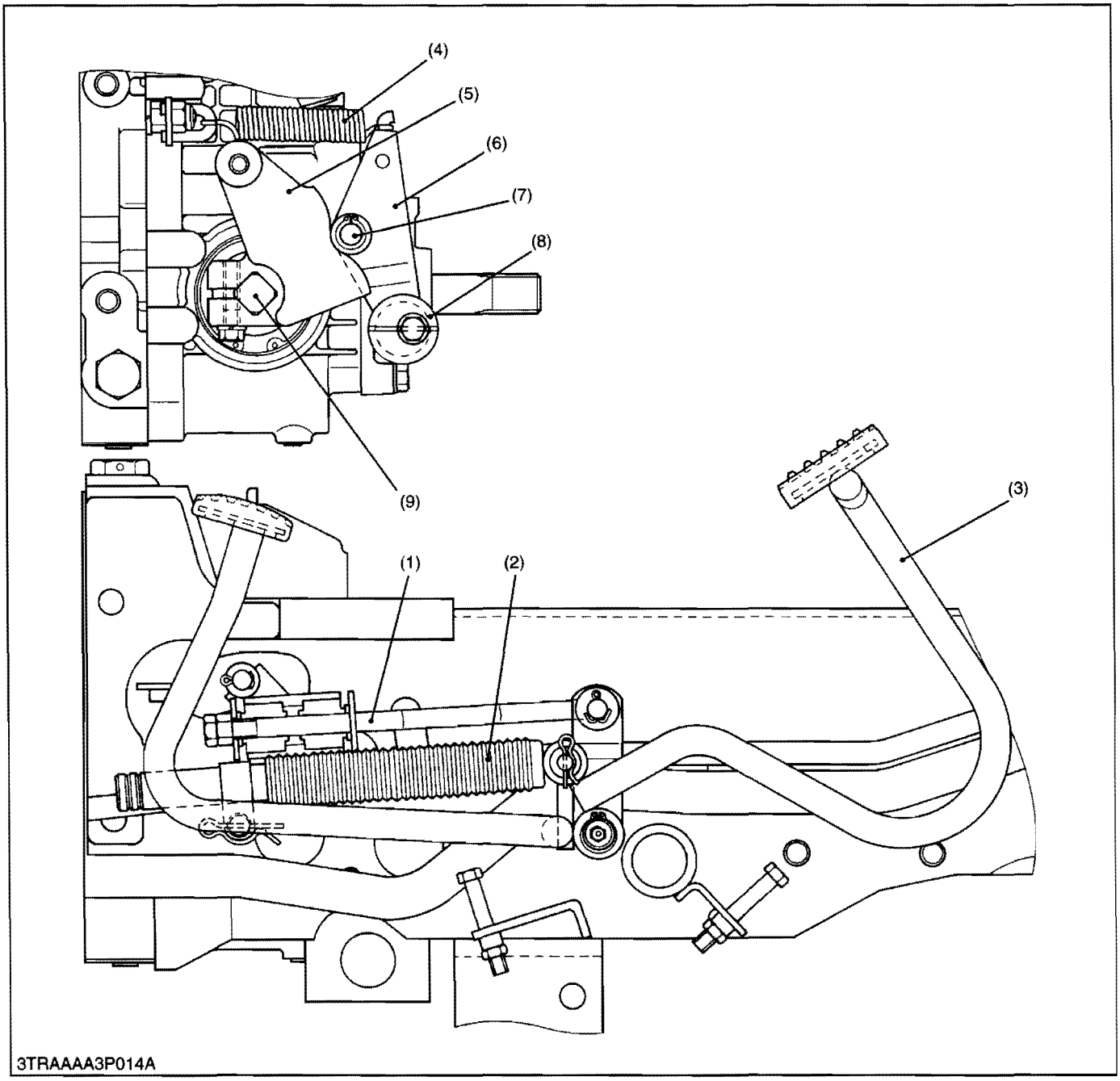
When the speed control pedal is stepped on and in reverse, the variable swashplate is tilted as shown in figure above.

As the pump cylinder block rotates with the input shaft, oil is forced out of pump port **B** at high pressure. As pressure oil enters motor port **D**, the pistons, which align with port **D**, are pushed against the swashplate and slide down the inclined surface.

Then the output shaft rotates with the motor cylinder block. This drives the machine rearward and the angle of pump swashplate determines the output shaft speed.

As the motor cylinder block continues to rotate, oil is forced out of motor port **C** at low pressure and returns to the pump.

(5) Control Linkage



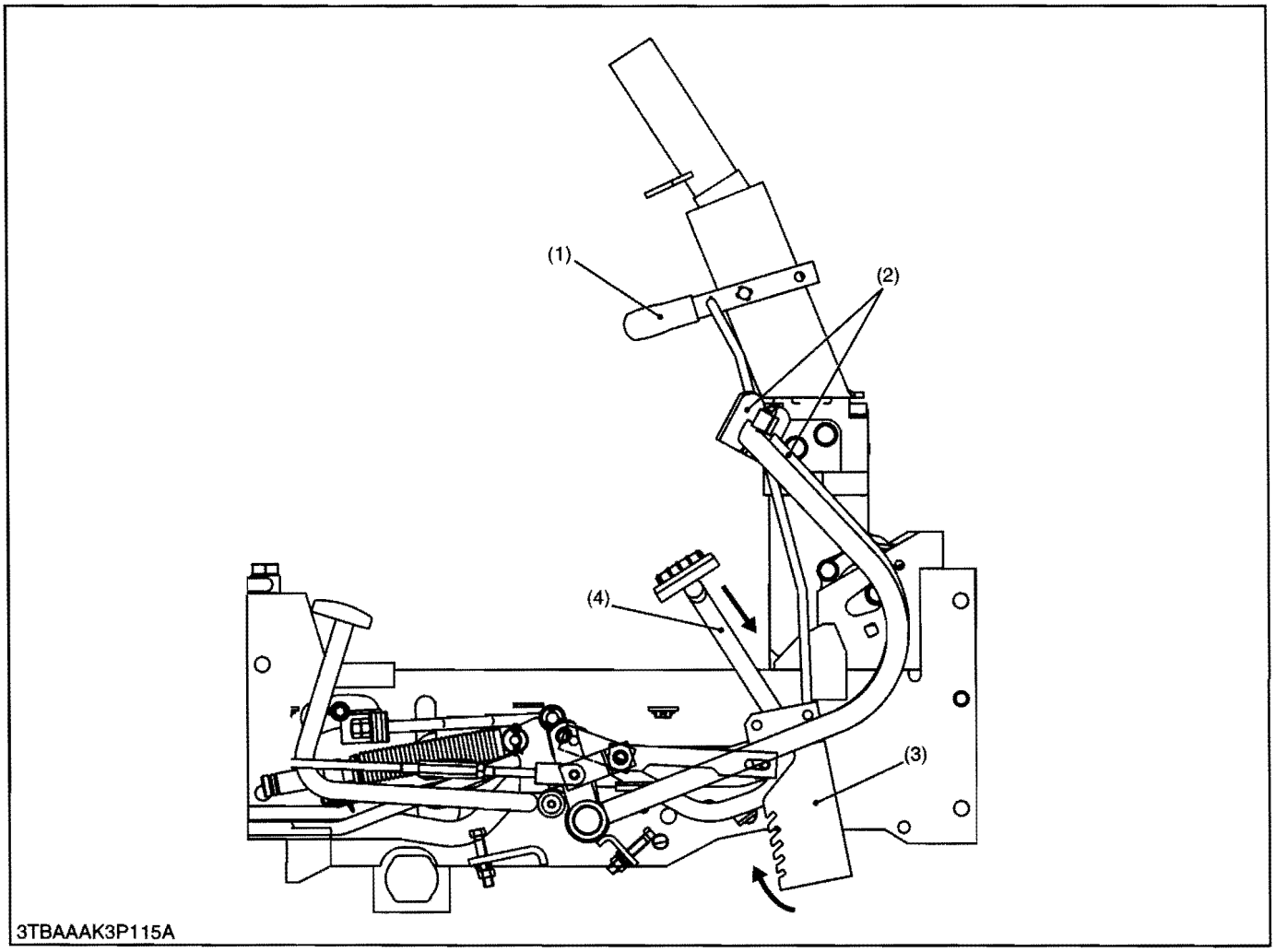
(1) Speed Control Rod Assembly
(2) Damper
(3) Speed Control Pedal
(4) Spring
(5) Neutral Holder
(6) Neutral Holder Arm
(7) Roller
(8) Neutral Adjuster
(9) Trunnion Shaft

The speed control pedal (3) and the trunnion shaft (9) of variable swashplate are linked with the speed control rod (1) and the neutral holder (5). As the front footrest of the pedal is depressed, the swashplate rotates and forward travelling speed increases. Depressing the rear footrest increases reverse speed.

The roller (7) on the neutral holder arm (6) is held with spring seats the detent of the neutral holder (5) so that the neutral holder returns to neutral. Then, the swashplate is returned to neutral with the neutral holder, when the pedal is released. The damper (2) connected to the speed control pedal restricts the movement of the linkage to prevent abrupt operation or reversing.

(6) Speed Set Linkage

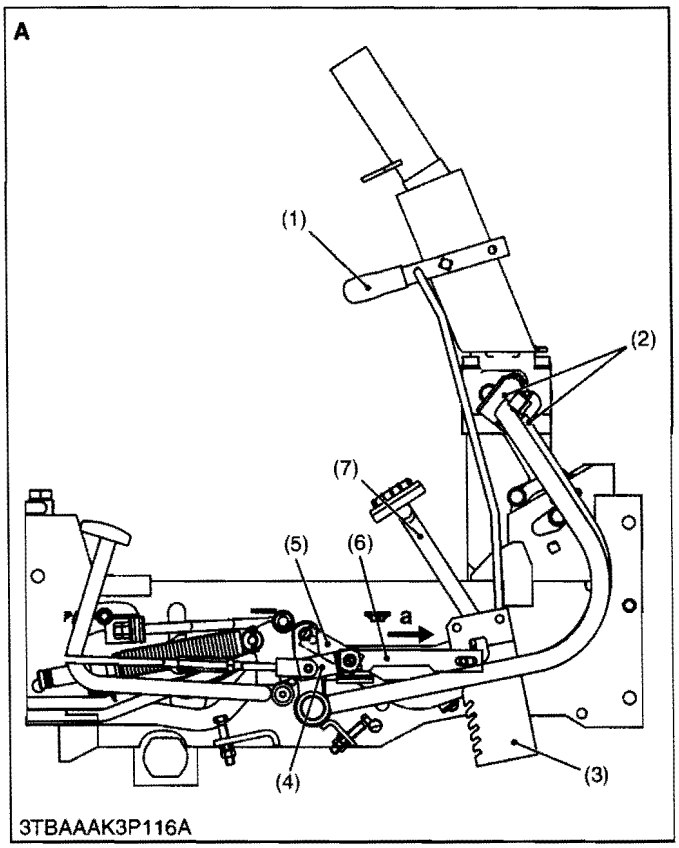
■ Speed Set

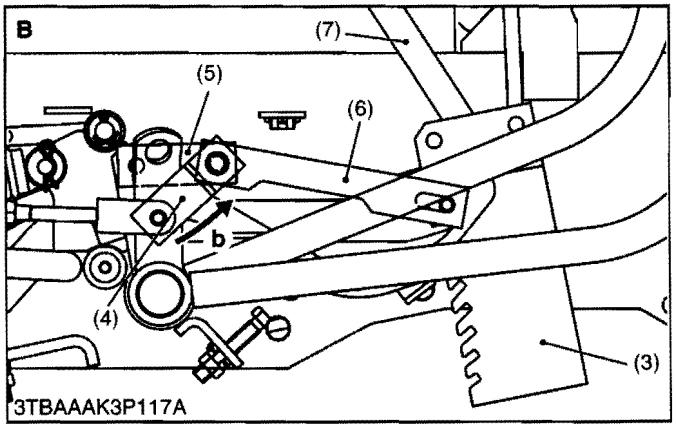


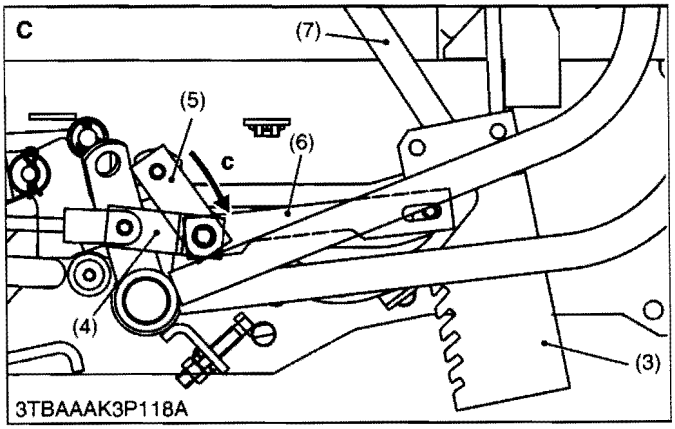
(1) Cruise Control Lever (2) Brake Pedal (3) Cruise Lock (4) HST Pedal

When depressing the HST pedal (4) to "Forward", the HST pedal (4) and cruise lock (3) moves like the arrow.

And when the cruise control lever (1) is set to the desired position, HST pedal (4) is lock to the cruise lock (3) and the travelling speed is held to the desired speed.







■ Conditions for Releasing the Cruise Control

When depressing the both brake pedals (2) at same time, the release link 3 (6) is moved direction **a** by the force of release link 1 (4) and release link 2 (5). Then the cruise lock (3) release from the HST pedal (7).

As a result, Cruise control is released.

Since the cruise lock is disengaged the cruise lock (3) and HST pedal (7). The neutral holder turns counter clockwise and the roller is returned to "Neutral" position.

The HST pedal (7) also returns to "Neutral" position and the tractor stops.

(Reference)

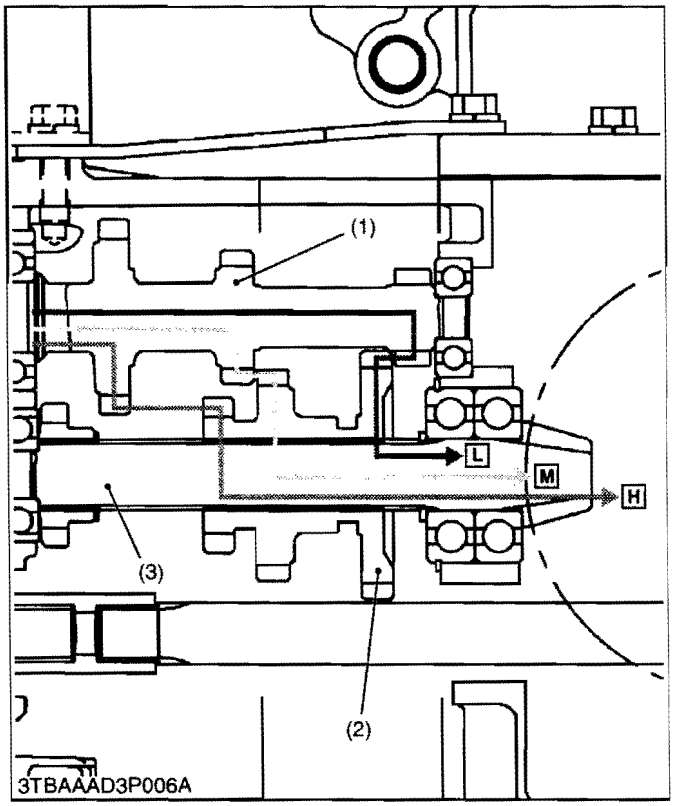
- When depressing the right brake pedal, the release link 1 (4) moves in direction **b**.
- When depressing the left brake pedal, the release link 2 (5) moves in direction **c**.
- The cruise control is not released if either one of the brake pedals (2) only is depressed.
- The cruise control is released only when the release link 3 (6) is pushed in direction **a**.

(1) Cruise Control Lever
(2) Brake Pedal
(3) Cruise Lock
(4) Release Link 1
(5) Release Link 2
(6) Release Link 3
(7) HST Pedal

A : Depressing the right and left brake pedal at same time
B : Depressing the right brake pedal only
C : Depressing the left brake pedal only
a : Release link 3 moved direction a
b : Release link 1 moved direction b
c : Release link 2 moved direction c

W1020179

(7) Range Gear Shift Section



Three kinds of power flow (from 4th shaft to spiral bevel pinion shaft) are selected by operating the range gear shift lever to shift the gears (2) on the spiral bevel pinion shaft (3) and the 4th shaft (1).

■ **Low Position**

4th Gear Shaft 11T (1) → Shifter Gear (2) → Spiral Bevel Pinion Shaft (3).

■ **Middle Position**

4th Gear Shaft 16T (1) → Shifter Gear (2) → Spiral Bevel Pinion Shaft (3).

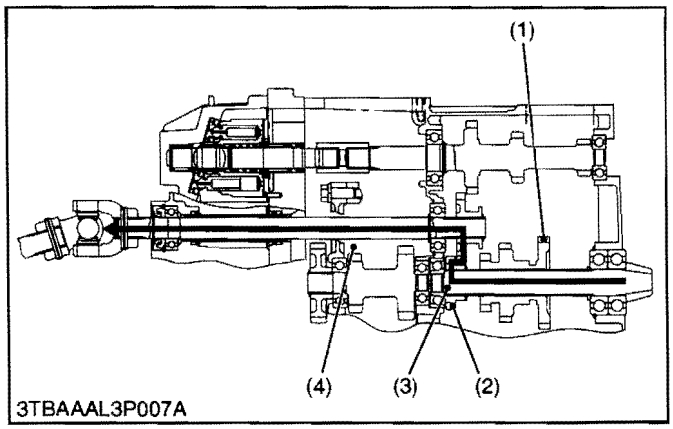
■ **High Position**

4th Gear Shaft 21T (1) → Shifter Gear (2) → Spiral Bevel Pinion Shaft (3).

(1) 4th Gear Shaft
(2) 16T-27T-32T Shifter Gear
(3) Spiral Bevel Pinion Shaft

W1016157

(8) Front Wheel Drive Section



2-wheel drive or 4-wheel drive is selected by changing the position of 19T shift gear (1) with the front wheel drive lever. When the front wheel drive lever is set to **"Disengaged"**, the 19T shift gear (1) is neutral and power is not transmitted to the front wheel drive shaft (4).

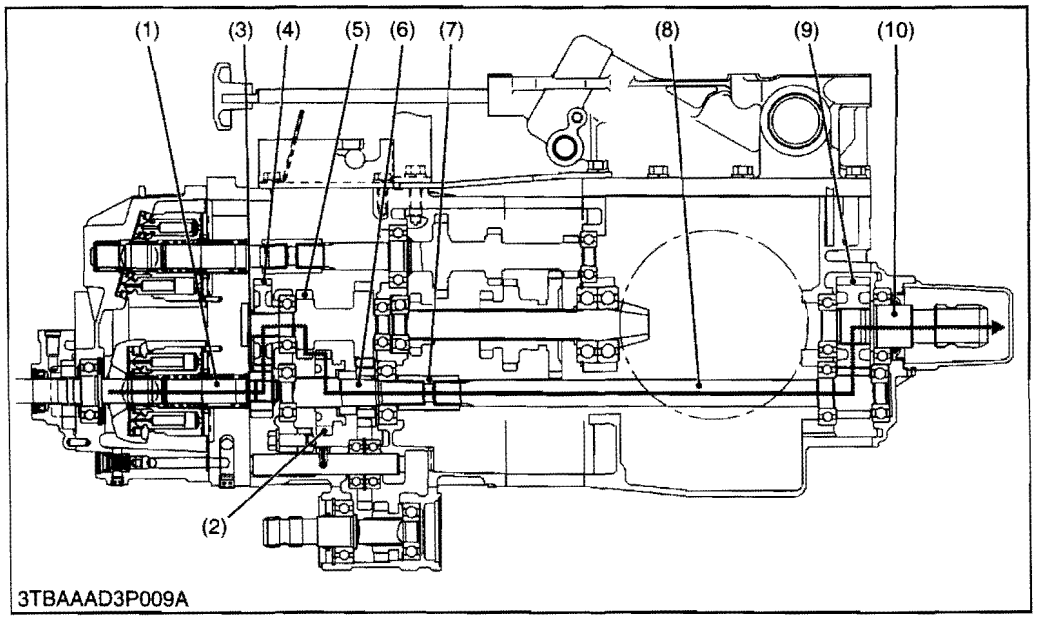
When the front wheel drive lever is set to **"Engaged"**, the 19T shift gear (1) slides to the right to engage with 14T gear (2) on the spiral bevel pinion shaft (3). Therefore, the front drive shaft is actuated to drive the front wheels.

(1) 19T Shift Gear
(2) 14T Gear
(3) Spiral Bevel Pinion Shaft
(4) Front Wheel Drive Shaft

W1016393

3. POWER TRAIN FOR PTO GEAR

[1] REAR PTO SECTION



3TBAAAD3P009A

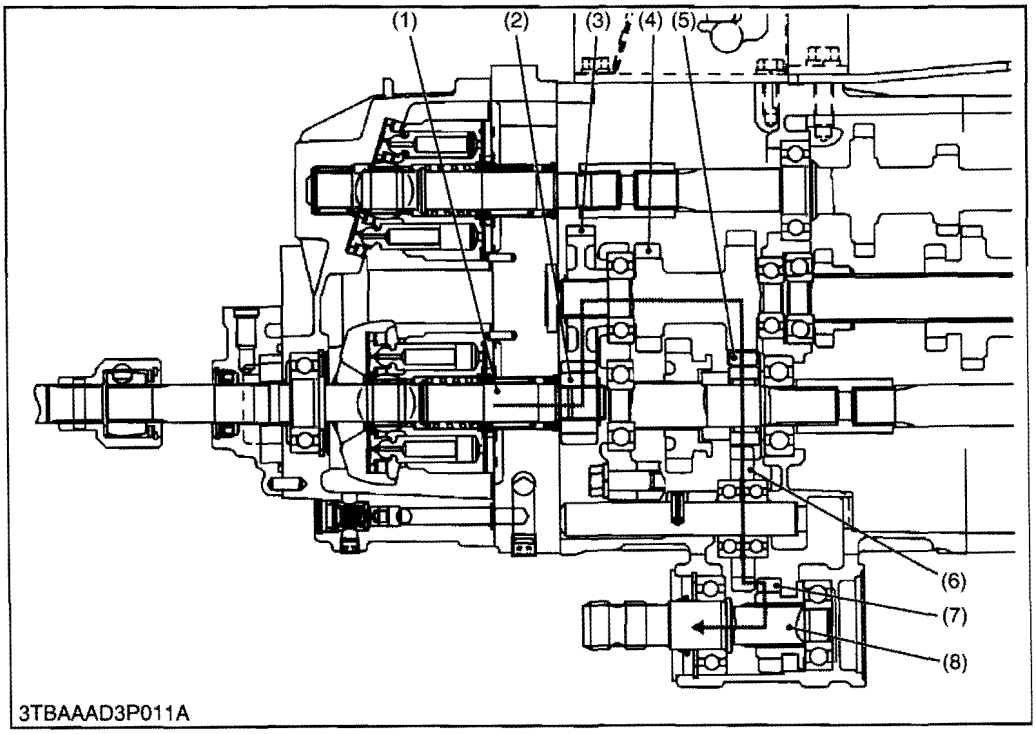
(1) HST Pump Shaft
(2) 14T Gear
(3) 27T Gear
(4) 2nd Gear Shaft with 13T and 18T Gear
(5) 17T Shifter Gear
(6) 3rd Shaft
(7) Coupling
(8) 5th Shaft with 11T Gear
(9) 24T Gear
(10) Rear PTO Shaft

W1016559

■ **Rear PTO Shift Lever ON Position**

HST Pump Shaft (1) → 14T Gear (2) → 27T Gear (3) → 2nd Gear Shaft with 13T Gear (4) → 17T Shifter Gear (5) → 3rd Shaft (6) → Coupling (7) → 5th Shaft with 11T Gear (8) → 24T Gear (9) → Rear PTO Shaft (10).

[2] MID-PTO SECTION



3TBAAAD3P011A

(1) HST Pump Shaft
(2) 14T Gear
(3) 27T Gear
(4) 2nd Gear Shaft with 13T and 18T Gear
(5) 13T Gear
(6) 19T Gear
(7) 11T Shifter Gear
(8) Mid-PTO Shaft

W1016761

■ **Mid-PTO Shift Lever ON Position**

HST Pump Shaft (1) → 14T Gear (2) → 27T Gear (3) → 2nd Gear Shaft with 18T Gear (4) → 13T Gear (5) → 19T Gear (6) → 11T Shifter Gear (7) → Mid- PTO Shaft (8).

SERVICING

CONTENTS

1. TROUBLESHOOTING

HYDROSTATIC TRANSMISSION

Symptom	Probable Cause	Solution	Reference Page
System Will Not Operate in Either Direction	Oil level is low	Check oil level or fill oil to proper level	3-S13
	Speed control pedal linkage defective	Repair linkage	3-S25
	Charge pressure is too low	Solution order 1. Replace oil filter cartridge	G-17
		2. Check charge pressure	3-S11
		3. Inspect or flush charge relief valve	3-S39
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	3-S39
	Neutral valve defective	Inspect or replace neutral valve	3-S39
	Component parts defective	Replace hydrostatic transmission assembly	3-S22
Vibration and Noise	Oil level is too low	Check oil level or fill oil to proper level	3-S13
	Speed control pedal linkage defective	Repair linkage	3-S25
	Charge pressure is too low	Solution order 1. Replace oil filter cartridge	G-17
		2. Check charge pressure	3-S11
		3. Inspect or flush charge relief valve	3-S39
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	3-S39
	Neutral valve defective	Replace hydrostatic transmission assembly	3-S39
	Component part is defective	Replace hydrostatic transmission assembly	3-S22

W1014322

Symptom	Probable Cause	Solution	Reference Page
Loss of Power	Oil level is low	Check oil level or fill oil to proper level	3-S13
	Speed control pedal linkage defective	Repair linkage	3-S25
	Charge pressure is too low	1. Replace oil filter cartridge	G-17
		2. Check charge pressure	3-S11
		3. Inspect or flush charge relief valve	3-S39
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	3-S39
	Neutral valve defective	Inspect or replace neutral valve	3-S39
	Component parts defective	Replace hydrostatic transmission assembly	3-S22
Transmission Oil Over Heats	Low transmission oil level	Fill transmission oil level up to proper level	3-S13
	Radiator net clogged	Clean radiator net	–
	Excessive machine load	Reduce machine load	–
	Improper charge pressure	1. Check high relief pressure	3-S9
		2. Replace transmission oil filter cartridge	G-17
		3. Replace check and high pressure relief valve	3-S39
		4. Inspect and replace charge relief valve	3-S39
Machine Will Not Stop in Neutral Position	Speed control linkage is out of adjustment or sticking	Repair or replace linkage	3-S25
		Adjust neutral adjuster	3-S8
	Neutral valve defective	Inspect or replace neutral valve	3-S39
System Operates in One Direction Only	Speed control linkage defective	Repair or replace linkage	3-S25
	Check and high pressure relief valve defective	Replace check and high pressure relief valve	3-S39

W1014322

CLUTCH HOUSING

Symptom	Probable Cause	Solution	Reference Page
Noise from Clutch Housing	Gear worn or broken	Replace	3-S27
	Bearing worn	Replace	3-S27

W1013580

TRANSMISSION CASE SECTION

Noise from Transmission	Transmission oil insufficient	Refill	3-S13
	Gear worn or broken	Replace	–
	Bearing worn	Replace	–
Gear Slip Out of Mesh	Shift fork spring tension insufficient	Replace	3-S32
	Shift fork or shifter worn	Replace	3-S32
	Shift fork bent	Replace	3-S32

W1015467

DIFFERENTIAL CASE SECTION

Excessive or Unusual Noise at All Time	Improper backlash between spiral bevel pinion and bevel gear	Adjust	3-S42
	Improper backlash between differential pinion and differential side gear	Adjust	3-S42
	Bearing worn	Replace	–
	Insufficient or improper type of transmission fluid used	Replenish or Replace	3-S13
Noise while Turning	Differential pinions or differential side gears worn or damaged	Replace	3-S36
	Differential lock binding (does not disengage)	Replace	3-S31
	Bearings worn	Replace	–
Differential Lock Can Not Be Set	Deferential lock shift fork damaged	Replace	4-S6
	Deferential lock shifter mounting pin damaged	Replace	4-S6
	Differential lock clutch damaged	Replace	4-S6
Differential Lock Pedal Does Not Return	Differential lock pedal return spring weaken or damaged	Replace	–
	Differential lock fork shaft rusted	Repair	4-S6

W1010800

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Check and High Pressure Relief Valve	Setting Pressure [Relief Valve] Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C , 122 °F	32.1 to 33.2 MPa 328 to 338 kgf/cm^2 4660 to 4810 psi	–
Charge Relief Valve	Setting Pressure Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C , 122 °F	600 to 800 kPa 6.12 to 8.12 kgf/cm^2 87.1 to 116 psi	–
Piston to Bore (HST)	Clearance	0.2 mm 0.0008 in.	0.04 in. 0.0016 in.
Piston Slipper	Thickness	3.00 mm 0.118 in.	2.90 mm 0.1142 in.
Shift Fork to Shift Gear Groove	Clearance	0.10 to 0.35 mm 0.0040 to 0.013 in.	0.5 mm 0.02 in.
13T Gear to 2nd Gear	Clearance	0.0070 to 0.046 mm 0.00028 to 0.0018 in.	0.10 mm 0.0039 in.
	2nd Shaft (O.D.)	21.987 to 22.000 mm 0.86563 to 0.86614 in.	–
	13T Gear (I.D.)	30.007 to 30.021 mm 1.1814 to 1.1819 in.	–
	Needle (O.D.)	3.994 to 4.000 mm 0.1573 to 0.1574 in.	–
Spiral Bevel Pinion	Side Clearance	Less than 0.15 mm Less than 0.0059 in.	–
Spiral Bevel Pinion to Spiral Bevel Gear	Backlash	0.1 to 0.2 mm 0.004 to 0.007 in.	0.4 mm 0.02 in.
	Adjusting Shim (Thickness)	0.2 mm, 0.008 in.	–
		0.5 mm, 0.02 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.01 in.	0.4 mm 0.02 in.
	Adjusting Shim (Thickness)	0.8 mm, 0.03 in.	–
		1.0 mm, 0.039 in.	–
		1.2 mm, 0.047 in.	–

W10138740

Item		Factory Specification	Allowable Limit
Differential Case to Differential Side Gear	Clearance	0.025 to 0.066 mm 0.00099 to 0.0025 in.	0.30 mm 0.012 in.
	Differential Case (I.D.)	32.000 to 32.025 mm 1.2599 to 1.2608 in.	–
	Spiral Bevel Gear (I.D.)	32.000 to 32.025 mm 1.2599 to 1.2608 in.	–
	Differential Side Gear (O.D.)	31.959 to 31.975 mm 1.2583 to 1.2588 in.	–
Differential Pinion Shaft to Differential Pinion	Clearance	0.016 to 0.045 mm 0.00063 to 0.0018 in.	0.30 mm 0.012 in.
	Differential Pinion Shaft (O.D.)	15.973 to 15.984 mm 0.62886 to 0.62929 in.	–
	Differential Pinion (I.D.)	16.000 to 16.018 mm 0.62993 to 0.63062 in.	–

W10138740

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting screw and nut	145 to 150	14.8 to 15.3	107 to 111
3-Point hitch shaft setting screw	15 to 19	1.5 to 2.0	11 to 14
3-Point hitch shaft setting screw lock nut	44 to 47	4.4 to 4.8	32 to 34
Drawbar frame mounting screw	63 to 72	6.4 to 7.4	47 to 53
ROPS frame mounting screw (M12)	90 to 95	9.2 to 9.6	67 to 70
Sub-frame mounting screw (M10) for aluminum	40 to 44	4.0 to 4.5	29 to 32
Sub-frame (bracket) mounting screw (M12) for aluminum	63 to 72	6.4 to 7.4	47 to 53
Sub-frame (bracket) mounting bolt (M12) and nut	78 to 90	7.9 to 9.2	58 to 66
Sub-frame mounting screw (M10)	48 to 55	4.9 to 5.7	36 to 41
Steering wheel mounting nut	30 to 49	3.0 to 5.0	22 to 26
Delivery pipe nut for HST	34 to 39	3.5 to 3.9	25 to 28
Oil cooler pipe nut	34 to 39	3.5 to 3.9	25 to 28
Delivery pipe nut for power steering	65 to 75	6.7 to 7.6	48 to 55
Pitman arm mounting nut	120 to 150	14.4 to 15.3	88.5 to 110.6
Slotted nut for drag link	18 to 34	1.8 to 3.5	13 to 25
Power steering assembly mounting screw	78 to 90	7.9 to 9.2	58 to 66
Clutch housing and engine mounting screw and nut (M8 screw)	18 to 21	1.8 to 2.1	13 to 15
Clutch housing and engine mounting screw and nut (M10 nut)	48 to 55	4.9 to 5.7	36 to 41
Clutch housing and center frame mounting screw and nut	63 to 72	6.4 to 7.4	47 to 53
Clutch housing rear cover mounting screw	18 to 20	1.8 to 2.1	13 to 15
Speed control rod screw	40 to 44	4.0 to 4.5	29 to 32
Front loader pipe joint bolt	48 to 70	4.9 to 7.1	36 to 52
3-point hitch delivery pipe joint bolt (front loader valve side)	48 to 70	4.9 to 7.1	36 to 52
HST (transmission case) and center frame mounting screw and nut (M12)	63 to 72	6.4 to 7.4	47 to 53
Transmission case and differential case mounting screw	40 to 44	4.0 to 4.5	29 to 32
Spring holder mounting screw	40 to 44	4.0 to 4.5	29 to 32
Connecting plate mounting screw	40 to 44	4.0 to 4.5	29 to 32
Hydraulic cylinder mounting screw and nut	40 to 44	4.0 to 4.5	29 to 32
Top link bracket mounting screw	78 to 80	7.9 to 9.2	58 to 66
Rear axle case mounting screw	40 to 44	4.0 to 4.5	29 to 32
HST and transmission case mounting screw and nut	40 to 44	4.0 to 4.5	29 to 32
Mid-PTO case mounting screw	40 to 44	4.0 to 4.5	29 to 32

W1012736

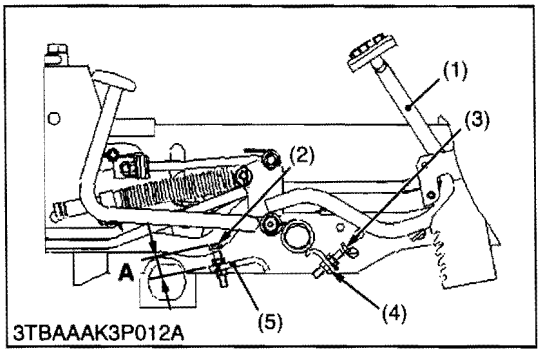
Item	N·m	kgf·m	lbf·ft
Neutral adjuster lock screw	18 to 20	1.8 to 2.1	13 to 15
Neutral holder mounting screw	18 to 20	1.8 to 2.1	13 to 15
Charge pump mounting screw	18 to 20	1.8 to 2.1	13 to 15
Center section mounting hex. socket screw	48 to 55	4.9 to 5.7	36 to 41
Check and high pressure relief valve plug	117 to 147	12.0 to 15.0	86.7 to 108
Neutral valve cap screw	59 to 68	6.0 to 7.0	44 to 50
3rd shaft, 2nd gear shaft bearing holder mounting screw	40 to 44	4.0 to 4.5	29 to 32
Bearing holder mounting screw	50 to 55	5.1 to 5.6	37 to 40
Rear PTO cover mounting screw	40 to 44	4.0 to 4.5	29 to 32
Differential gears bearing holder mounting screw	18 to 20	1.8 to 2.1	13 to 15
Spiral bevel gear UBS screw	30 to 34	3.0 to 3.5	22 to 25

W1012231

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) HST Type



Adjusting Maximum Speed

1. Press the speed control pedal (1) all the way down at a forward drive and measure the tractor speed.
2. If the measurement is not within the factory specifications, holding the pedal down, tighten the adjusting bolt (3) rightward not to let the adjusting bolt (3) touch the speed control pedal (1).
3. Check a gap is created between the adjusting bolt (3) and the speed control pedal (1).
4. Make the adjusting bolt (3) slightly touch the speed control pedal (1). At that point, give the adjusting bolt (3) another turn leftward and lock the adjusting bolt (3) with the locknut (4).
5. Depress the speed control pedal (1) all the way at a reverse drive and measure the tractor speed.
6. If the measurement is not within factory specifications, loosen the lock nut (5) and adjust with the bolt (2).

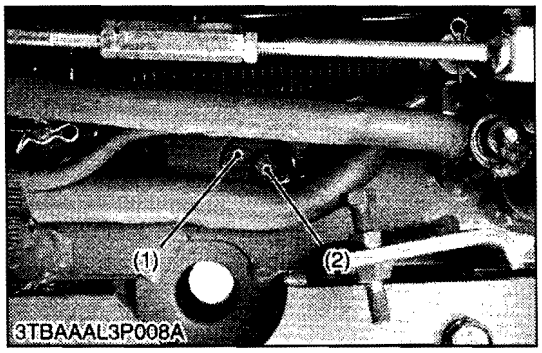
Maximum speed with farm tire (at 2700 min^{-1} (rpm))	Factory spec.	Forward	18.4 to 21.2 km/h 11.5 to 13.1 mph
		Reverse	14.8 to 17.0 km/h 9.20 to 10.5 mph

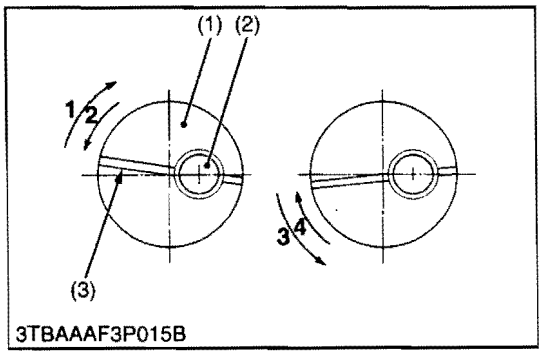
(Reference)

- Length **"A"** (Reverse) : 27.0 to 28.0 mm (1.07 to 1.10 in.)

(1) Speed Control Pedal
(2) Adjusting Bolt
(3) Adjusting Bolt
(4) Lock Nut
(5) Lock Nut

W1012749





Adjusting Neutral

1. Disengage the front wheel drive lever. (Drive only rear wheels.)
2. Lift the rear of the tractor so that the rear wheels are off the ground and run the engine at low idling and drive only rear wheels.
3. Slightly loosen the neutral adjuster setting screw (2).
4. Rotate the neutral adjuster (1) clockwise so the rear wheels turn reverse.
5. Then rotate it counterclockwise until wheels stop completely.
6. Put a mark on the center frame aligning the groove (3) on neutral adjuster.
7. Rotate the neutral adjuster (1) counterclockwise so the rear wheels turn forward.
8. Then rotate it clockwise until wheels stop completely.
9. Put a mark on the center frame aligning the groove (3) on neutral adjuster.
10. Hold the neutral adjuster so its groove is at the middle of the marks and tighten the setting screw (2).

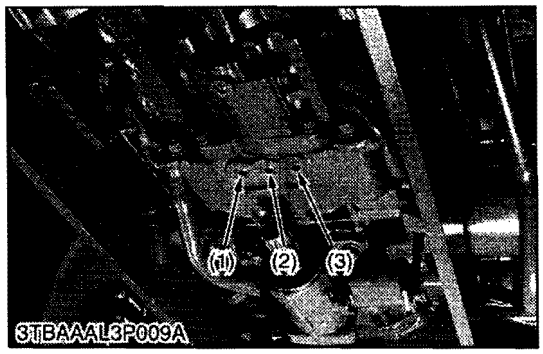
■ **NOTE**

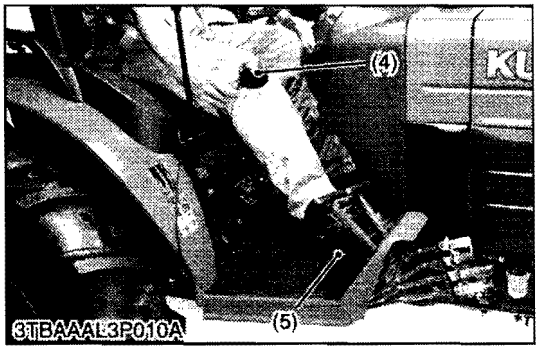
- **When the wheels tend to turn forward, rotate neutral adjuster clockwise.**
- **When the wheels tend to turn reverse, rotate neutral adjuster counterclockwise.**

(1) Neutral Adjuster
(2) Neutral Adjuster Setting Screw
(3) Groove

1 : Neutral Adjustment Stage 1
2 : Neutral Adjustment Stage 2
3 : Neutral Adjustment Stage 3
4 : Neutral Adjustment Stage 4

W1012994





Check and High Pressure Relief Valve (Forward)

⚠ CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the plug from **P2** port (forward) (3).
2. Install the adaptor **58** to **P2** port (3).
3. Install the cable and high pressure gauge (4).
4. Start the engine and warm the oil before testing. Check to see that parking brake is applied.
5. Place the range gear shift lever to **"HIGH"** position.
6. Run the engine speed at approx. 2700 min^{-1} (rpm).
7. Depress the front side pedal of the HST pedal (5).
8. Read the high pressure gauge to measure the high pressure relief valve pressure.
9. If the measurement is not same as factory specification, check the check and high pressure relief valve assembly.

High relief pressure	Factory spec.	32.1 to 33.2 MPa 328 to 338 kgf/cm^2 4660 to 4810 psi

■ IMPORTANT

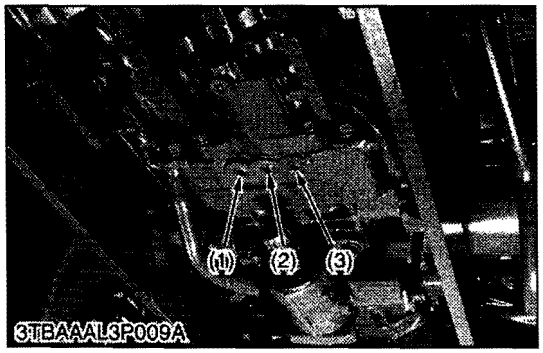
- **Measure quickly so that the relief valve may not be in operation more than 10 seconds.**

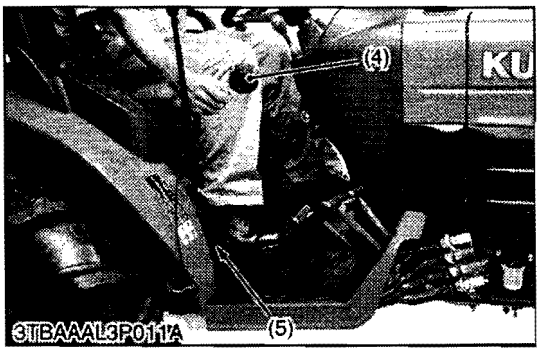
■ NOTE

- **High pressure gauge is 40 MPa (400 kgf/cm^2, 5800 psi) full scale.**
- **Engine speed : Approx. 2700 min^{-1} (rpm)**
- **Oil temperature : 50 °C**
  122 °F

(1) **P1** Port (Reverse)
(2) **P3** Port (Charge)
(3) **P2** Port (Forward)
(4) High Pressure Gauge
(5) HST Pedal

W1018710





Check and High Pressure Relief Valve (Reverse)

⚠ CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the plug from **P1** port (reverse) (1).
2. Install the adaptor **58** to **P1** port (1).
3. Install the cable and high pressure gauge.
4. Start the engine and warm the oil before testing. Check to see that parking brake is applied.
5. Place the range gear shift lever to **"HIGH"** position.
6. Run the engine speed at approx. 2700 min^{-1} (rpm).
7. Depress the rear side pedal of the HST pedal (5).
8. Read the high pressure gauge (4) to measure the high pressure relief valve pressure.
9. If the measurement is not the same as factory specification, check the check and high pressure relief valve assembly.

High relief pressure	Factory spec.	32.1 to 33.2 MPa 328 to 338 kgf/cm^2 4660 to 4810 psi

■ IMPORTANT

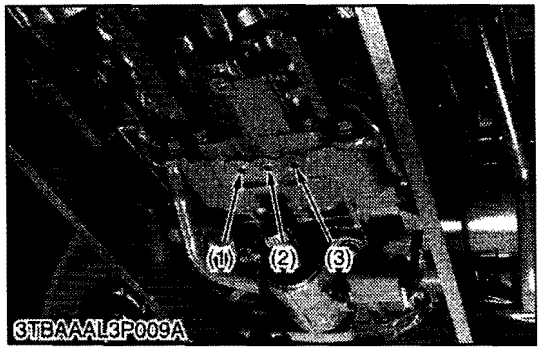
- **Measure quickly so than the relief valve may not be in operation more than 10 seconds.**

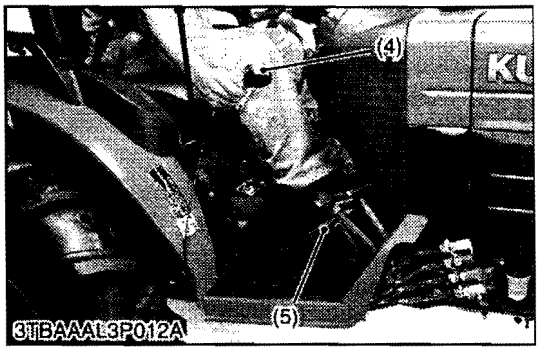
■ NOTE

- **High pressure gauge is 40 MPa (400 kgf/cm^2, 5800 psi) full scale.**
- **Engine speed : Approx. 2700 min^{-1} (rpm)**
- **Oil temperature : 50 °C**
  122 °F

(1) **P1** Port (Reverse)
(2) **P3** Port (Charge)
(3) **P2** Port (Forward)
(4) High Pressure Gauge
(5) HST Pedal

W1018302





Charge Relief Pressure

⚠ CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the plug from **P3** port (charge) (2).
2. Install the adaptor **58** to **P1** port (1).
3. Install the cable and low pressure gauge (4) to the adaptor **58**.
4. Change the range gear shift lever to **"NEUTRAL"** position.
5. Run the engine speed at approx. 2700 min^{-1} (rpm).
6. Release the foot from the HST pedal (5).
7. Read the low pressure gauge to measure the charge relief pressure.
8. If the measurement is not same as factory specification, check the charge relief valve and the related hydraulic.

Charge relief pressure	Factory spec.	600 to 800 kPa 6.12 to 8.12 kgf/cm^2 87.1 to 116 psi

■ NOTE

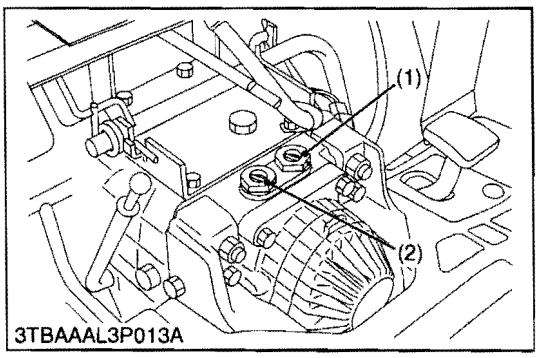
- **Low pressure gauge is 2.9 MPa (30 kgf/cm^2, 427 psi) full scale.**
- **Engine speed : Approx. 2700 min^{-1} (rpm)**
- **Oil temperature : 50 °C**
  122 °F

(When reassembling)

Tightening torque	Checking port plug	29 to 39 N·m 3.0 to 3.9 Kgf·m 22 to 28 lbf·ft

(1) **P1** Port (Reverse)
(2) **P3** Port (Charge)
(3) **P2** Port (Forward)
(4) Low Pressure Gauge
(5) HST Pedal

W1017567



Neutral Valve Actuation Test

WARNING

To avoid personal injury :

- **Do not operate if tractor moves on level ground with foot off speed control pedal.**

(Checking Procedure)

CAUTION

- **When checking, park the tractor on flat ground, and apply the parking brake.**

1. Disengage the front wheel drive lever.
2. Disconnect the brake rod, one side.
3. Lift the rear of tractor, one side.
4. Set the engine speed to 1500 min^{-1} (rpm).
5. Shift the range gear shift leer to **HI** position.
6. Move the HST pedal from the forward to the neutral position make sure that the tire comes to stop. Check the same way for the movement form rearward to the neutral position.
   In this time, make sure that the neutral range of HST.
7. If the tire fail to stop or neutral range is point, check the each neutral valve.

NOTE

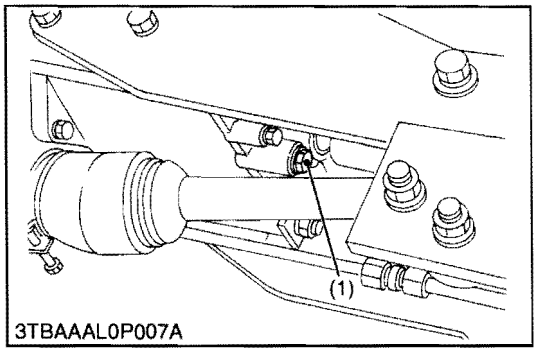
- **When reinstall the neutral valve, take care not to damage the O-ring.**

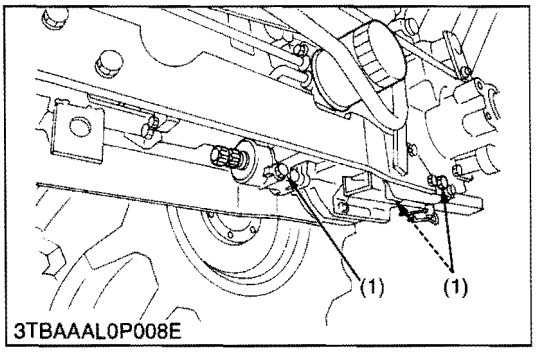
(1) Neutral Valve (Forward) (2) Neutral Valve (Reverse)

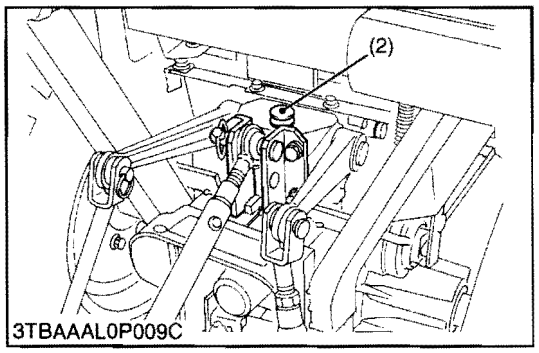
W1016788

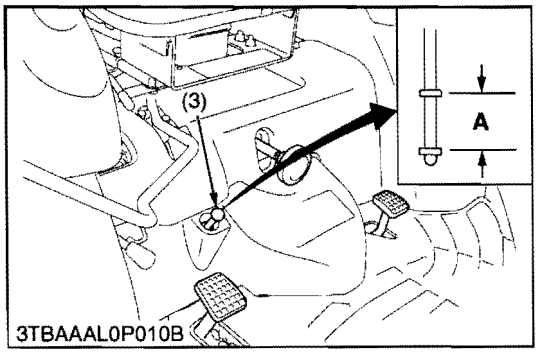
[2] PREPARATION

(1) Separating Clutch Housing









Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1).
2. Drain the transmission fluid.
3. Reinstall the drain plug.

(When refilling)

- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

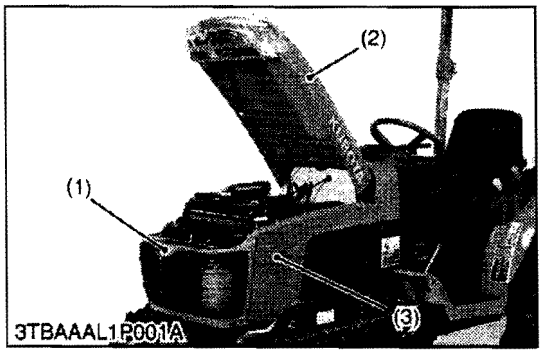
- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

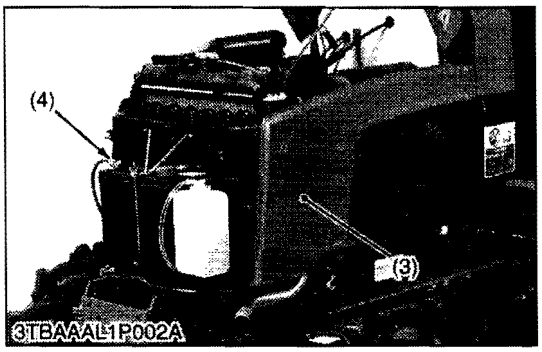
Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

(1) Drain Plug
(2) Filling Plug
(3) Dipstick

A : Proper Oil Level

W1017173





Bonnet, Front Grille, Side Cover and Battery Negative Cord

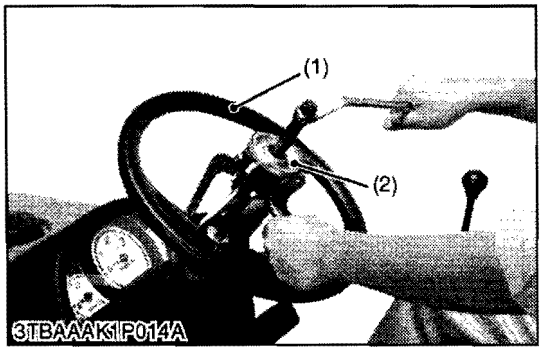
1. Open the bonnet (2) and remove the front grille (1).
2. Disconnect the negative cord (4).
3. Disconnect the head light connectors and remove the bonnet (2).
4. Remove the side covers (3).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the negative cord first. When connecting, positive cord first.**

(1) Front Grille
(2) Bonnet
(3) Side Cover
(4) Battery Negative Code

W1017369



Steering Wheel

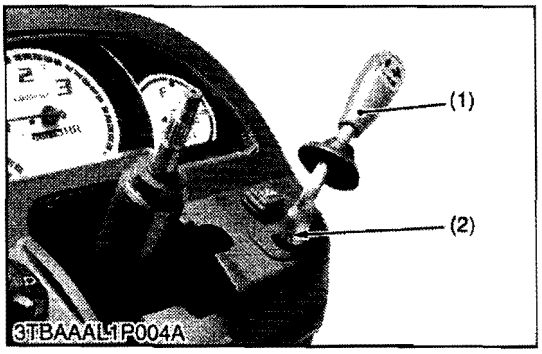
1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel (1) with a steering wheel puller (2).

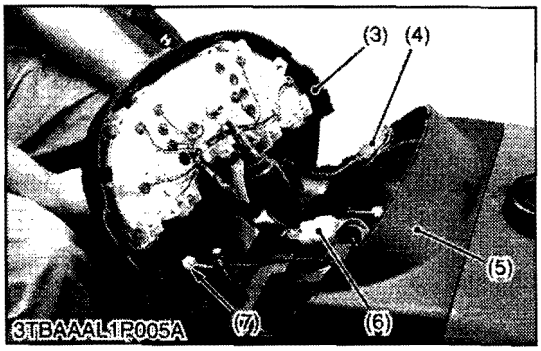
(When reassembling)

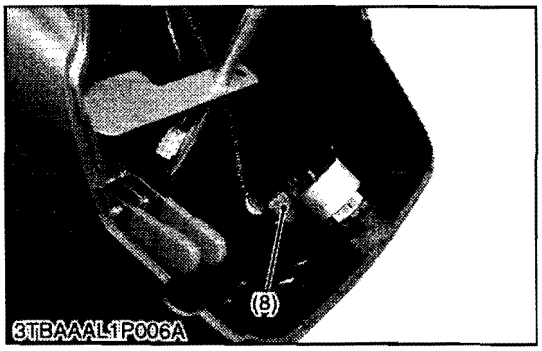
Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

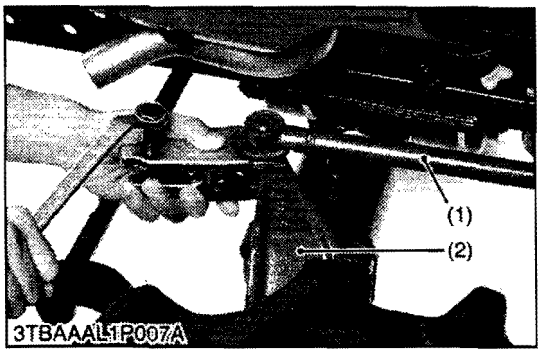
(1) Steering Wheel
(2) Steering Wheel Puller

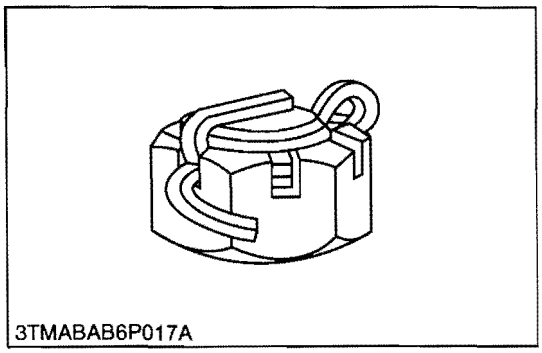
W1017659











Meter Panel and Panel Under Cover

1. Tap out the spring pin (2) and remove the hand accelerator lever (1).
2. Open the meter panel (3) and disconnect the hourmeter cable, meter panel connector (6), combination switch connector (4) and hazard switch connector (7). Then remove the meter panel (3).
3. Disconnect the main switch connector (8) and remove the panel under cover (5).

(1) Hand Accelerator Lever
(2) Spring Pin
(3) Meter Panel
(4) Combination Switch Connector
(5) Panel Under Cover
(6) Meter Panel Connector
(7) Hazard Switch Connector
(8) Main Switch Connector

W1108120

Drag Link

1. Remove the cotter pin and loosen the slotted nut.
2. Disconnect the drag link (1) with a pitman arm puller from the knuckle arm (2).

(When reassembling)

■ **IMPORTANT**

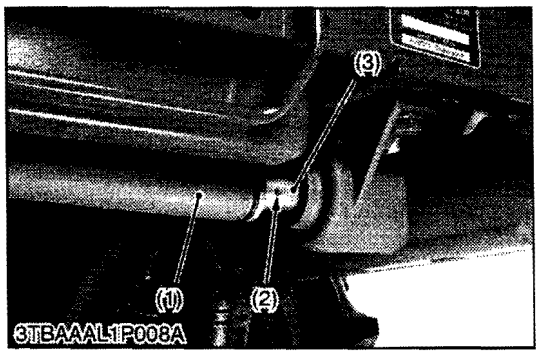
- **Do not loosen the slotted nut to align the hole.**
- **Install the cotter pin as shown in the figure.**

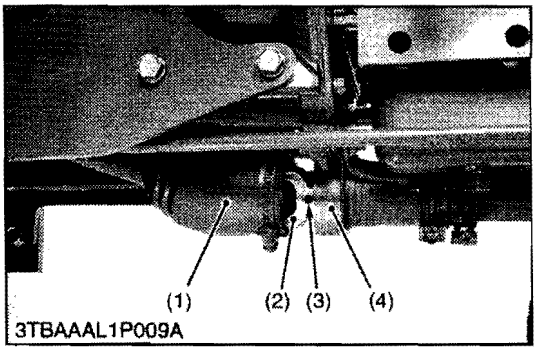
(Reference)

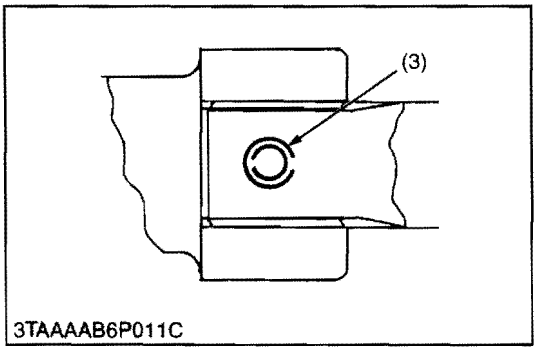
Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 lbf·ft

(1) Drag Link
(2) Knuckle Arm

W1017893







Propeller Shaft Cover and Coupling

1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft and coupling.

(1) Propeller Shaft Cover
(2) Spring Pin
(3) Coupling

W1028559

Universal Joint and Bearing Holder

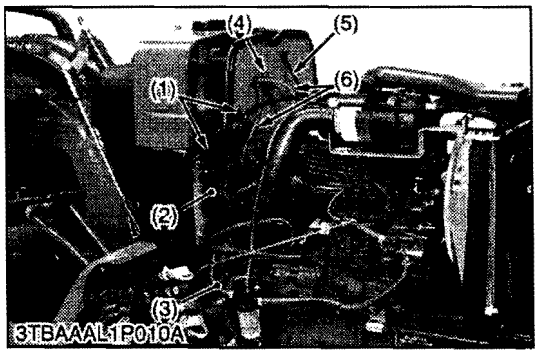
1. Loosen the clamp and slide the universal joint cover (1) to the rear.
2. Tap out the spring pins (3) and then slide the universal joint (2) to the rear.
3. Remove the bearing holder (4) with propeller shaft and universal joint.

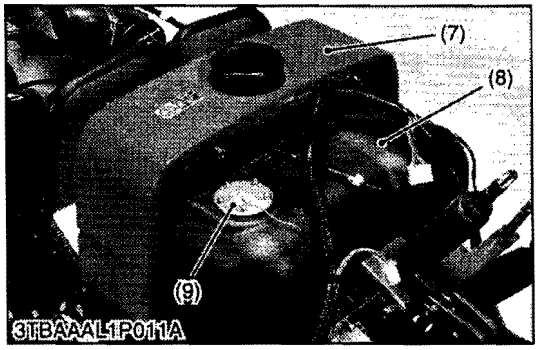
(When reassembling)

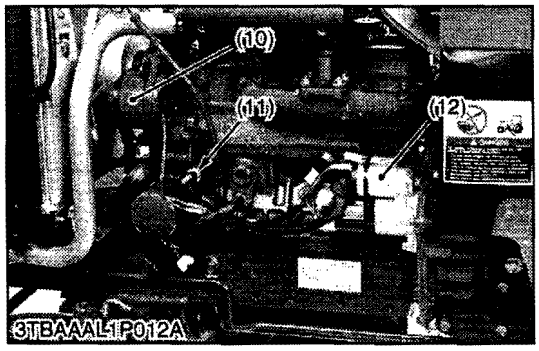
- Apply grease to the splines of the propeller shaft and universal joint.
- Replace the spring pins (3) with new one.
- When inserting the spring pins (3), face their splits in the direction parallel to the universal joint as shown in the figure.

(1) Universal Joint Cover
(2) Universal Joint
(3) Spring Pin
(4) Bearing Holder

W1018159





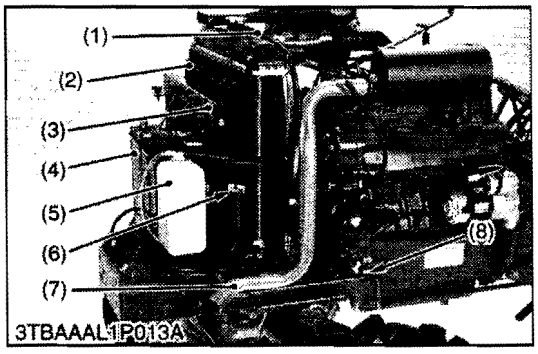


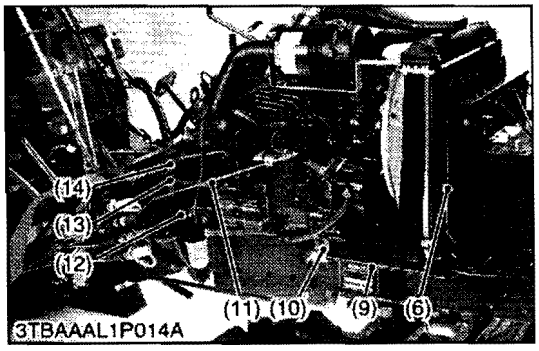
Fuel Tank and Wire Harness

1. Disconnect the fuel hose (3) at the fuel filter side, then drain fuel completely.
2. Remove the fuse box (2) and disconnect the wire harness clamp (1).
3. Remove the fuel tank frame stay bolt (4). Disconnect the overflow hoses (6) and pull out the hour meter cable (5).
4. Disconnect the lead wires for fuel gauge and disconnect the wire harness clamps.
5. Remove the fuel tank (8) with tank frame (7).
6. Disconnect the glow plug lead wire, thermo sensor lead wire, engine stop solenoid connector, engine oil pressure switch lead wire, dynamo connector and starter motor lead wire.

(1) Wire Harness Clamp
(2) Fuse Box
(3) Fuel Hose
(4) Bolt
(5) Hour Meter Cable
(6) Overflow Hose
(7) Tank Frame
(8) Fuel Tank
(9) Fuel Gauge
(10) Dynamo
(11) Engine Oil Pressure Switch
(12) Starter Motor

W1018320



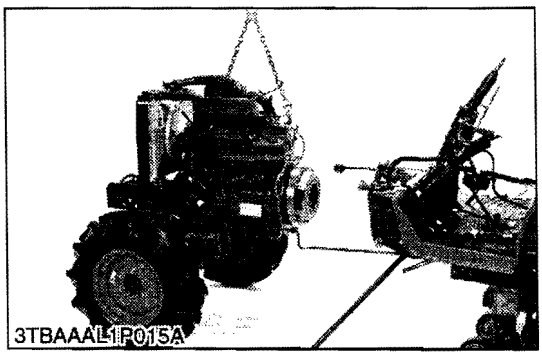


Battery, Recovery Tank, Battery Stay and Hydraulic Pipes

1. Remove the battery retainer.
2. Disconnect the positive cord and remove the battery (4).
3. Remove the recovery hose (1).
4. Remove the muffler pipe (7).
5. Remove the oil cooler pipe plate spring (6).
6. Remove the battery stay (3) with oil cooler (2).
7. Remove the oil cooler pipe clamp (8), (10). Then remove the oil cooler pipe (2).
8. Disconnect the accelerator rod (11).
9. Remove the power steering delivery pipe (14).
10. Remove the pipe clamp and the disconnect the 3-point hitch delivery pipe (13) and suction hose (12).

(1) Recovery Tank Hose
(2) Oil Cooler
(3) Battery Stay
(4) Battery
(5) Recovery Tank
(6) Oil Cooler Pipe Plate Spring
(7) Muffler Pipe
(8) Clamp
(9) Oil Cooler Pipe
(10) Clamp
(11) Accelerator Rod
(12) Suction Hose
(13) 3-Point Hitch Delivery Pipe
(14) Power Steering Delivery Pipe

W1018538



Separating the Engine from Clutch Housing

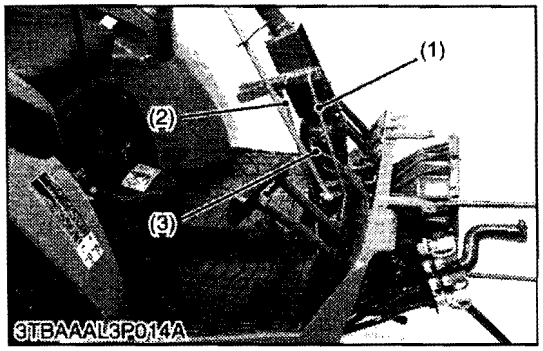
1. Place the jack under the center frame.
2. Hoist the engine by the chain at the engine hook.
3. Remove the engine mounting screws and separate the engine from the clutch housing.

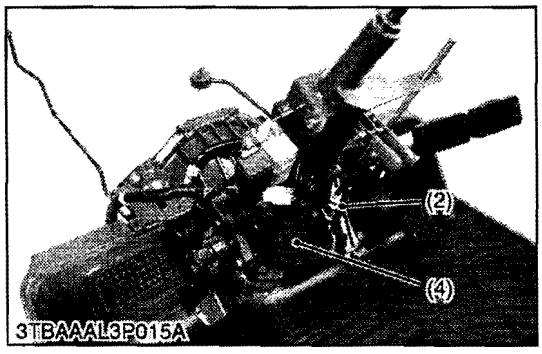
(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine mounting M8 screw	18 to 21 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Engine mounting M10 nut	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

W1018763





Power Steering Assembly

1. Remove the cruise control lever rod (2).
2. Remove the parking brake lever rod (1).
3. Disconnect the return pipe (3).
4. Remove the wire harness clamp and disconnect the wire harness.
5. Remove the power steering assembly (4).

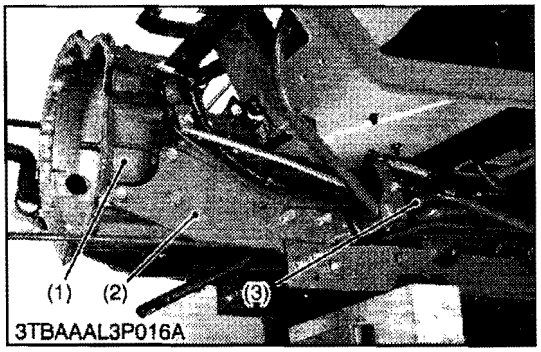
■ **NOTE**

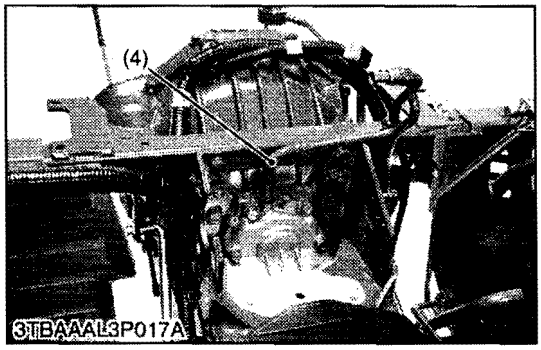
- **For fastening hydraulic pipe nut, use two wrenches. Hold the fitting with a wrench, turn the pipe nut with another wrench to avoid damage at fitting installed part.**

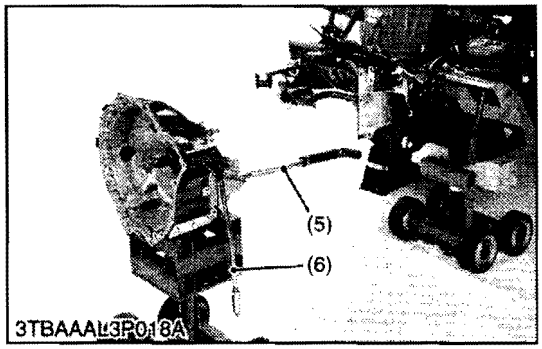
Tightening torque	Return pipe nut	34 to 39 N·m 3.5 to 3.9 kgf·m 25 to 28 lbf·ft
	Power steering assembly mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Parking Brake Lever Rod
(2) Cruise Control Lever Rod
(3) Return Pipe
(4) Power Steering Assembly

W1044333







Separating Clutch Housing from Center Frame

1. Remove the bracket (2).
2. Disconnect the hose (4) to hydraulic pipe.
3. Loosen the clamp and disconnect connecting hose (3).
4. Separate the clutch housing (1) from center frame.
5. Remove the hydraulic pipe (5).
6. Remove the clutch pedal rod (6).

(When reassembling)

- Apply grease to the splines of propeller shaft and ball joint.

Tightening torque	Clutch housing mounting screw and nut	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft
	Bracket (sub-frame) mounting screw (M12) for aluminum	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft
	Bracket (sub-frame) mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Clutch Housing
(2) Bracket (Sub-frame)
(3) Connecting Hose
(4) Hose
(5) Hydraulic Pipe
(6) Clutch Pedal Rod

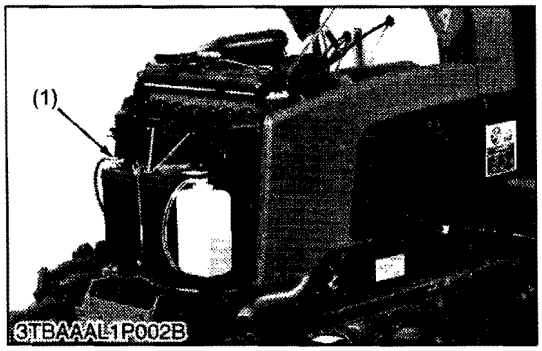
W1016310

(2) Separating HST Assembly

Draining Transmission Fluid

1. Refer to page 3-S13.

W1016652



Battery Cord

1. Open the bonnet and remove the front grille.
2. Disconnect the battery negative cord (1).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the grounding cord first. When connecting, the positive cord first.**

(1) Battery Negative Cord

W1016716

Steering Wheel

1. Refer to page 3-S14.

W1050229

Meter Panel and Panel Under Cover

1. Refer to page 3-S15.

W1050291

Drag Link

1. Refer to page 3-S15.

W1020143

Propeller Shaft Cover and Coupling

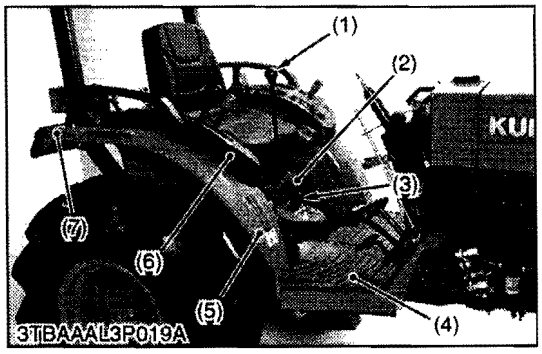
1. Refer to page 3-S16.

W1020197

Universal Joint and Bearing Holder

1. Refer to page 3-S16.

W1020049

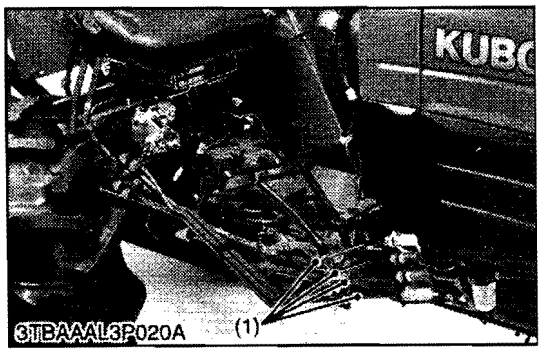


Seat Under Cover, Rubber Mat, Lever Guide and Fender etc.

1. Remove the front loader lever (1).
2. Remove the 3-point hitch lowering speed knob (3) seat under cover (2).
3. Remove the rubber mat (4).
4. Remove the front wheel drive shift lever grip and hydraulic control lever grip.
5. Remove the lever guide, R.H. (6).
6. Disconnect the wire harness and remove the tail lamp, R.H. (7).
7. Remove the fender, R.H. (5).
8. Disconnect the springs from step, cruise control lever rod and parking brake lever rod. Then remove the step.

(1) Front Loader Lever
(2) Seat Under Cover
(3) 3-Point Hitch Lowering Speed Knob
(4) Rubber Mat
(5) Fender, R.H.
(6) Lever Guide, R.H.
(7) Tail Lamp, R.H.

W1050684



Front Loader Pipe

1. Remove the front loader pipes (1).

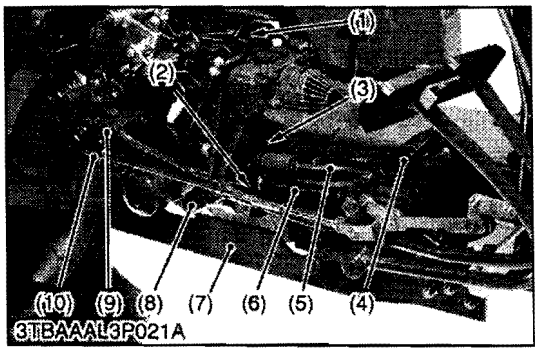
(When reassembling)

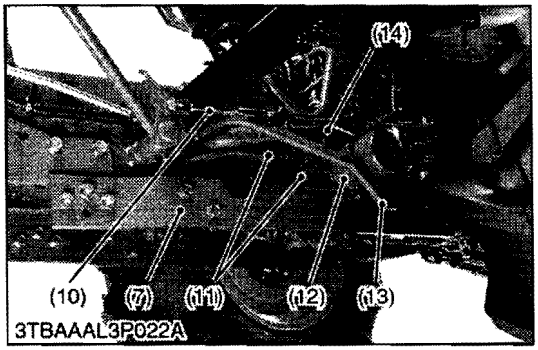
- Take care not to damage the O-ring of front loader pipes.

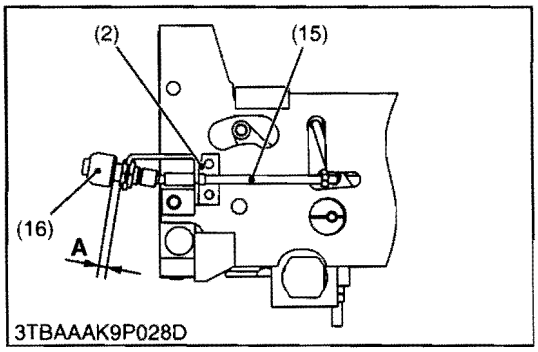
Tightening torque	Joint bolt (Front loader pipe)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

(1) Front Loader Pipes

W1019134







HST Pedal, Hydraulic Pipes and Others

1. Disconnect the brake rods (10).
2. Remove the damper (6) and HST neutral rod (15).
3. Remove the speed control rod (5) with HST pedal (4).
4. Remove the speed control rod screw (3) from the neutral holder.
5. Remove the pipe clamps and delivery pipe joint bolt (9) at the front loader valve.
6. Remove the hydraulic pipe joint bolt (1) and disconnect the return pipe.
7. Remove the bracket (2) of HST safety switch.
8. Disconnect the suction pipe (8).
9. Remove the sub frame (7), hydraulic oil filter assembly (12) and pipes (10).
10. Remove the connecting pipe (13).
11. Remove the HST suction pipe (14).

(When reassembling)

- Apply liquid lock (Three Bond 1324B or equivalent) to the speed control rod screw (2).
- Take care not to damage the O-ring of delivery pipe.

Tightening torque	Speed control rod screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Joint bolt (Delivery pipe 1)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Joint bolt (Hydraulic pipe)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Sub frame mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
	Sub frame mounting screw (M10) for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

■ **IMPORTANT**

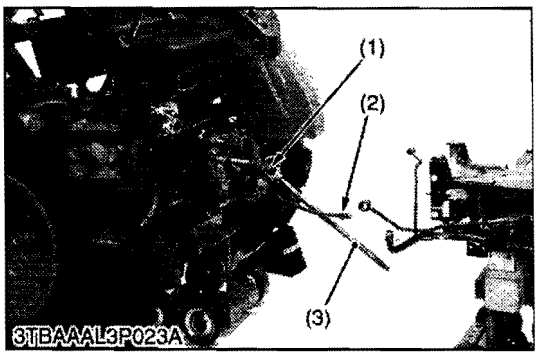
- **When HST safety switch (16) has been removed, be sure to adjust the length A.**

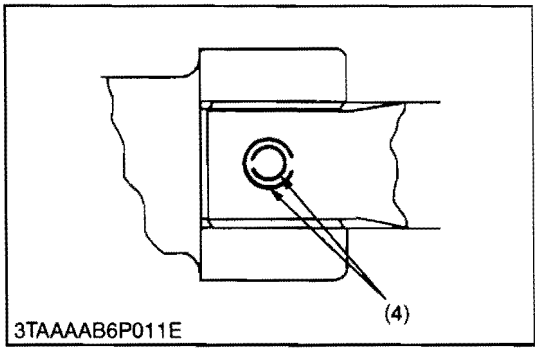
(Reference)

- Length **A** : 17.3 to 17.7 mm (0.682 to 0.696 in.)

(1) Hydraulic Pipe Joint Bolt
(2) HST Safety Switch Bracket
(3) Speed Control Rod Screw
(4) HST Pedal
(5) Speed Control Rod
(6) Damper
(7) Sub Frame
(8) Suction Pipe
(9) Delivery Pipe Joint Bolt
(10) Brake Rod
(11) Return Pipe
(12) Hydraulic Oil Filter Assembly
(13) Connecting Pipe
(14) HST Suction Pipe
(15) HST Neutral Rod
(16) HST Safety Switch

W1051971





Separating HST from Center Frame

1. Place the disassembling jack under the transmission case and engine clutch housing.
2. Separate the HST from center frame.
3. Tap out the spring pins and remove the universal joint (1) with front wheel drive propeller shaft (3).
4. Remove the delivery pipe (2).

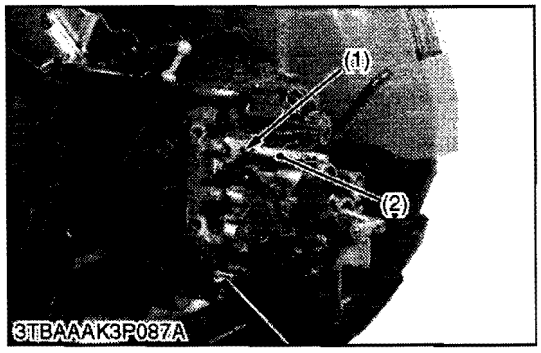
(When reassembling)

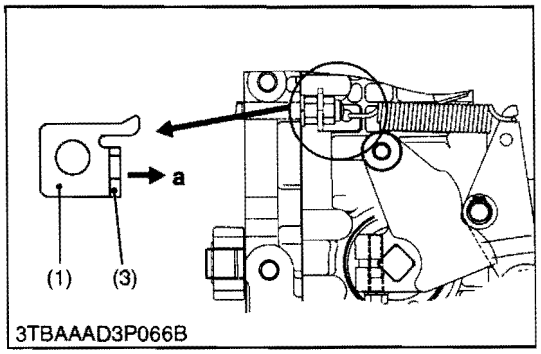
- Replace the spring pins (4) with new one.
- When inserting the spring pins, face their splits in the direction at a right angle to the universal joint and propeller shaft as shown in the figure.
- Apply grease to the spline of the HST pump shaft, front wheel propeller shaft, universal joint and ball coupling.

Tightening torque	HST and center frame mounting nut (M10)	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	HST and center frame mounting bolt (M12)	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft

(1) Universal Joint
(2) Delivery Pipe
(3) Front Wheel Drive Propeller Shaft
(4) Spring Pin

W1052378





Separating HST from Transmission Case

1. Remove the neutral spring (2) and remove the spring holder (1).
2. Separate the HST from transmission case.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to join face of the HST and transmission case.

■ **NOTE**

- **When reassembling the spring holder, spring hook (3) must be inside as shown in the figure.**

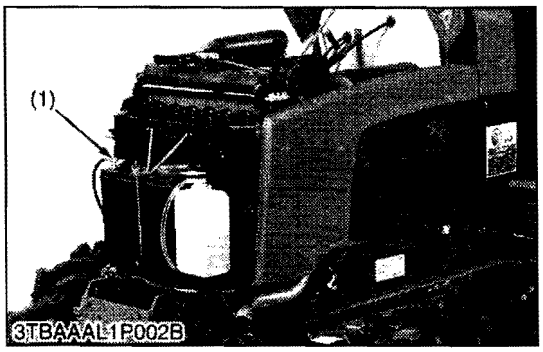
Tightening torque	Spring holder mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	HST and transmission mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

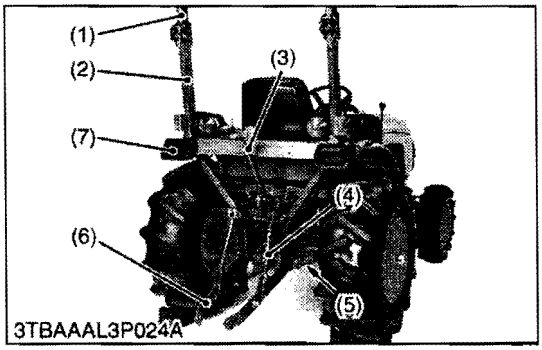
(1) Spring Holder
(2) Neutral Spring 1
(3) Spring Hook

a : HST Case Side

W1064339

(3) Separating Center Frame and Transmission Assembly





Draining Transmission Fluid

1. Refer to page 3-S13.

W1017811

Battery Cord

1. Open the bonnet and remove the front grille.
2. Disconnect the battery negative cord (1).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the grounding cord first. When connecting, the positive cord first.**

(1) Battery Negative Cord

W1022319

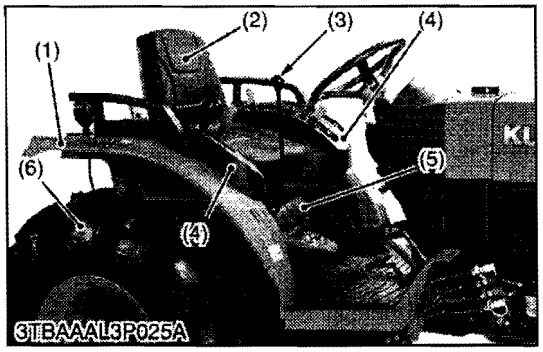
ROPS and 3-Point Hitch

1. Remove the upper frame mounting bolts and nuts, then remove the upper frame (1).
2. Disconnect the wire harness and remove the tail lamps (7).
3. Remove the top link (3) and lift rods (4).
4. Remove the lower link (6) and the collars from the 3-point hitch shaft (5).
5. Remove the lower frames (2).

Tightening torque	ROPS mounting bolt (M12)	90 to 95 N·m 9.2 to 9.6 kgf·m 67 to 70 lbf·ft
	3-point hitch shaft setting screw	15 to 19 N·m 1.5 to 2.0 kgf·m 11 to 14 lbf·ft
	3-point hitch shaft setting screw lock nut	44 to 47 N·m 4.0 to 4.8 kgf·m 32 to 34 lbf·ft

(1) Upper Frame
(2) Lower Frame
(3) Top Link
(4) Lift Load
(5) 3-Point Hitch Shaft
(6) Lower Link
(7) Tail Lamp

W1016882



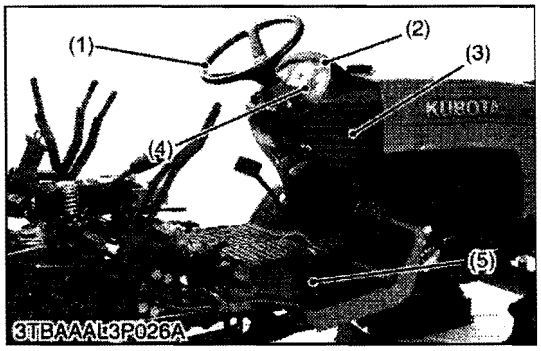
Rear Wheel, Seat, Fender and Seat Under Cover

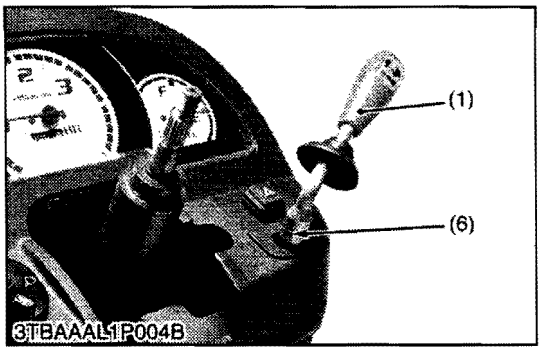
1. Place the disassembling jack under the transmission case.
2. Disconnect the wire harness of seat switches and remove the seat (2).
3. Remove the rear wheels (6).
4. Remove the all lever grips.
5. Remove the lever guides (4) and fenders (1).
6. Remove the loader valve lever (3) and 3-point hitch lowering speed knob.
7. Remove the seat under cover (5).

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

(1) Fender
(2) Seat
(3) Loader Valve Lever
(4) Lever Guide
(5) Seat Under Cover
(6) Rear Wheel

W1017217





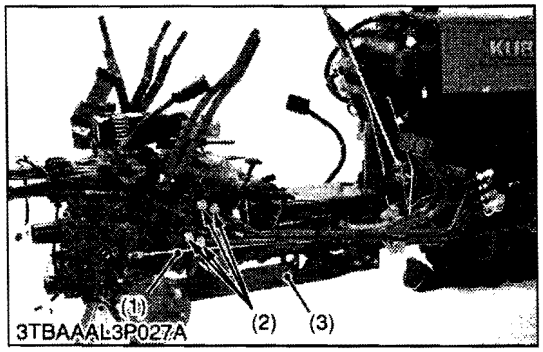
Steering Wheel, Meter Panel, Panel Under Cover and Step

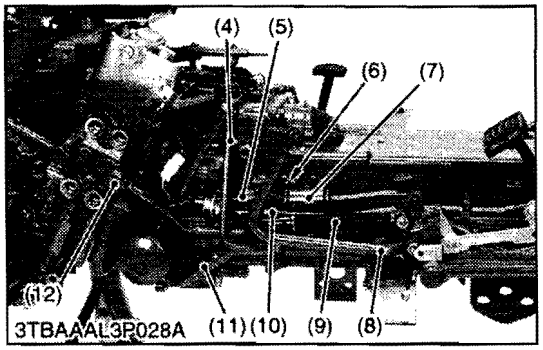
1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel (1) with a steering wheel pillar (Code No. 07916-51090).
3. Tap out the spring pin (6) and remove the hand accelerator lever (4).
4. Open the meter panel (2).
5. Disconnect the meter panel connector, combination switch connector, hazard switch connector and hour meter cable. Then remove the meter panel (2).
6. Disconnect the main switch connector and remove the panel under cover (3).
7. Remove the rubber mat (5).
8. Disconnect the springs, cruise control rod and parking brake rod from steps, and then remove the steps.

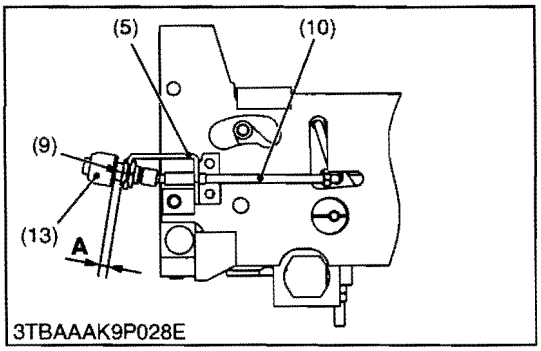
Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

(1) Steering Wheel
(2) Meter Panel
(3) Panel Under Cover
(4) Accelerator Lever
(5) Rubber Mat
(6) Spring Pin

W1017621







Front Loader Pipe, HST Pedal, Delivery Pipe, Suction Pipe and Hydraulic Pipe

1. Remove the front loader pipes (2).
2. Disconnect the brake rod R.H. (1).
3. Remove the damper (9) and speed control rod with HST pedal
4. Remove the speed control rod screw (6) from the neutral holder.
5. Remove the pipe clamps and disconnect the 3-point hitch delivery pipe (12) from loader valve side.
6. Disconnect the return pipe (4).
7. Remove the HST safety switch bracket with HST neutral rod (10).

(When reassembling)

- Take care not to damage the O-ring of loader pipes.
- Apply liquid lock (Three Bond 1324B or equivalent) to the speed control rod screw (6).

Tightening torque	Joint bolt (Front loader pipe)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Speed control rod screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Joint bolt (3-point hitch delivery pipe)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame (M10) mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame (M10) mounting screw for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame (M12) mounting bolt and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

■ **IMPORTANT**

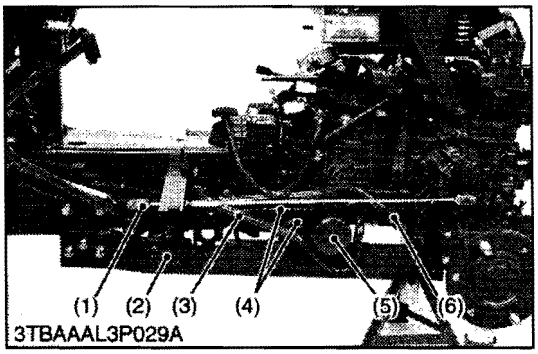
- **When HST safety switch (13) has been removed, be sure to adjust the length A.**

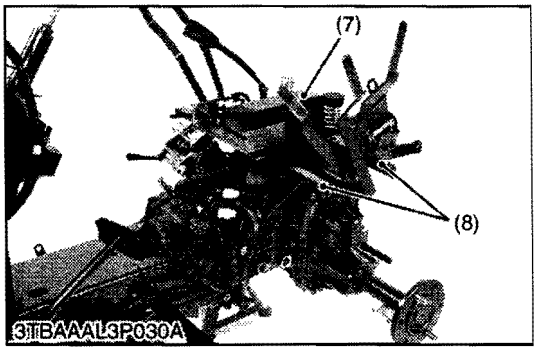
(Reference)

- Length **A** : 17.3 to 17.7 mm (0.682 to 0.696 in.)

(1) Brake Rod R.H.
(2) Front Loader Pipe
(3) Sub Frame
(4) Return Pipe
(5) HST Safety Switch Bracket
(6) Speed Control Rod Screw
(7) Speed Control Rod
(8) HST Pedal
(9) Damper
(10) Neutral Rod
(11) Suction Pipe
(12) 3-Point Hitch Delivery Pipe
(13) HST Safety Switch

W1017935



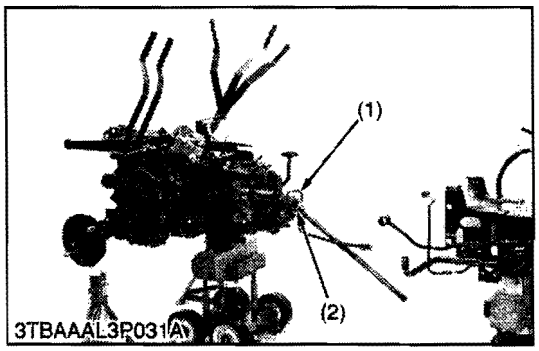


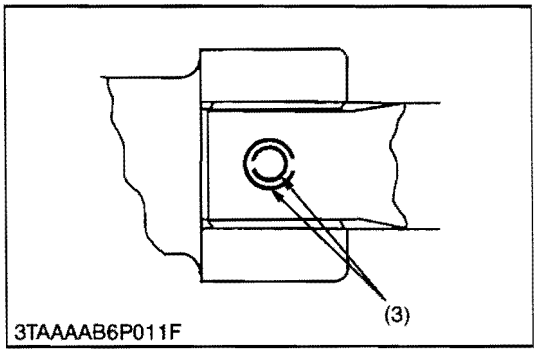
Sub Frame, Hydraulic Pipes and Others

1. Remove the tool box (7).
2. Remove the connecting pipe (3).
3. Remove the HST suction pipe (6).
4. Remove the sub frame (2).
5. Disconnect the wire harness from the seat stay and remove the seat stay (8).
6. Disconnect the brake rod, L.H. (1).
7. Remove the hydraulic oil filter assembly (5) and hydraulic pipes (4).

(1) Brake Rod, L.H.
(2) Sub Frame
(3) Connecting Pipe
(4) Hydraulic Pipe
(5) Hydraulic Oil Filter Assembly
(6) HST Suction Pipe
(7) Tool Box
(8) Seat Stay

W1018695





Separating Transmission Assembly

1. Separate the transmission assembly from center frame.
2. Remove the universal joint (2) with front wheel propeller shaft.
3. Remove the delivery pipe (1).

(When reassembling)

- Replace the spring pins (3) with new one.
- When inserting the spring pins, face their splits in the direction at a right angle to the universal joint and propeller shaft as shown in the figure.
- Apply grease to the spline of the HST pump shaft, front wheel propeller shaft, universal joint and ball coupling.

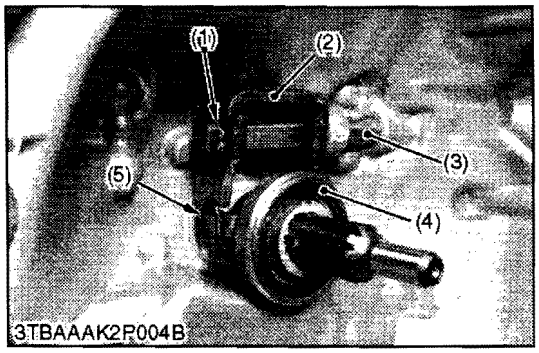
Tightening torque	HST and center frame mounting nut (M10)	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	HST and center frame mounting bolt (M12)	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft
	Transmission case and center frame mounting nut (M10)	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Transmission case and center frame mounting bolt (M12)	63 to 72 N·m 6.4 to 7.4 kgf·m 47 to 53 lbf·ft

(1) Delivery Pipe
(2) Universal Joint
(3) Spring Pin

W1018936

[3] DISASSEMBLING AND ASSEMBLING

(1) Disassembling Clutch Housing



Clutch Rod and Clutch Release Fork

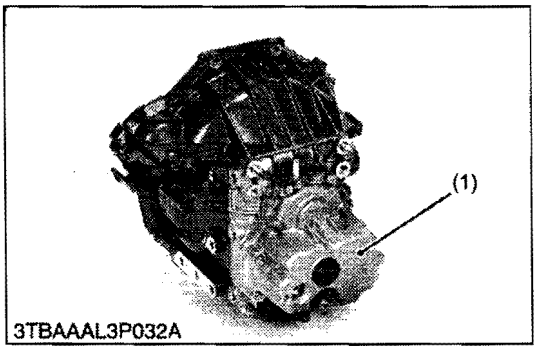
1. Remove the external snap ring (1) at the end of clutch rod.
2. Draw out the clutch rod (3) and remove the clutch release fork (2).
3. Take out the release hub with release bearing (4).

(When reassembling)

- Set the clutch release fork and release hub with set spring (5) in the correct direction.

(1) Snap Ring
(2) Clutch Release Fork
(3) Clutch Rod
(4) Release Bearing
(5) Set Spring

W1019689



Clutch Housing Rear Cover

1. Remove the clutch housing rear cover (1).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of clutch housing and rear cover (1).

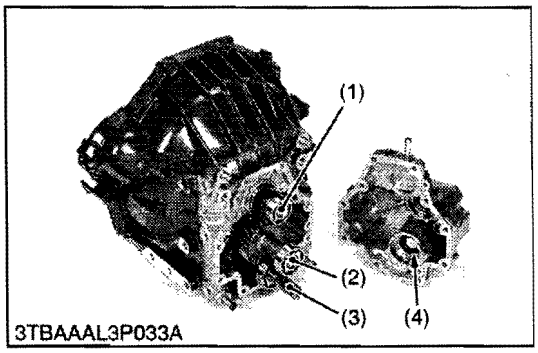
■ **NOTE**

- **When reassembling the clutch housing rear cover, be sure to wrap the output shaft with vinyl tape. And then, attach the clutch housing rear cover, taking care not to damage the oil seal of the rear cover with the output shaft.**

Tightening torque	Clutch housing rear cover mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Clutch Housing Rear Cover

W1019883



Clutch Shaft and Others

1. Pull out the clutch shaft assembly (1).
2. Pull out the 2nd gear shaft, front assembly (2).
3. Pull out the 3rd shaft, front assembly (3).

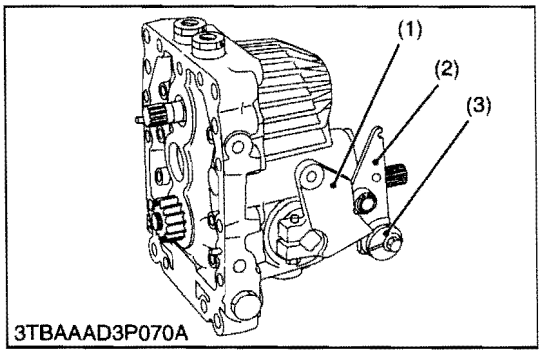
(When reassembling)

- Apply small amount of the grease to the oil seal (4).

(1) Clutch Shaft Assembly
(2) 2nd Gear Shaft, Front Assembly
(3) 3nd Shaft, Front Assembly
(4) Oil Seal

W1020137

(2) Disassembling HST



Neutral Holder and Neutral Holder Arm

1. Place parting marks on the neutral adjuster (3) and the neutral holder arm (2).
2. Remove the neutral holder arm (2) with neutral adjuster (3).
3. Remove the screw and pull out the neutral holder (1).

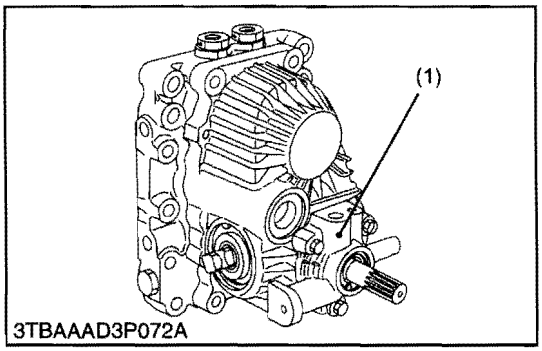
(When reassembling)

- Align the parting marks and install the neutral adjuster and the neutral holder arm.

Tightening torque	Neutral adjuster lock screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Neutral holder mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Neutral Holder
(2) Neutral Holder Arm
(3) Neutral Adjuster

W10228840



Charge Pump

1. Remove the charge pump mounting screws, and remove the charge pump assembly (1) from the HST housing.

(When reassembling)

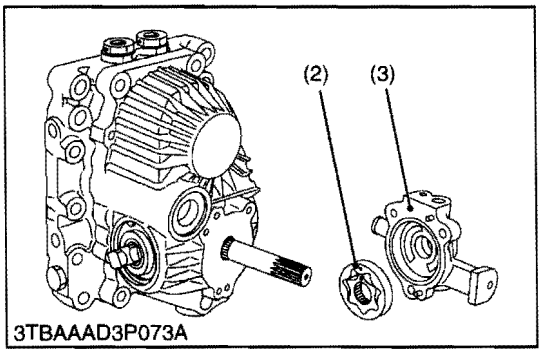
■ **NOTE**

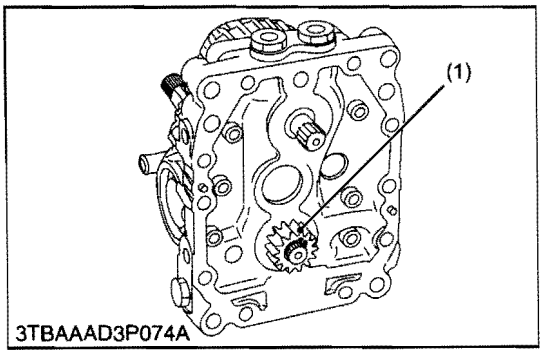
- **Take care not to damage the O-ring.**

Tightening torque	Charge pump mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Charge Pump Assembly
(2) Gerotor Assembly
(3) Charge Pump Housing

W10230730



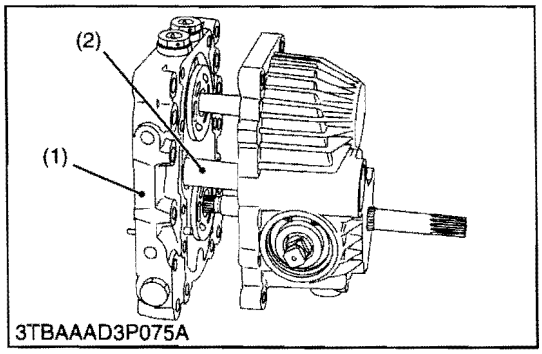


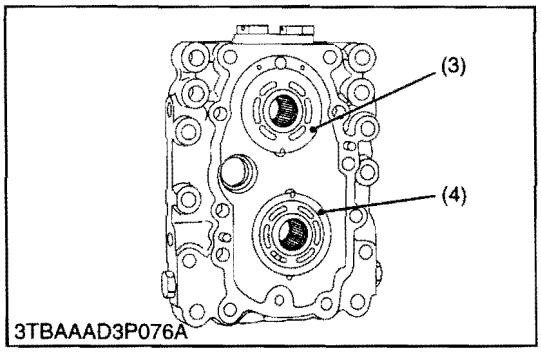
14T Gear

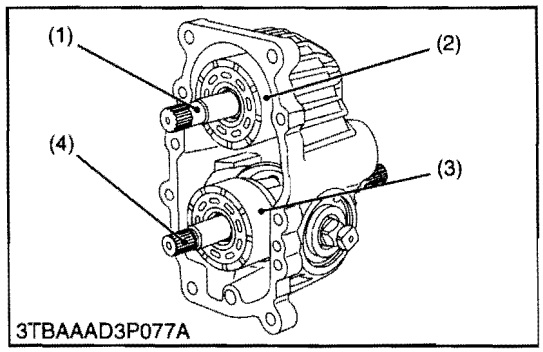
1. Remove the external snap ring and draw out the 14T gear (1).

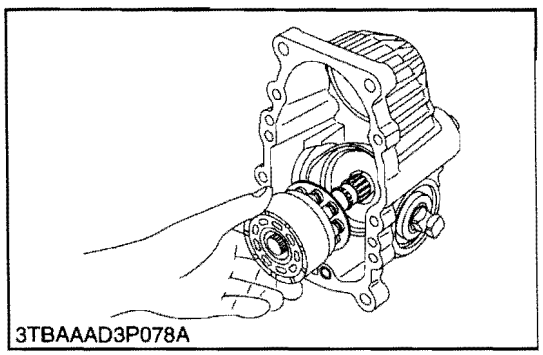
(1) 14T Gear

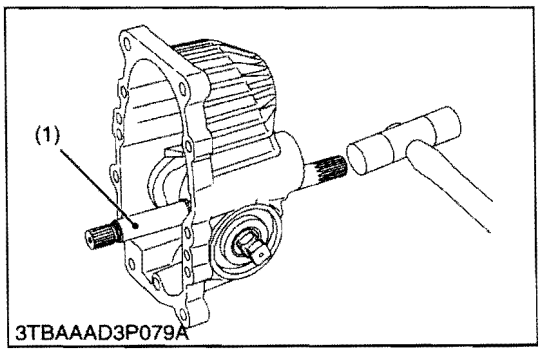
W10232800











Center Section

1. Remove the center section mounting hex. socket head screws.
2. Tap the front of center section flange with a soft hammer and separate the center section (1) from HST housing.

(When reassembling)

- Cover the splines of each shaft with thin tape to protect sealing lip.
- Install center section with gasket, O-ring and valve plates in place.

■ IMPORTANT

- **Valve plates (3), (4) may stick to the center section but they are not fixed. Take care not to drop them.**
- **Valve plates are not interchangeable. Valve plate of pump has two notches and the one of motor has no.**

Tightening torque	Center section mounting hex. socket screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

(1) Center Section
(2) Front Wheel Drive Shaft Pipe
(3) Valve Plate of Motor
(4) Valve Plate of Pump

W10233570

Motor Cylinder Block and Pump Cylinder Block

1. Pull out the output shaft (1) and motor cylinder block (2) with pistons as a unit.
2. Slide out the pump cylinder block (3) with pistons.

(1) Output Shaft
(2) Motor Cylinder Block
(3) Pump Cylinder Block
(4) Input Shaft

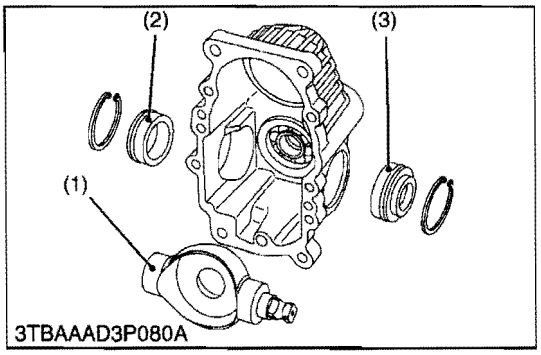
W10235500

Input Shaft

1. Tap out the input shaft (1) to the rear.

(1) Input Shaft

W10237420



Cover A, B and Trunnion Shaft

1. Remove the internal snap rings both side.
2. Tap the trunnion shaft (1) using a soft hammer to create a clearance between the case and the cover **B** (2).
   Then, pry the cover **B** (2) open with a screw-driver. Pry the cover **A** (3) in the same way.
3. Take out the trunnion shaft (1).

(When reassembling)

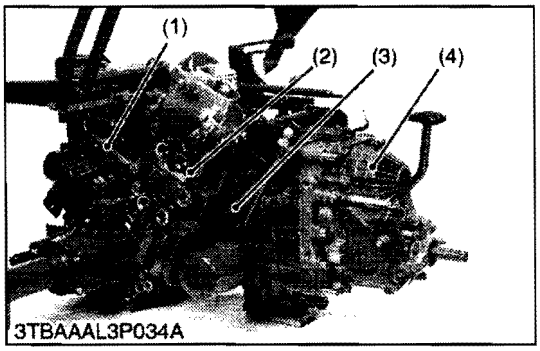
■ **NOTE**

- **Take care not to damage the O-rings.**

(1) Trunnion Shaft
(2) Cover **B**
(3) Cover **A**

W10238190

(3) Disassembling Transmission Case



Front Loader Valve Assembly and HST Assembly

1. Remove the 3-point hitch delivery pipe 2 (1).
2. Remove the hose clamp and hydraulic hose (3).
3. Remove the front loader valve assembly (2).
4. Separate the HST assembly (1) from transmission case.

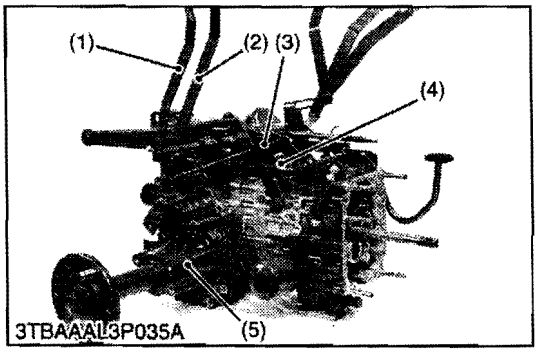
(When reassembling)

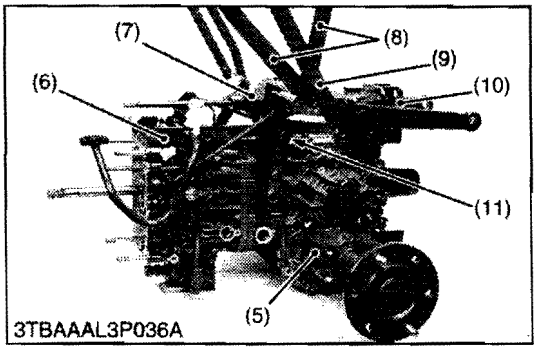
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the differential case to hydraulic cylinder and rear axle cases

Tightening torque	Joint bolt (3-point hitch delivery pipe 2)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	HST and transmission case mounting screw and nut	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) 3-point Hitch Delivery Pipe 2
(2) Front Loader Valve assembly
(3) Hydraulic Hose
(4) HST Assembly

W1056216





Separating Hydraulic Cylinder Case, Rear Axle Cases and Others

1. Remove the differential lock rod (3).
2. Remove the front wheel drive lever (2) and hydraulic control lever (1).
3. Remove the external snap ring (11) and remove the PTO shift lever (8) and range gear shift lever (9).
4. Remove the differential lock pedal support (6).
5. Remove the top link bracket (10).
6. Remove the hydraulic cylinder case assembly (7) with connecting plate (4).
7. Remove the rear axle cases (5).

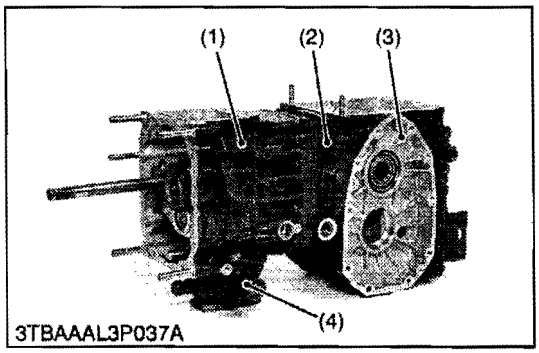
(When reassembling)

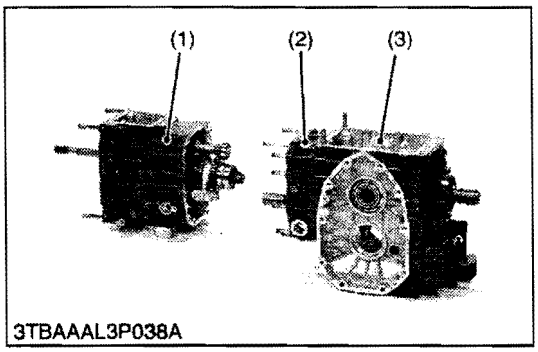
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the differential case to hydraulic cylinder case and rear axle cases.

Tightening torque	Differential lock pedal support mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Connecting plate mounting nut	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Hydraulic cylinder case mounting nut	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Rear axle case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Top link bracket mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Hydraulic Control Lever
(2) Front Wheel Drive Lever
(3) Differential Lock Rod
(4) Connecting Plate
(5) Rear Axle Case
(6) Differential Lock Pedal Support
(7) Hydraulic Cylinder Case Assembly
(8) PTO Shift Lever
(9) Range Gear Shift Lever
(10) Top Link Bracket
(11) External Snap Ring

W1021854





Separating Mid-PTO Case, Transmission Case and Differential Case

1. Remove the mid-PTO case mounting screws and separate the mid-PTO case (4) and transmission case (1).
2. Remove the transmission case mounting screws and nuts and separate the differential case (3) and transmission case (1).

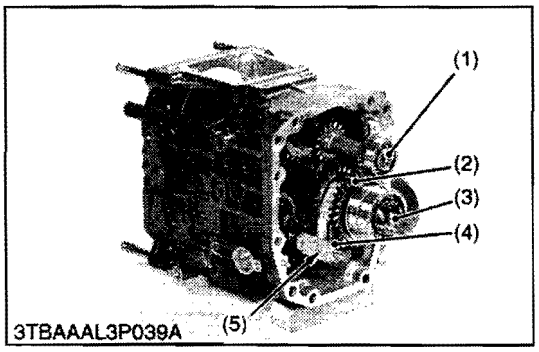
(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the transmission case to Mid case and mid-PTO case to transmission case and Mid case to differential case.
- When reassembling the transmission case, remove the mid case from the differential case. Attach the transmission case, mid case and differential case after spreading the liquid gasket over their surfaces.

Tightening torque	Transmission case and mid-PTO case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Transmission case and differential case mounting nut	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Transmission Case
(2) Mid Case
(3) Differential Case
(4) Mid-PTO Case

W1022177

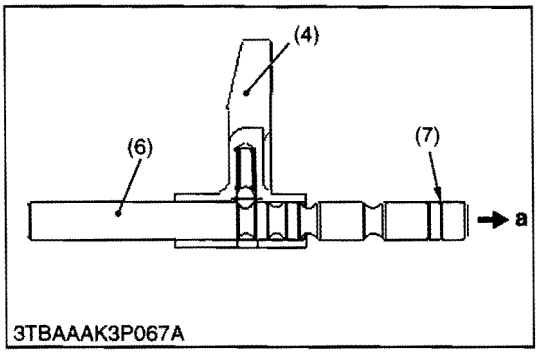


4th Gear Shaft and Spiral Bevel Pinion Shaft

1. Remove the spiral bevel pinion shaft (3) with 16T-27T-32T shift gear (2), 14T gear (9) and shift fork (4).
2. Remove the 4th gear shaft (1).

(When reassembling)

- When installing the spiral bevel pinion shaft, be sure to install the shims (10).
- Install the shift fork (4), so that the groove (7) of the shift rod (6) faces rearward.
- When reassembling the shift fork, attach it making the shift fork arm fit the rear shift groove of the shift fork.

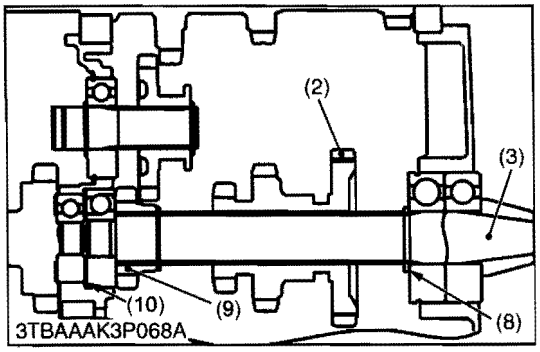


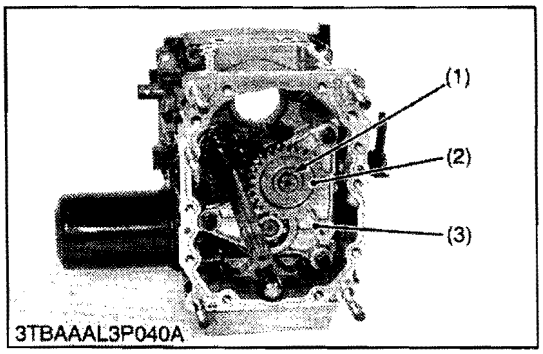
■ IMPORTANT

- **When disassembling the spiral bevel pinion shaft (3), be sure to replace the external snap ring (8) with new one.**

(1) 4th Gear Shaft
(2) 16T-27T-32T Shiftier Gear
(3) Spiral Bevel Pinion Shaft
(4) Shift Fork
(5) Groove
(6) Shift Rod
(7) Groove
(8) External Snap Ring
(9) 14T Gear
(10) Shim
a : Rear

W1022386





Bearing Holder

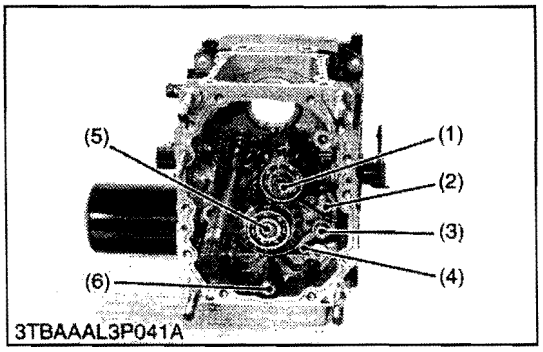
1. Remove the external snap ring (1) and remove the 27T gear (2).
2. Remove the bearing holder mounting screws and remove the bearing holder (3).

(When reassembling)

Tightening torque	Bearing holder mounting screw	50 to 55 N·m 5.1 to 5.6 kgf·m 37 to 40 lbf·ft

(1) External Snap Ring
(2) 27T Gear
(3) Bearing Holder

W1022804

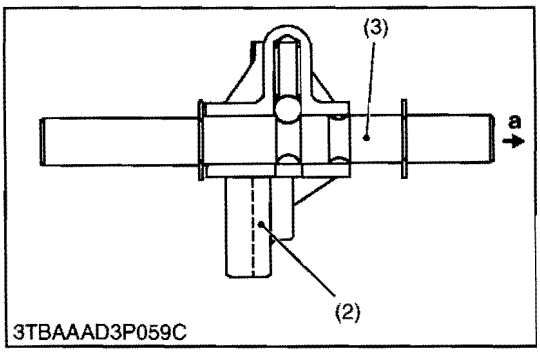


2nd Gear Shaft and Middle Shaft

1. Remove the 2nd gear shaft (1) with bearings.
2. Remove the 3rd shaft assembly (5) and shift fork (2) with shift rod.
3. Remove the middle shaft (6) and 19T gear with bearing.

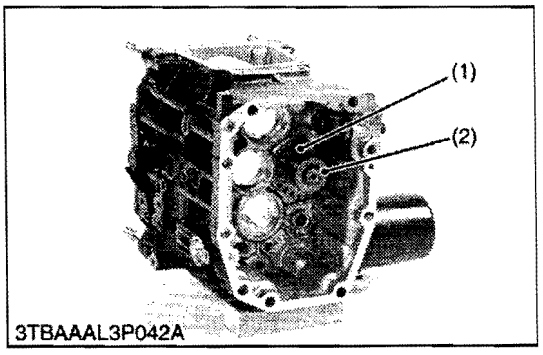
(When reassembling)

- When reassembling the 19T gear (4), face the chamfer side to the front.
- Install the shift fork (2), so that the snap ring (7) of the shift rod (3) faces rearward.



(1) 2nd Gear Shaft
(2) Shift Fork
(3) Shift Rod
(4) 19T Gear
(5) 3rd Gear Shaft Assembly
(6) Middle Shaft
(7) Snap Ring
a : Rear

W1022999

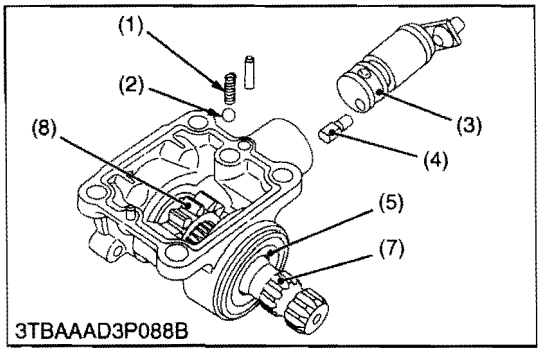


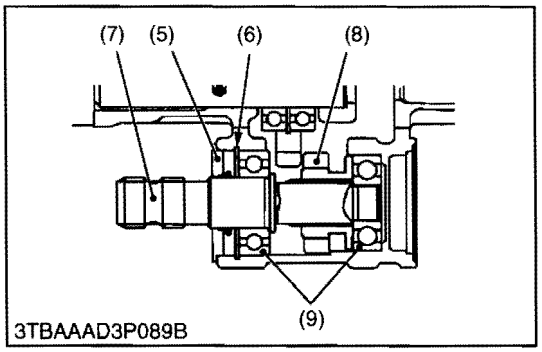
Front Wheel Drive Shaft

1. Remove the external snap ring and remove the 19T shiftier gear (1).
2. Draw out the front wheel drive shaft (2) to the front.

(1) 19T Shifter Gear
(2) Front Wheel Drive Shaft

W1023378





Mid-PTO Shaft

1. Remove the spring (1) and ball (2).
2. Draw out the dowel pin and remove the shift arm (3) with shifter (4).
3. Remove the oil seal (5) and internal snap ring (6).
4. Remove the mid-PTO shaft (7) with 11T shifter gear (8) and bearings (9).

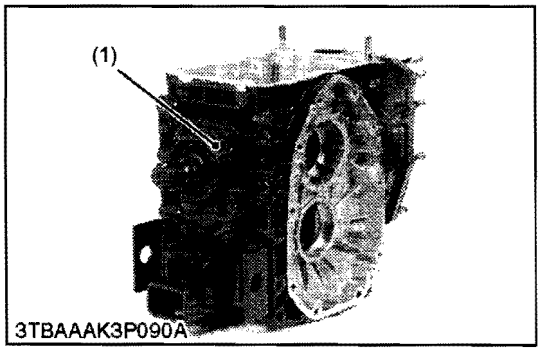
(When reassembling)

- Apply grease to lip and outer of oil seal.

(1) Spring
(2) Ball
(3) Shift Arm
(4) Shifter
(5) Oil Seal
(6) Internal Snap Ring
(7) Mid-PTO Shaft
(8) 11T Shifter Gear
(9) Bearing

W1027920

(4) Disassembling Differential Gear Case



PTO Shaft

1. Remove the rear PTO cover mounting screws and remove the rear PTO cover assembly (1).

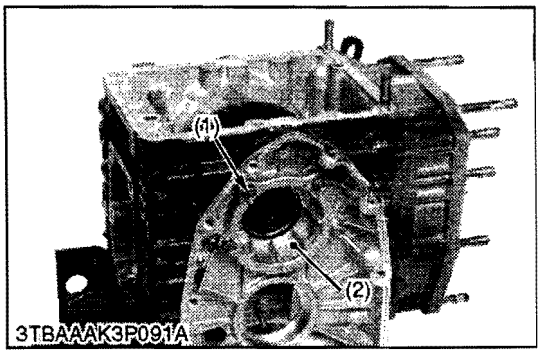
(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of differential gear case and PTO cover.

Tightening torque	Rear PTO cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Rear PTO Cover Assembly

W1026331



Differential Bearing Holder

1. Remove the differential bearing holder mounting screws(1).
2. Remove the differential bearing holder (2) and shims (3), (4).

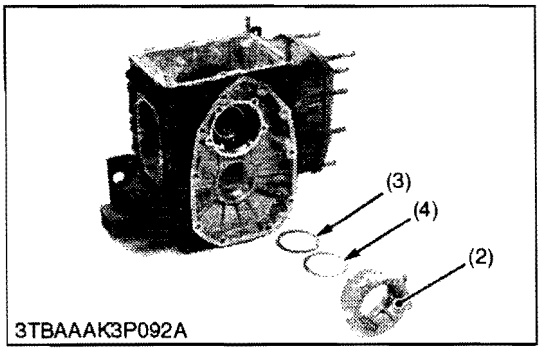
(When reassembling)

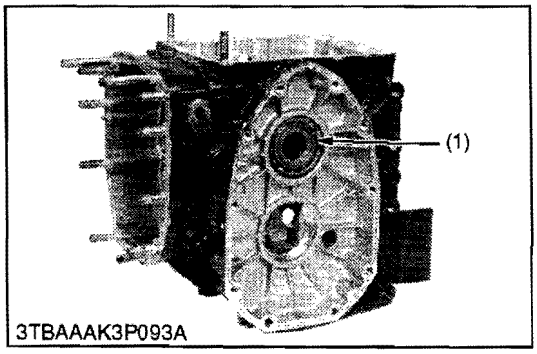
0.2 mm (0.008 in.) shim.
0.5 mm (0.020 in.) shim.

Tightening torque	Differential bearing holder mounting screw (M8)	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft

(1) Screw
(2) Differential Bearing Holder
(3) Shim
(4) Shim

W1026453





Differential Gear Assembly

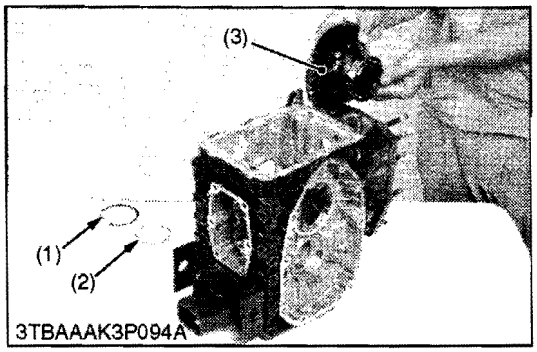
1. Remove the internal snap ring (1) from the differential case.
2. Remove the shims (2).
3. Remove the differential gear assembly (3) from the differential case.

(When reassembling)

0.2 mm (0.008 in.) shim.
0.5 mm (0.020 in.) shim.

(1) Internal Snap RIng
(2) Shim
(3) Differential Gear Assembly

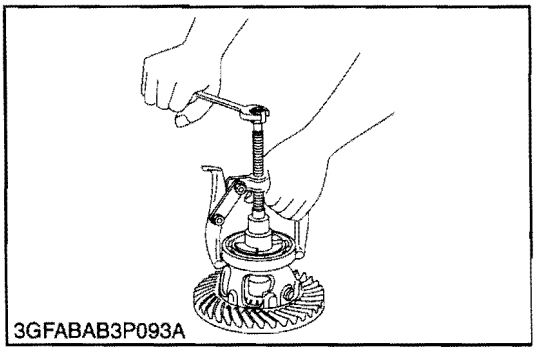
W1065115



Bearings

1. Remove the right and left bearings from the differential case.

W1026644



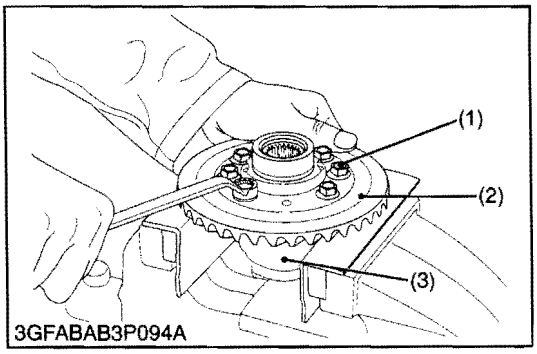
Spiral Bevel Gear

1. Remove the spiral bevel gear UBS screws (1).
2. Remove the spiral bevel gear (2) from differential case (3).

(When reassembling)

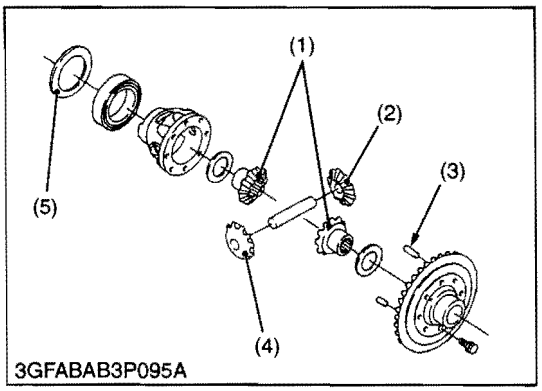
- Apply liquid lock (Three Bond 1324B or its equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft



(1) Spiral Bevel Gear UBS Screw
(2) Spiral Bevel Gear
(3) Differential Case

W1026723



Differential Side Gear and Differential Pinion

1. Put parting marks on the differential pinion (1) and the differential side gear (2).
2. Tap out the dowel pin (3).
3. Remove the differential pinion shaft.
4. Remove the differential pinion (4), differential side gear (2) and shim (5).

(When reassembling)

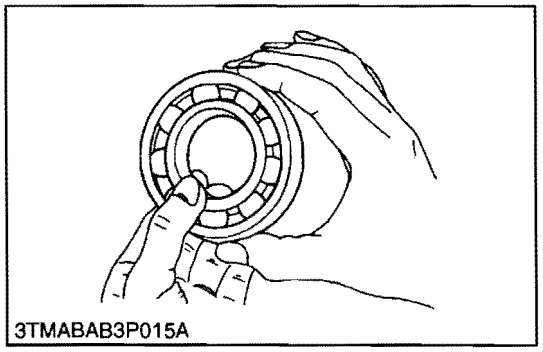
- Install the differential pinion and differential side gear, aligning the parting marks.

(1) Differential Pinion
(2) Differential Side Gear
(3) Dowel pin
(4) Differential Pinion
(5) Shim

W1026914

[4] SERVICING

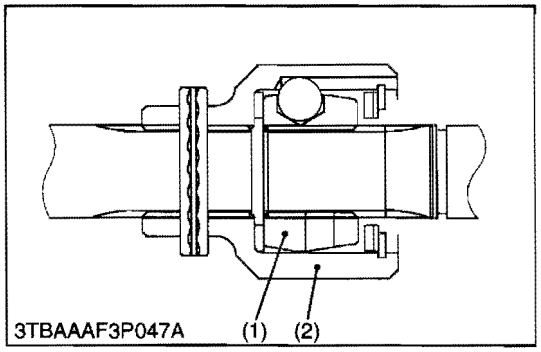
(1) Clutch Housing



Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1027222



Checking Propeller Shaft Ball Coupling

1. Hold the ball coupling outer, and push and pull, and rotate the ball coupling inner in all directions to check for wear and roughness.
2. If there is any defect, replace it.

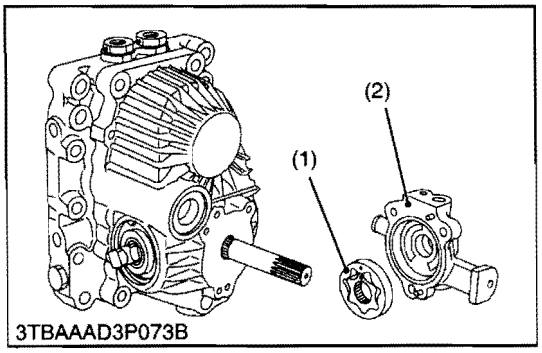
(When reassembling)

- Apply grease to the inner parts of ball coupling and splines of ball coupling inner.
- When replacing the ball coupling assembly, install the ball coupling inner (1) with balls so that its ball position inside of ball coupling outer (2) as shown in the figure.

(1) Inner, Coupling
(2) Outer, Coupling

W1027323

(2) Hydrostatic Transmission

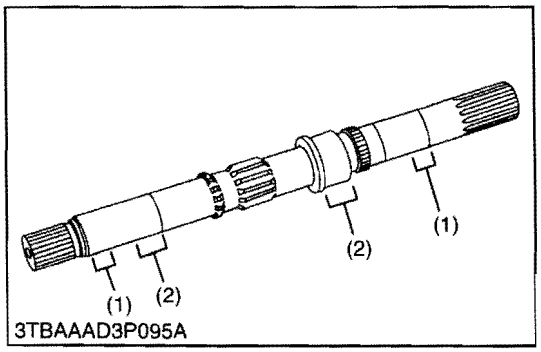


Charge Pump

1. Check the charge pump housing (2) and the gerotor assembly (1) for scratches and wear.
2. If scratch or worn, replace the charge pump complete assembly.

(1) Gerotor Assembly
(2) Charge Pump Housing

W1029255

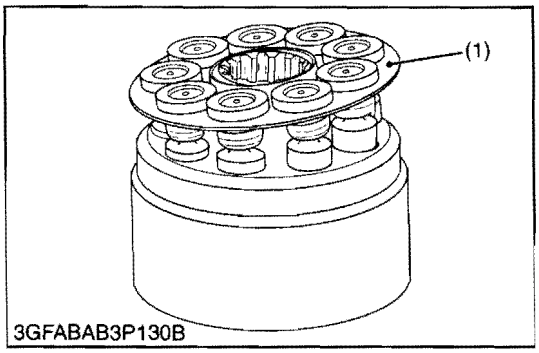


Input Shaft

1. Pull out the input shaft from the case.
2. Check the seal surface (1), the bearing surface (2) and the bearing.
3. If the shaft is rough or grooved, replace it.
4. If the bearing is worn, replace it.

(1) Seal Surface (2) Bearing Surface

W1029413



Cylinder Block Bore and Pistons

1. Lift all the pistons gently with the retainer plate (1).
2. Check the pistons for their free movement in the cylinder block bores.
3. If the piston or the cylinder block bore is scored, replace cylinder block assembly.

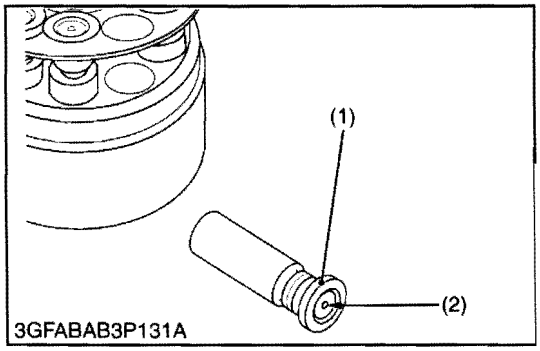
■ **IMPORTANT**

- **Do not interchange pistons between pump and motor cylinder block. Pistons and cylinder blocks are matched.**

Clearance between piston and bore	Factory spec.	0.02 mm 0.0008 in.
	Allowable limit	0.04 mm 0.0016 in.

(1) Retainer Plate

W1029661



Piston Slipper and Retainer Plate

1. Check the slipper (1) for flatness.
2. If rounded, replace.
3. Measure the thickness of piston slipper.
4. If the measurement is less than the allowable limit, replace.
5. Check the lubricant hole (2) for clogging.

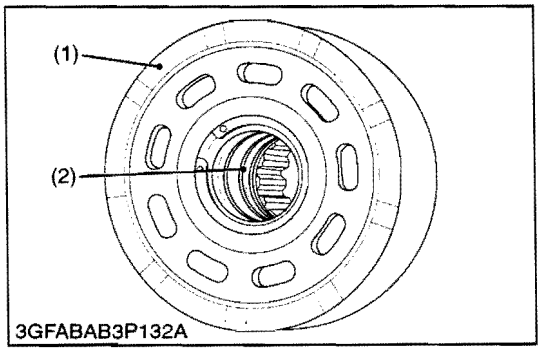
■ **IMPORTANT**

- **Do not interchange pistons between pump and motor cylinder block. Pistons and cylinder blocks are matched.**

Thickness of slipper	Factory spec.	3.00 mm 0.118 in.
	Allowable limit	2.90 mm 0.114 in.

(1) Piston Slipper (2) Lubricant Hole

W1029858

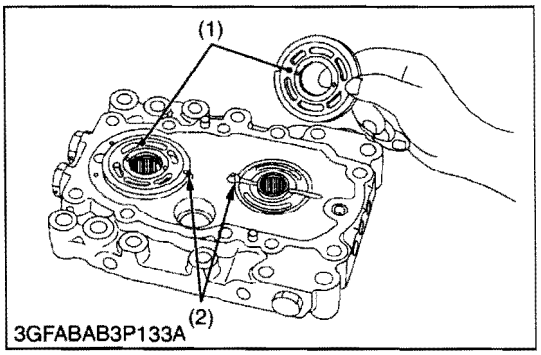


Cylinder Block Face

1. Check the polished face (1) of cylinder block for scoring.
2. If scored, replace cylinder block assembly.
3. Check the spring (2) for breakage.
4. If broken, replace cylinder block assembly.

(1) Polished Face (2) Spring

W1030086



Valve Plate

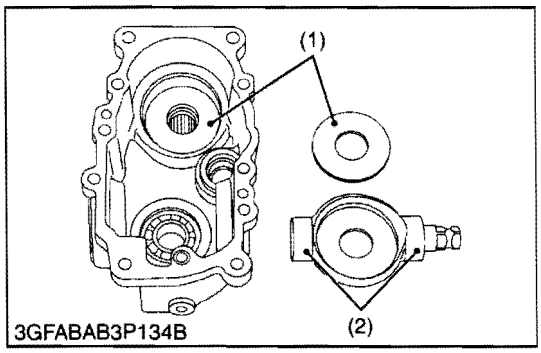
1. Check the engagement of the valve plate (1) and the anchor pin (2).
2. Pushing the valve plate against the anchor pin, lift it to remove.
3. Check the valve plate for foreign particles.
4. Clean the valve plate and dry with compressed air.
5. Check the valve plate for scratches, wear and erosion. (Run a finger nail across the valve plate surface. If worn, it will be felt.)
6. If worn or scored, replace it.

■ **NOTE**

- **After checking, coat them with hydrostatic transmission oil.**

(1) Valve Plates (2) Anchor Pin

W1030262

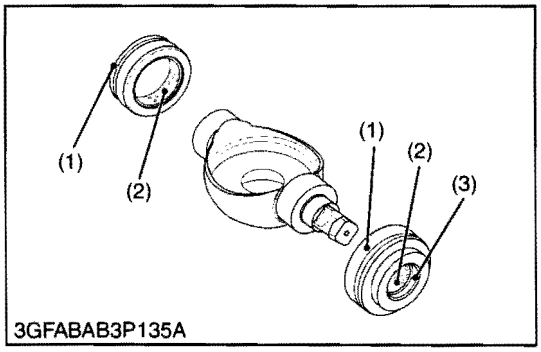


Thrust Plate and Swashplate

1. Check the thrust plate (1) for scratches and excessive wear.
2. If worn or scored, replace it.
3. Check the bearing surface (2) of trunnion shaft (swashplate) for scratches and excessive wear.
4. If worn or scored, replace it.

(1) Thrust Plate (2) Bearing Surface

W1030563



Trunnion Shaft Cover

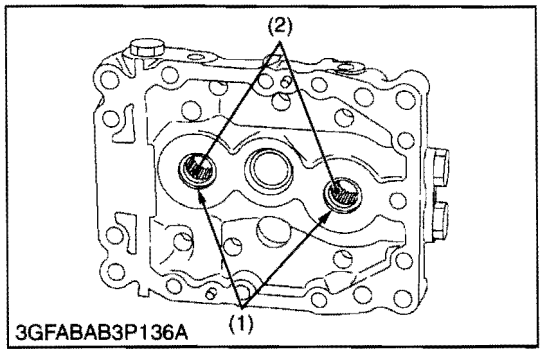
1. Check the bearing (2) for scratches and excessive wear.
2. If worn or scored, replace it.
3. Check the oil seal (3) and the O-rings (1) for damage.

■ **NOTE**

- **After checking, coat the bearings with hydrostatic transmission oil, and the oil seal lip and the O-rings (1) with grease.**

(1) O-ring (3) Oil Seal
(2) Bearing

W1030731



Oil Seals and Bearings for Shaft

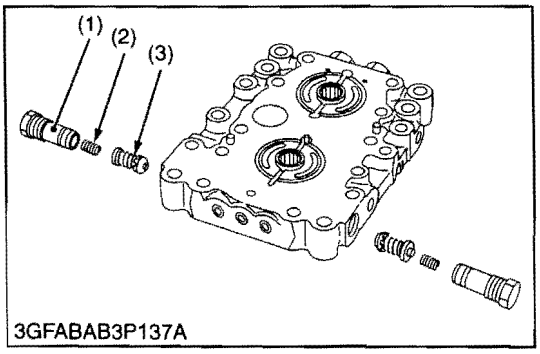
1. Remove the internal snap ring and check the oil seals (1) for damage.
2. Check the bearings (2) for wear.
3. If the bearings are worn, replace it.

■ **NOTE**

- **After checking, coat the bearing with hydrostatic transmission oil and the oil seal lip with grease.**

(1) Oil Seal (2) Needle Bearing

W1030904



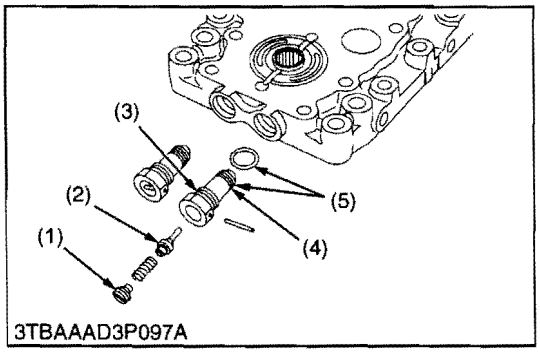
Check and High Pressure Relief Valve

1. Check the valve plug (1) and valve (3) for scratches and damage.
2. Check the valve seat in the port block for damage.
3. Check the spring (2) for breakage and wear.
4. If anything unusual, replace the check and high pressure relief valve assembly.

Tightening torque	Valve plug	117 to 147 N·m 12.0 to 15.0 kgf·m 86.7 to 108 lbf·ft

(1) Valve Plug
(2) Spring
(3) Valve

W1031071



Neutral Valve

1. Check the holes of the valve body (3) and the neutral valve (2) for clogging.
2. If clogged, open hole with compressed air.
3. Check the O-rings (1), (5) and the backup ring (4) for scratches and damage.
4. Check the springs for breakage and wear.
5. If the valve surface is scored, replace it.
6. If anything unusual, replace it.

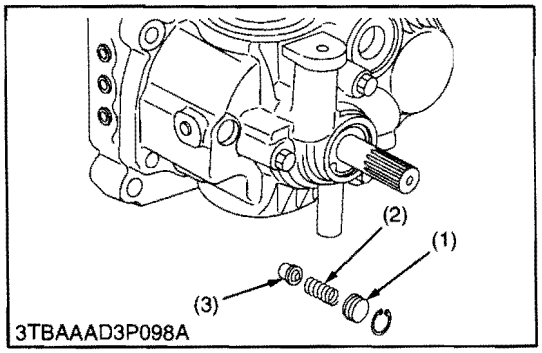
■ **NOTE**

- **When reassembling, replace the O-rings and the backup rings.**

Tightening torque	Cap screw	59 to 68 N·m 6.0 to 7.0 kgf·m 44 to 50 lbf·ft

(1) O-ring
(2) Neutral Valve
(3) Valve Body
(4) Backup Ring
(5) O-ring

W1031289



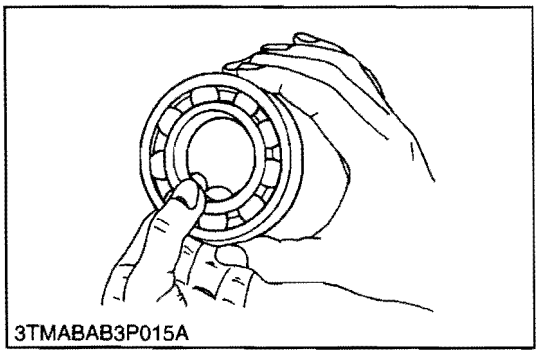
Charge Relief Valve

1. Check the spring (2) for breakage and wear.
2. If it unusual, replace it.

(1) Valve Plug
(2) Spring
(3) Valve Poppet

W1031570

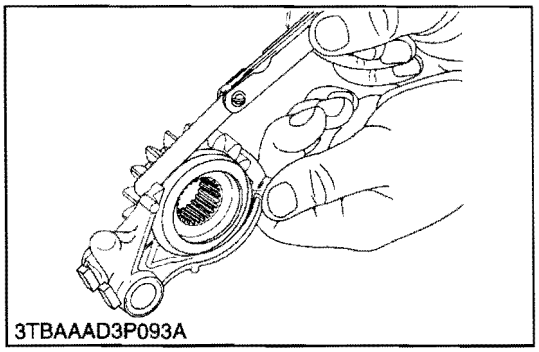
(3) Transmission Case


3TMABAB3P015A

Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1029963

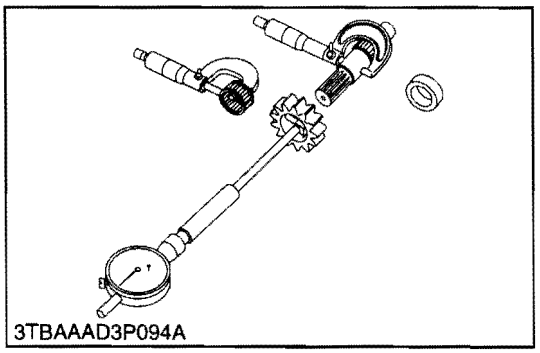

3TBAAAD3P093A

Clearance between Shift Fork and Shift Gear Groove

1. Insert the fork into the shift gear groove and measure the clearance with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace it.

Clearance between shift fork and shift gear groove	Factory spec.	0.10 to 0.35 mm 0.0040 to 0.013 in.
	Allowable limit	0.5 mm 0.02 in.

W1030039


3TBAAAD3P094A

Clearance between Gear and Shaft

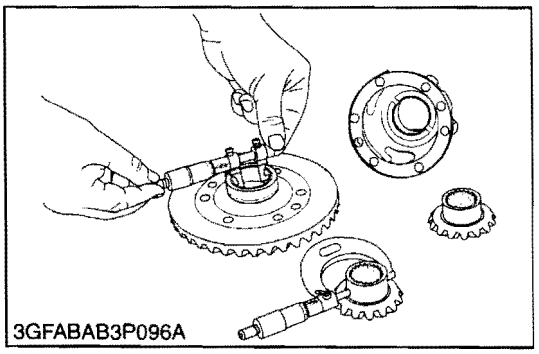
1. Measure the gear I.D. with a cylinder gauge, and then shaft O.D. with an outside micrometer.
2. Measure the O.D. of two needles in the needle bearing with an outside micrometer.
3. Clearance is the difference between the gear I.D. and the sum of shaft O.D. and two needles O.D..
4. If the clearance exceeds the allowable limit, replace it.

Clearance between 13T gear and 2nd gear	Factory spec.	0.0070 to 0.046 mm 0.00028 to 0.0026 in.
	Allowable limit	0.10 mm 0.0039 in.

2nd shaft O.D.	Factory spec.	21.987 to 22.000 mm 0.86563 to 0.86614 in.
13T gear I.D.	Factory spec.	30.007 to 30.021 mm 1.1814 to 1.1819 in.
Needle O.D.	Factory spec.	3.994 to 4.000 mm 0.1573 to 0.1574 in.

W1030172

(4) Differential Gear


3GFABAB3P096A

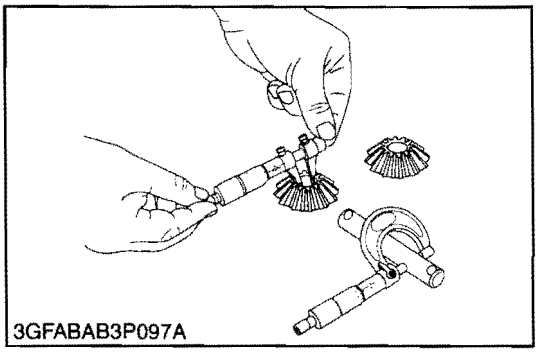
Clearance between Differential Case (Spiral Bevel Gear) and Differential Side Gear

1. Measure the differential side gear boss O.D. with an out side micrometer.
2. Measure the differential case I.D. and the spiral bevel gear I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (spiral bevel gear) and differential side gear	Factory spec.	0.025 to 0.066 mm 0.00099 to 0.0025 in.
	Allowable limit	0.30 mm 0.012 in.

Differential case I.D.	Factory spec.	32.000 to 32.025 mm 1.2599 to 1.2608 in.
Spiral bevel gear I.D.	Factory spec.	32.000 to 32.025 mm 1.2599 to 1.2608 in.
Differential side gear O.D.	Factory spec.	31.959 to 31.975 mm 1.2583 to 1.2588 in.

W1030494


3GFABAB3P097A

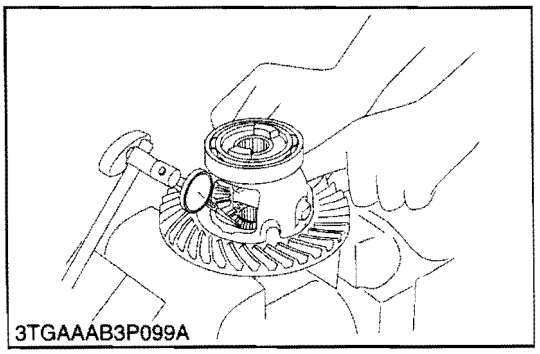
Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D. with an outside micrometer.
2. Measure the differential pinion I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.0017 in.
	Allowable limit	0.30 mm 0.012 in.

Differential pinion I.D.	Factory spec.	16.000 to 16.018 mm 0.62993 to 0.63062 in.
Differential pinion shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.62886 to 0.62929 in.

W1030667


3TGAAAB3P099A

Backlash between Differential Pinion and Differential Side Gear

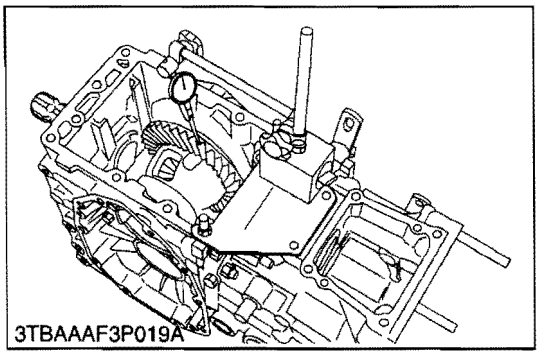
1. Secure the differential case with a vise.
2. Set the dial indicator (lever type) with its finger on the tooth of the differential side gear.
3. Press differential pinion and side gear against the differential case.
4. Hold the differential pinion and move the differential side gear to measure the backlash.
5. If the backlash exceeds the allowable limit, adjust with differential side gear shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.01 in.
	Allowable limit	0.4 mm 0.02 in.

■ **NOTE**

- **Thickness of shims : 0.8 mm (0.315 in.), 1.0 mm (0.0394 in.), 1.2 mm (0.0472 in.)**

W1030852



Backlash between Spiral Bevel Pinion and Spiral Bevel Gear

1. Set the dial indicator (lever type) with its finger on the end of spiral bevel pinion (4).
2. Move the spiral bevel pinion back and forth to each end and measure the side clearance.
3. If the side clearance exceeds the factory specifications, adjust with the shims (3) at front end of spiral bevel pinion.
4. Set the dial indicator (lever type) with its finger on the tooth surface of bevel gear.
5. Measure the backlash by fixing the spiral bevel pinion (4) and moving bevel gear (2) by hand.
6. If the backlash exceeds the factory specifications, adjust with the shims (1), (5) at bearing holder (6) and differential case.
7. Adjust the backlash properly by repeating the above procedures.

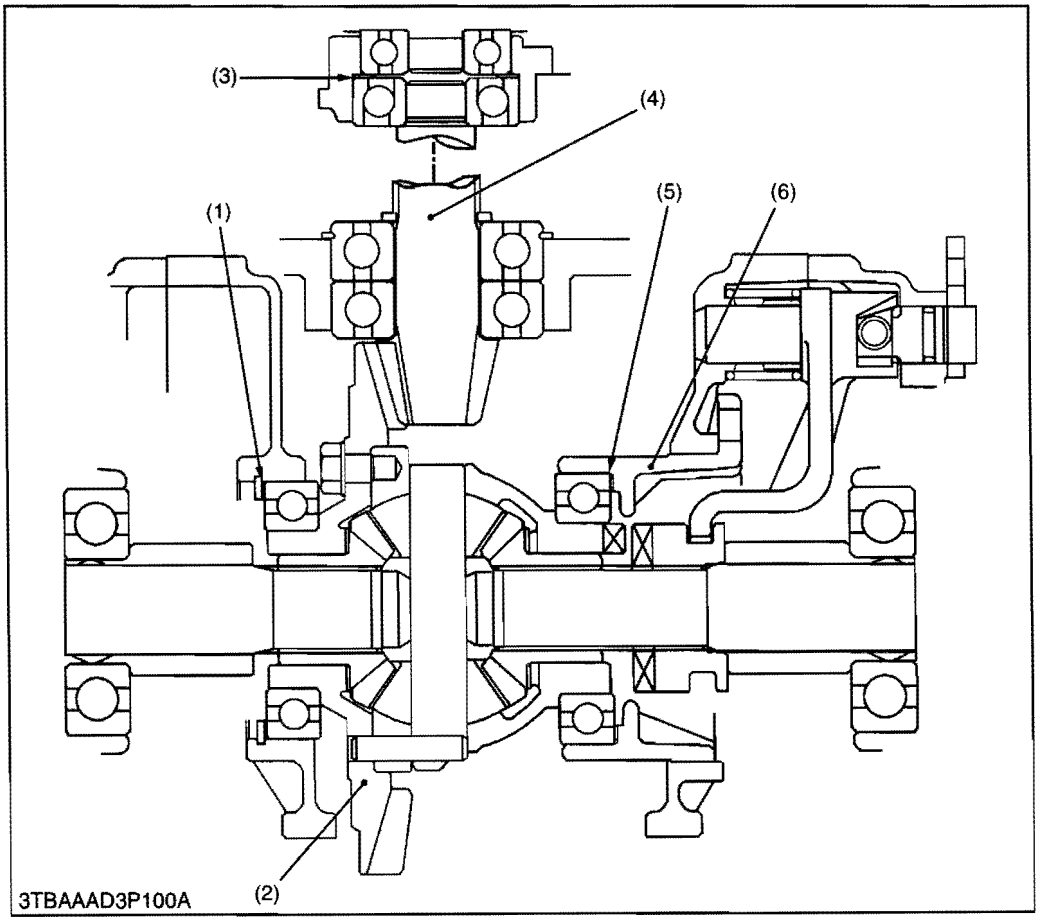
Side clearance of spiral bevel pinion	Factory spec.	Less than 0.15 mm 0.0059 in.

Backlash between spiral bevel pinion and spiral bevel gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.01 in.
	Allowable limit	0.4 mm 0.02in.

(Reference)

- Thickness of shims (1), (5) 0.2 mm (0.008 in.) 0.5 mm (0.020 in.)
  Thickness of shims (3). 0.2 mm (0.008 in.) 1.0 mm (0.039 in.)

W1031046



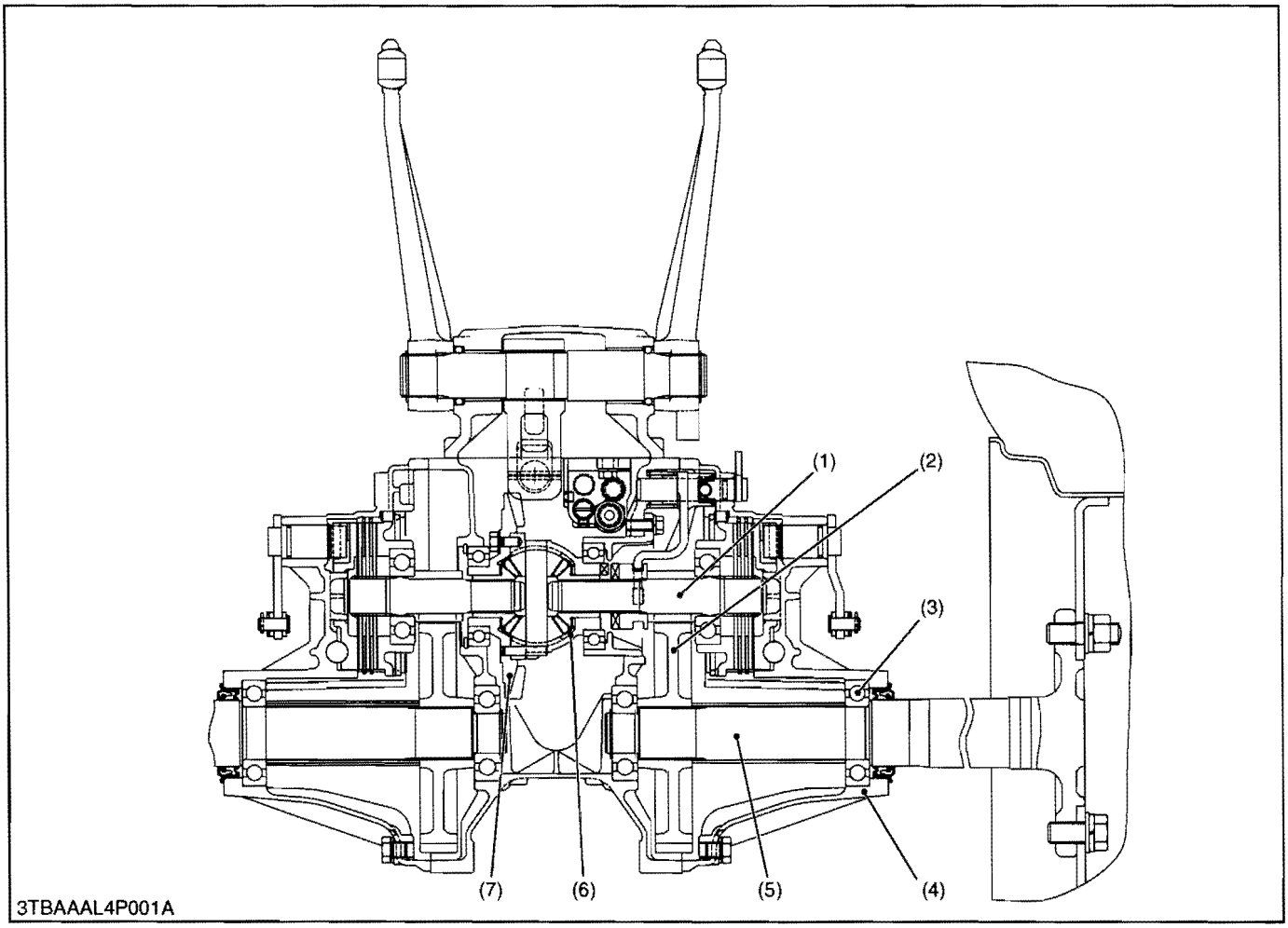
(1) Shim
(2) Bevel Gear
(3) Shim
(4) Spiral Bevel Pinion
(5) Shim
(6) Bearing Holder

W1031434

MECHANISM

CONTENTS

1. STRUCTURE



(1) Differential Gear Shaft
(2) 57T Spur Gear
(3) Ball Bearing
(4) Rear Axle Case
(5) Rear Axle
(6) Differential Gear
(7) Spiral Bevel Gear

The rear axles are the semifloating type with ball bearings (3) between the rear axle (5) and the rear axle case (4), which supports the rear wheel load as well as transmitting power to the rear wheels.

The differential gears (6) automatically controls the revolution of right and left wheels when the rear wheels encounter unequal road resistance during turning.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	Improper backlash between differential gear shaft and final reduction gear	Replace	–
	Bearing worn	Replace	–
	Insufficient or improper type of transmission fluid used	Replenish or change	G-9
Noise while Turning	Brake shaft and 57T gear and internal gear worn or damaged	Replace	4-S6

W1014322

2. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

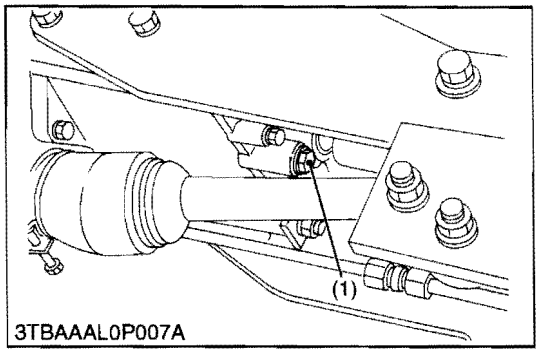
Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	145 to 150	14.8 to 15.3	107 to 111
Front loader valve pipe joint bolt	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 1 joint bolt	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe joint bolt	50 to 60	5.1 to 6.1	37 to 44
3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60	5.1 to 6.1	37 to 44
Rear axle case mounting screw	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw (M10) for aluminum	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw	48 to 55	4.9 to 5.7	36 to 41
Sub frame mounting bolt (M12) and nut	78 to 90	7.9 to 9.2	58 to 66

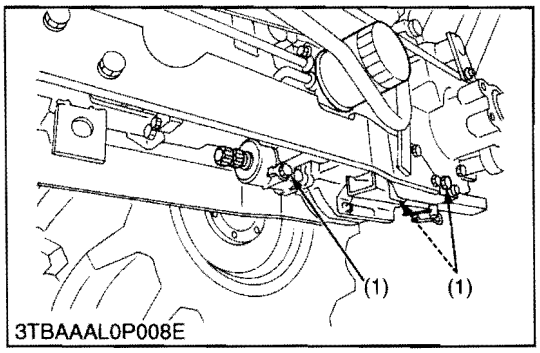
W1013038

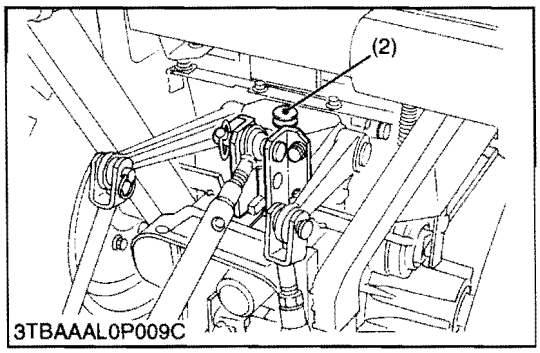
3. DISASSEMBLING AND SERVICING

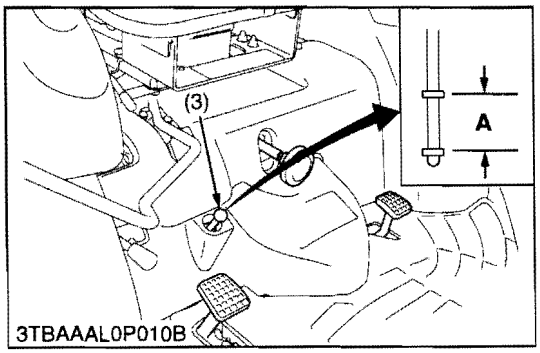
[1] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case









Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1).
2. Drain the transmission fluid.
3. Reinstall the drain plug.

(When refilling)

- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

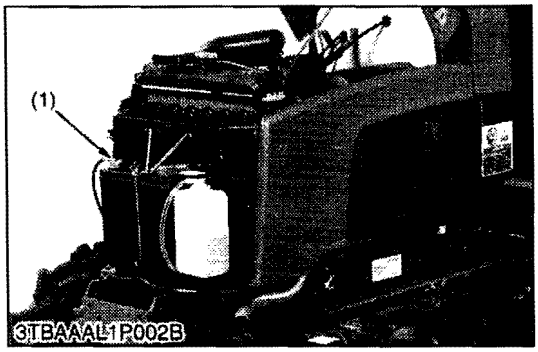
- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

(1) Drain Plug
(2) Filling Plug
(3) Dipstick

A : Proper Oil Level

W1011008



Battery Cord

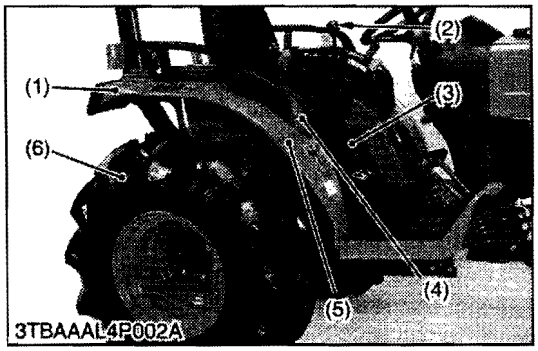
1. Open the bonnet and remove the front grille.
2. Disconnect the battery negative cord (1).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the grounding cord first. When connecting, the positive cord first.**

(1) Battery Negative Cord

W1011204



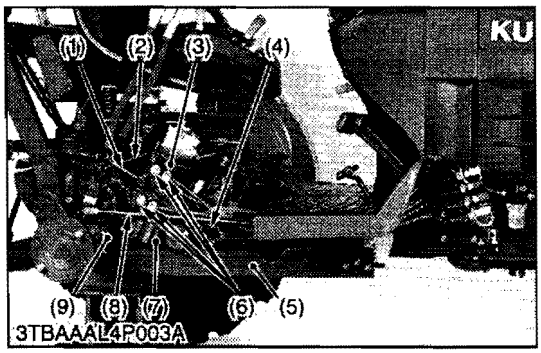
Rear Wheel and Fender

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (6).
3. Remove the loader lever (2) and seat under cover (3).
4. Remove the tail lamp (1), lever grips, lever guide (4) and fender (5).

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

(1) Tail Lamp
(2) Loader Lever
(3) Seat Under Cover
(4) Lever Guide
(5) Fender
(6) Rear Wheel

W1012021



Rear Axle Case

1. Remove the brake rod (8).
2. Remove the front loader valve pipes (6), 3-point hitch delivery pipe 2 (1) and return hose (7).
3. Remove the sub frame (5).
4. Remove the pipe clamps and disconnect the 3-point hitch delivery pipe 1 (4).
5. Remove the loader valve assembly (3).
6. Remove the differential lock rod (2).
7. Remove the rear axle case (9).

(When reassembling)

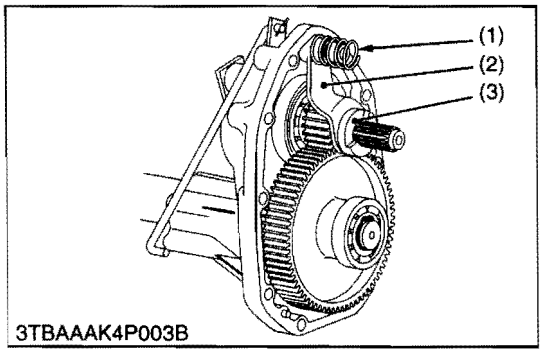
- Do not damage the O-rings of front loader valve pipes and delivery pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and differential gear case after eliminating the water and oil.

Tightening torque	Front loader valve pipe joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe joint bolt	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Rear axle case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw (M10) for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) 3-Point Hitch Delivery Pipe 2
(2) Differential Lock Rod
(3) Loader Valve Assembly
(4) 3-Point Hitch Delivery Pipe 1
(5) Sub Frame
(6) Front Loader Valve Pipe
(7) Return Hose
(8) Brake Rod
(9) Rear Axle Case

W1011334

(2) Disassembling Rear Axle Case



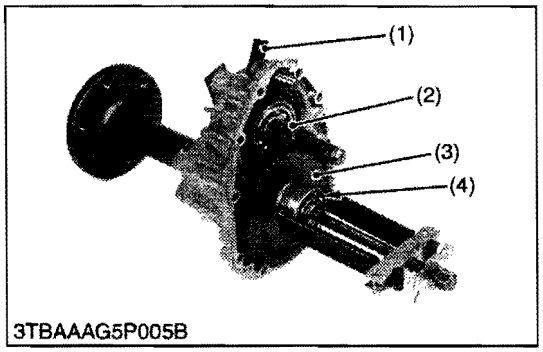
3TBAAAK4P003B

Differential Lock Shift Fork, Differential Lock Clutch (Right Side Only)

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).

(1) Spring
(2) Differential Lock Shift Fork
(3) Differential Lock Clutch

W1013833



3TBAAAG5P005B

Rear Axle Shaft

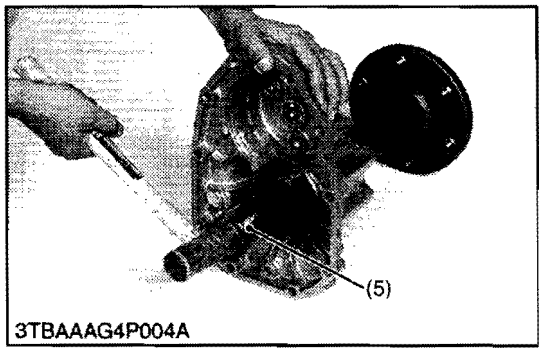
1. Remove the fork rod (1).
2. Remove the ball bearing (4) with a puller.
3. Remove the gear (3).
4. Remove the brake shaft assembly (2).
5. Tap out the rear shaft (5) with a rubber hammer to the outside.

(When reassembling)

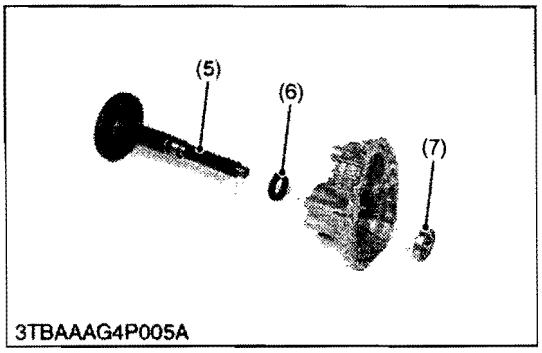
- Tap in the bearing to the rear axle case.

(1) Fork Rod
(2) Brake Shaft Assembly
(3) 57T Gear
(4) Ball Bearing
(5) Rear Axle Shaft
(6) Oil Seal
(7) Ball Bearing

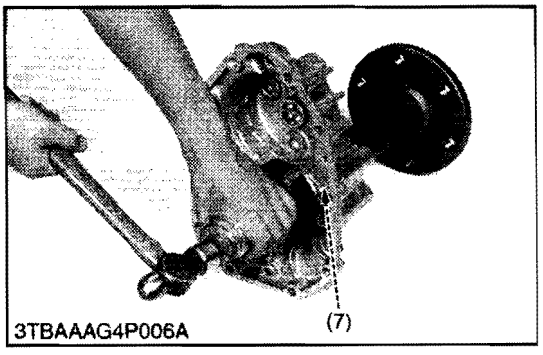
W1015288



3TBAAAG4P004A

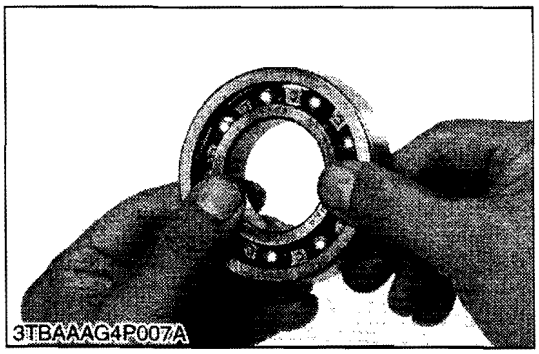


3TBAAAG4P005A



3TBAAAG4P006A

[2] SERVICING



Checking Ball Bearing

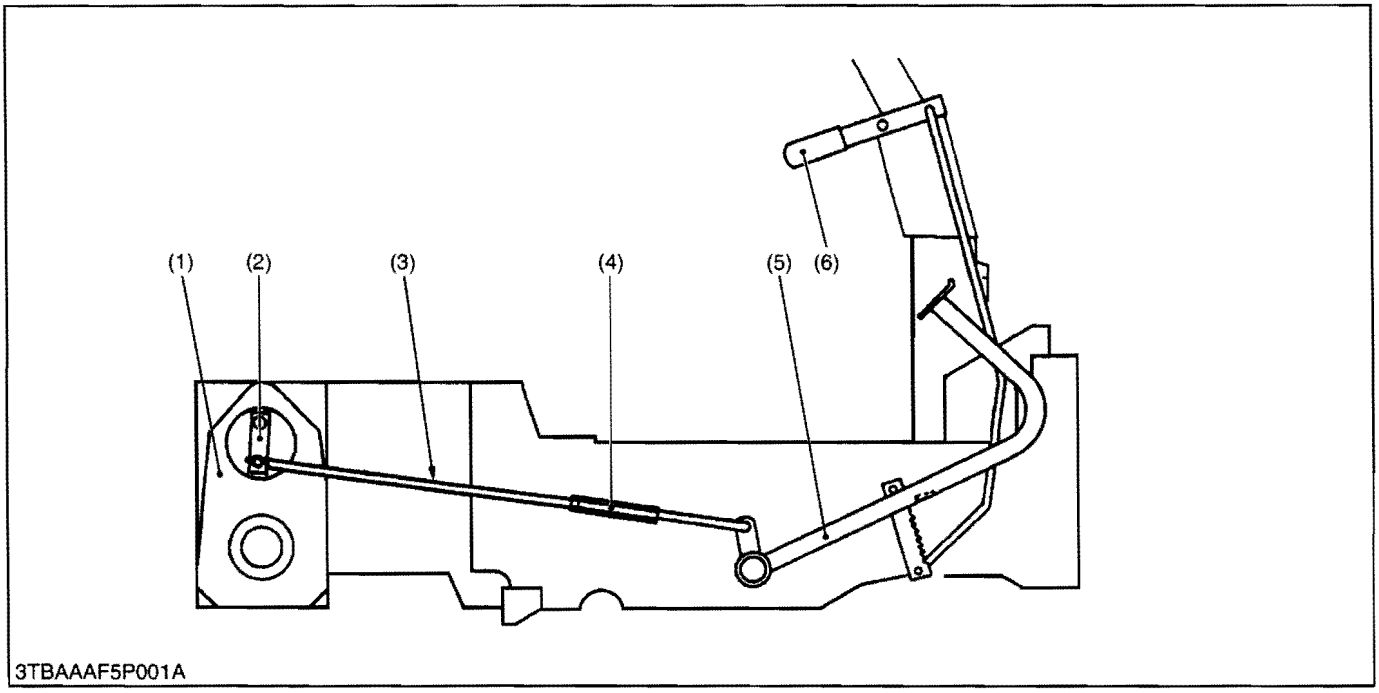
1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

W1014340

MECHANISM

CONTENTS

1. LINKAGE

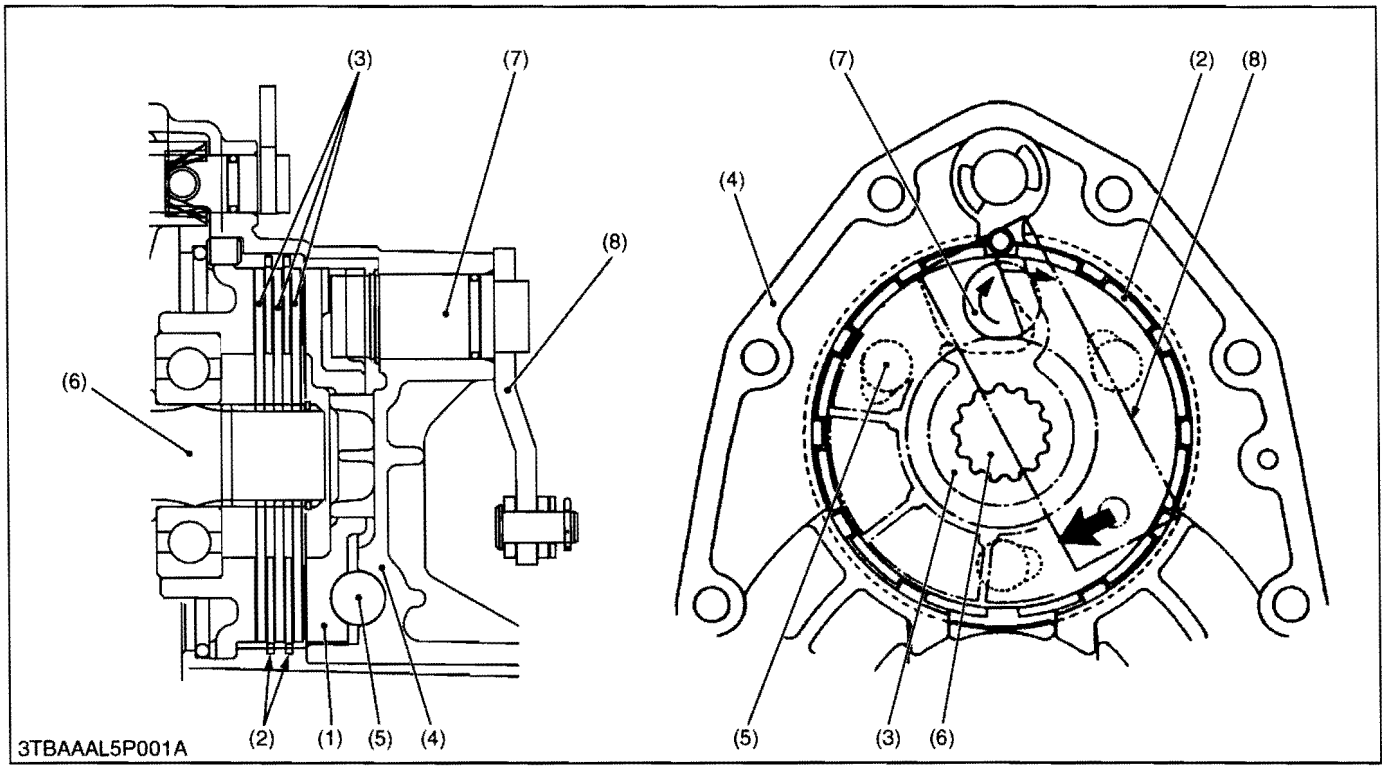


(1) Rear Axle Case
(2) Brake Cam Lever
(3) Brake Rod
(4) Turnbuckle
(5) Brake Pedal
(6) Parking Brake Lever

Independent mechanical wet disc brakes are used for the right and left traveling brakes. They are operated by the brake pedals through the mechanical linkages and provide stable braking and require little adjustment.

The parking brake is a mechanical type which is designed to actuate the traveling brakes through the linkages. Pulling the parking brake lever (6) results in the same state as the obtained when the brake pedals are depressed.

2. OPERATION



(1) Cam Plate
(2) Friction Plate
(3) Brake Disc
(4) Rear Axle Case
(5) Steel Ball
(6) Brake Shaft (Differential Gear Shaft)
(7) Brake Cam
(8) Brake Cam Lever

The brake body is incorporated in the rear axle case (4) filled with transmission oil and is designed to brake when the brake disc (3) splinted with the differential gear shaft (6) is pressed against the cam plate (1) by means of the cam mechanism incorporating steel balls (5).

For greater braking force, two brake discs are provided at the right and left sides respectively, and the friction plate (2) fixed to the rear axle case is arranged between the brake discs.

■ During Braking

When the brake pedal is pressed, the linage causes the brake cam lever (8) and brake cam (7) to turn into the direction of arrow shown in the above figure.

Therefore, the cam plate (1) also moves the direction of arrow. At this time, since the cam plate (1) rides on the steel balls (5) set in the grooves of the rear axle case to press the brake disc (3), the differential gear shaft (6) is braked by the frictional force generated by the cam plate (1) and brake disc (3).

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Uneven Braking Force	Brake pedal free travel unevenly adjusted	Adjust	5-S4
	Brake disc worn	Replace	5-S9
	Cam plate warped	Replace	5-S9
Brake Drags	Brake pedal free travel too small	Adjust	5-S4
	Ball holes of cam plate for uneven wear	Replace	5-S9
	Brake pedal return spring weaken or broken	Replace	5-S8
	Brake cam rusted	Repair	5-S9
Poor Braking Force	Brake pedal free travel excessive	Adjust	5-S4
	Brake disc worn	Replace	5-S9
	Cam plate warped	Replace	5-S9
	Brake cam or lever damaged	Replace	5-S9
	Transmission fluid improper	Change	G-9

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	30 to 40 mm 1.2 to 1.5 in.	–
Pedal Shaft to Center Frame	Clearance	0 to 0.165 mm 0 to 0.00649 in.	1.0 mm 0.039 in.
	Pedal Shaft (O.D.)	24.916 to 25.030 mm 0.98095 to 0.98543 in.	–
	Bush (I.D.)	25.030 to 25.081 mm 0.98544 to 0.98744 in.	–
Cam Plate and Bearing Holder	Flatness	–	0.30 mm 0.012 in.
Cam Plate and Ball	Height	22.89 to 22.99 mm 0.9012 to 0.9051 in.	22.40 mm 0.8819 in.
Brake Disc	Thickness	3.30 to 3.50 mm 0.130 to 0.137 in.	3.0 mm 0.12 in.
Friction Plate	Thickness	1.92 to 2.08 mm 0.0756 to 0.0818 in.	1.52 mm 0.0598 in.

W1013874

3. TIGHTENING TORQUES

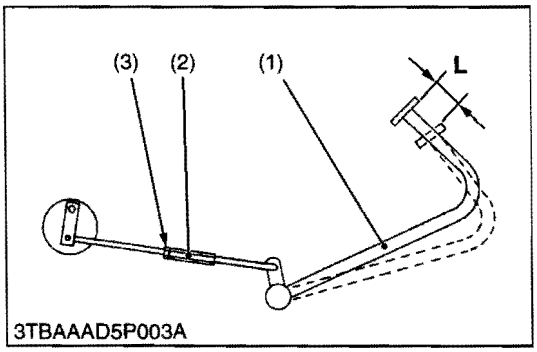
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	145 to 150	14.8 to 15.3	107 to 111
Front loader valve pipe joint bolt	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 1 joint bolt	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe joint bolt	50 to 60	5.1 to 6.1	37 to 44
3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60	5.1 to 6.1	37 to 44
Rear axle case mounting screw	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw (M10) for aluminum	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw	48 to 55	4.9 to 5.7	36 to 41
Sub frame mounting bolt (M12) and nut	78 to 90	7.9 to 9.2	58 to 66

W1013038

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Adjusting Brake Pedal Free Travel

⚠ CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**
- **The difference between the right and left pedal free travel must be less than 5 mm (0.2 in.).**

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut and turn the turnbuckle to adjust the brake rod length.
4. Retighten the lock nut securely.
5. Keep the free travel in the right and left brake pedals equal.

Brake pedal free travel (L)	Factory spec.	30 to 40 mm 1.2 to 1.5 in.

■ NOTE

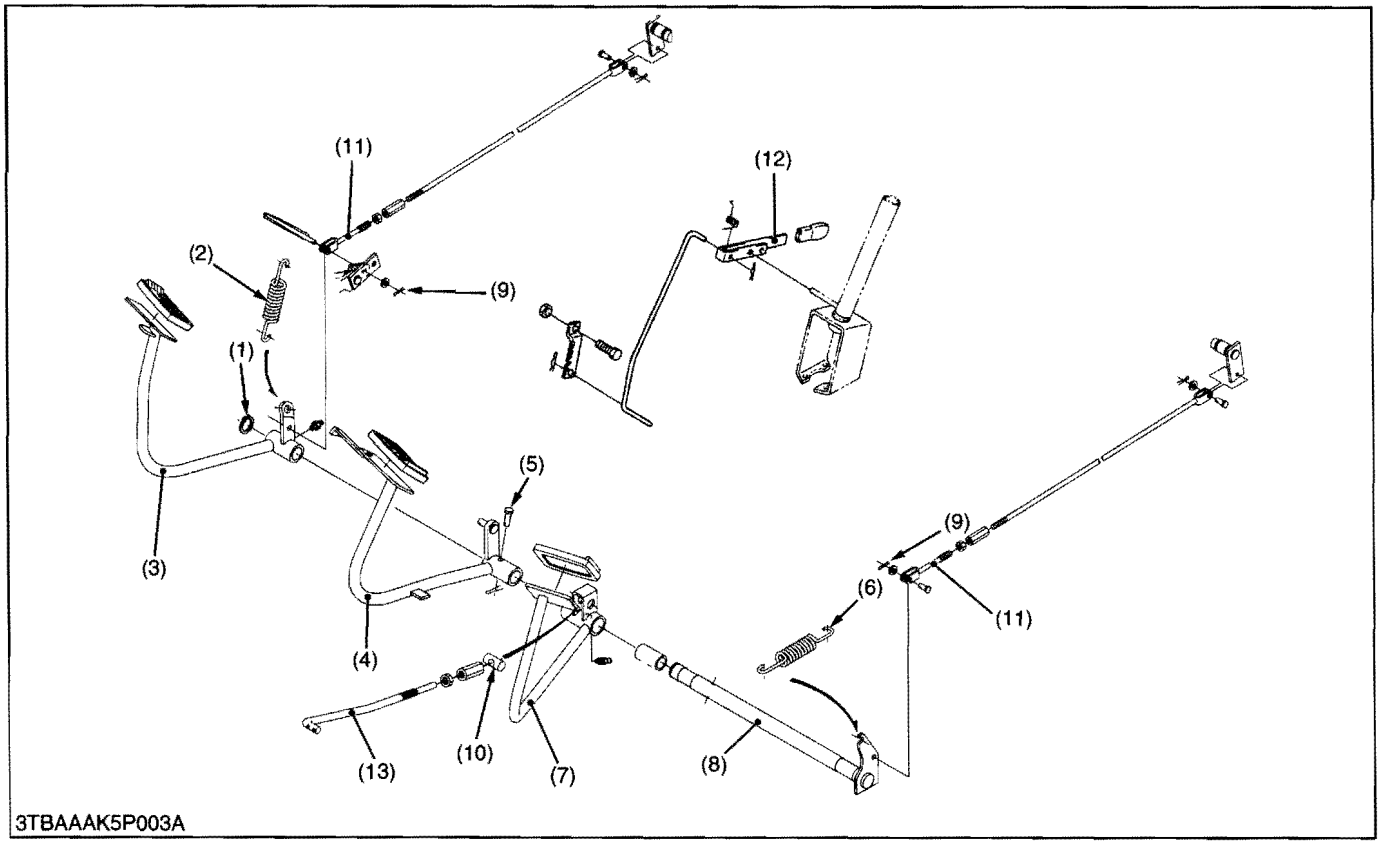
- **After checking brake pedal free travel, be sure to engage the parking brake lever fully and check to see that the brake pedals are securely locked.**

(1) Brake Pedal
(2) Turnbuckle
(3) Lock Nut
L : Free Travel

W1011243

[2] DISASSEMBLING AND ASSEMBLING

(1) Brake Pedal



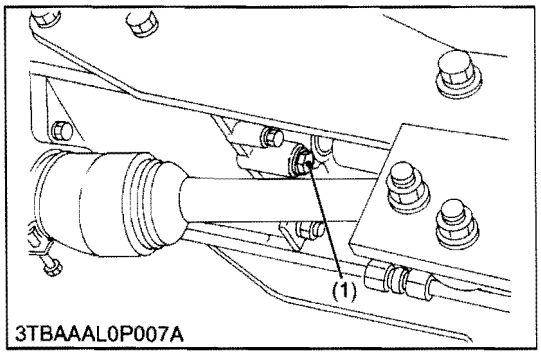
(1) External Snap Ring
(2) Return Spring
(3) Brake Pedal, R.H.
(4) Brake Pedal, L.H.
(5) Pin
(6) Return Spring
(7) Clutch Pedal
(8) Brake Pedal Shaft
(9) Cotter Pin
(10) Pin
(11) Brake Rod
(12) Parking Brake Lever
(13) Clutch Pedal Rod

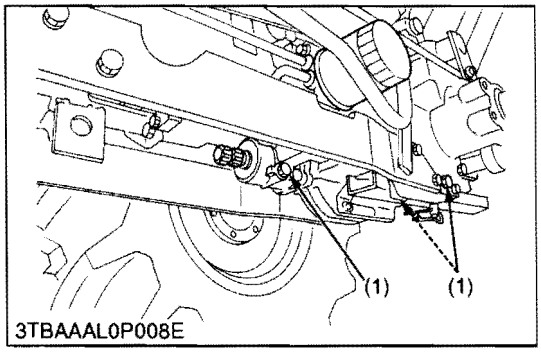
1. Remove the cotter pins (9) of brake rods (11) and pull out the brake rods (11).
2. Remove the return spring (2), (6).
3. Remove the external snap ring (1) at the end of the brake pedal shaft (8).
4. Remove the pin (5) of the brake pedal, L.H. (4).
5. Remove the clutch pedal rod (13).
6. Pull the right and left brake pedals from the brake pedal shaft (8).
7. Tap out the brake pedal shaft (8) to the left, and remove it with the clutch pedal (7).

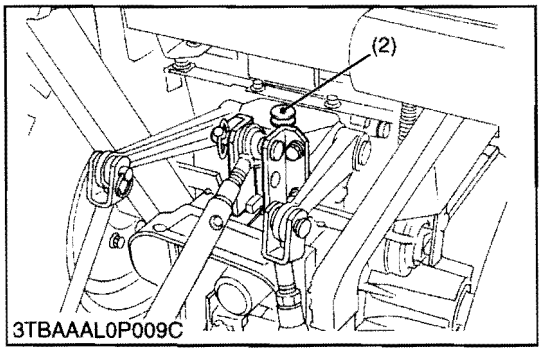
(When reassembling)

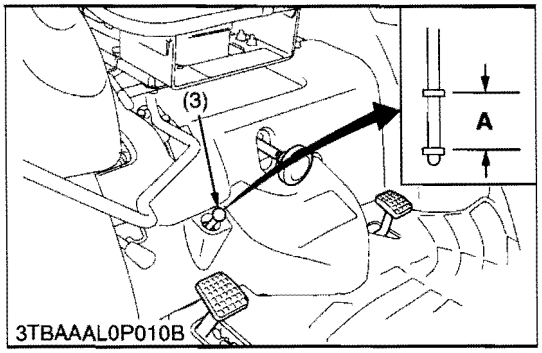
- Apply grease to the brake pedal shaft.

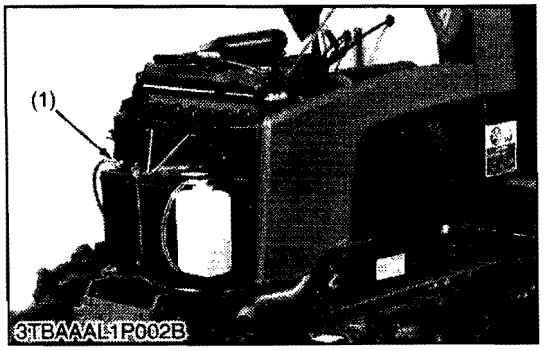
(2) Separating Rear Axle Case











Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1).
2. Drain the transmission fluid.
3. Reinstall the drain plug.

(When refilling)

- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	14.5 L 3.83 U.S.gals 3.19 Imp.gals

(1) Drain Plug
(2) Filling Plug
(3) Dipstick

A : Proper Oil Level

W1011695

Battery Cord

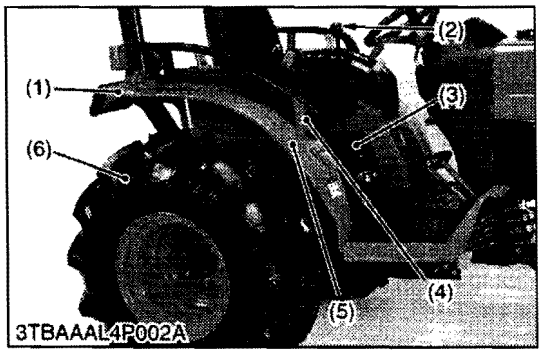
1. Open the bonnet and remove the front grille.
2. Disconnect the battery negative cord (1).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the grounding cord first. When connecting, the positive cord first.**

(1) Battery Negative Cord

W1011204



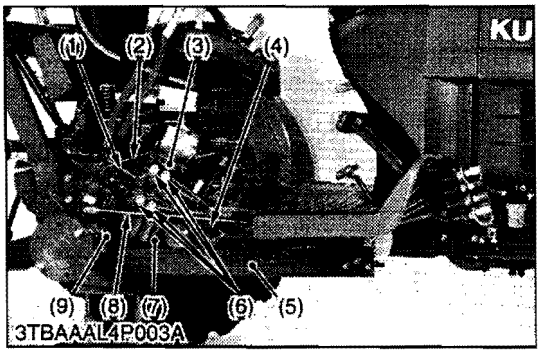
Rear Wheel and Fender

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (6).
3. Remove the loader lever (2) and seat under cover (3).
4. Remove the tail lamp (1), lever grips, lever guide (4) and fender (5).

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

(1) Tail Lamp
(2) Loader Lever
(3) Seat Under Cover
(4) Lever Guide
(5) Fender
(6) Rear Wheel

W1011972



Rear Axle Case

1. Remove the brake rod (8).
2. Remove the front loader valve pipes (6), 3-point hitch delivery pipe 2 (1) and return hose (7).
3. Remove the sub frame (5).
4. Remove the pipe clamps and disconnect the 3-point hitch delivery pipe 1 (4).
5. Remove the loader valve assembly (3).
6. Remove the differential lock rod (2).
7. Remove the rear axle case (9).

(When reassembling)

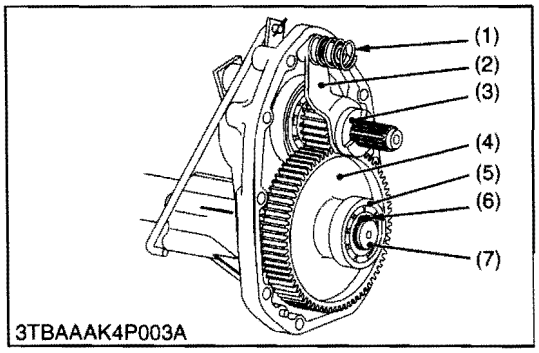
- Do not damage the O-rings of front loader valve pipes and delivery pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and differential gear case after eliminating the water and oil.

Tightening torque	Front loader valve pipe joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe joint bolt	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Rear axle case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw (M10) for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) 3-Point Hitch Delivery Pipe 2
(2) Differential Lock Rod
(3) Loader Valve Assembly
(4) 3-Point Hitch Delivery Pipe 1
(5) Sub Frame
(6) Front Loader Valve Pipe
(7) Return Hose
(8) Brake Rod
(9) Rear Axle Case

W1012138

(3) Disassembling Rear Axle Case

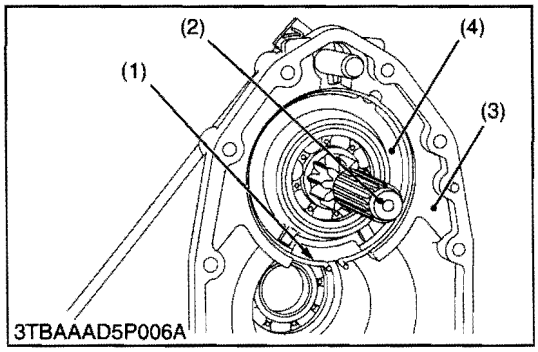


Differential Lock Shift Fork, Differential Lock Clutch (Right Side Only), 57T Gear and Rear Axle

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).
3. Remove the external snap ring (6) and remove the bearing (5).
4. Draw out the 57T gear (4) from the rear axle (7).
5. Tap out the rear axle (7) to the outside of the rear axle case.

(1) Spring
(2) Differential Lock Shift Fork
(3) Differential Lock Clutch
(4) 57T Gear
(5) Bearing
(6) External Snap Ring
(7) Rear Axle

W1014349



Brake Assembly

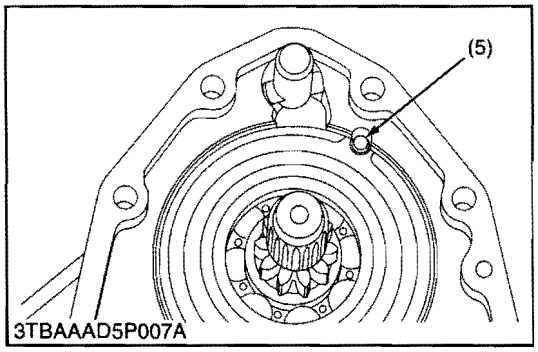
1. Remove the internal snap ring (1).
2. Remove the brake shaft (2) with brake discs.

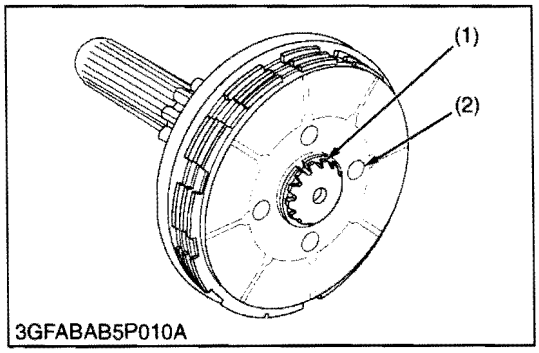
(When reassembling)

- When installing the internal snap ring (1) to rear axle case (3) as shown in the figure.
- When installing the bearing holder (4) to the rear axle case (3), do not forget to install the straight pin (5).

(1) Internal Snap Ring
(2) Brake Shaft
(3) Rear Axle Case
(4) Bearing Holder
(5) Straight Pin

W1012658





Brake Discs and Friction Plate

1. Remove the external snap ring (1), and remove the brake discs and friction plate.
2. Remove the cam plate and balls.
3. Remove the external snap ring and pull out the brake cam lever.

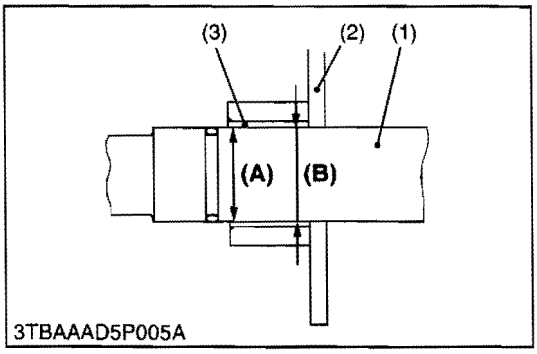
(When reassembling)

- Install the brake discs with their holes (2) deviation at less than 1/3 of the total hole area.

(1) External Snap Ring
(2) Hole

W1013079

[3] SERVICING



Clearance between Brake Pedal Shaft and Center Frame Bush

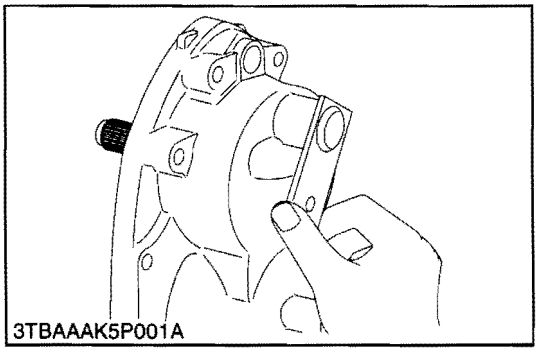
1. Measure the brake pedal shaft O.D. with an outside micrometer.
2. Measure the bush (3) I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between brake pedal shaft and center frame bush	Factory spec.	0 to 0.165 mm 0 to 0.00649 in.
	Allowable limit	1.0 mm 0.039 in.

Brake pedal shaft O.D.	Factory spec.	24.916 to 25.030 mm 0.98095 to 0.98543 in.
Center frame bush I.D.	Factory spec.	25.030 to 25.081 mm 0.98544 to 0.98744 in.

(1) Brake Pedal Shaft
(2) Center Frame
(3) Bush
(A) Bush I.D.
(B) Brake Pedal Shaft O.D.

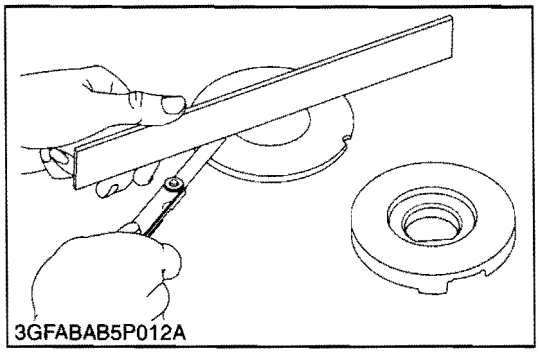
W1013384



Brake Cam Lever Movement

1. Move the brake cam lever by hand to check the movement.
2. If the movement is heavy, refine the brake cam with emery paper.

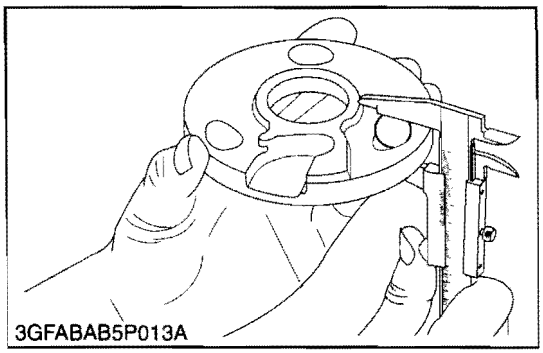
W1013621



Cam Plate Flatness and Bearing Holder Wear

1. Place a straightedge of 150 mm (5.91 in.) or more in length on the contacting surface of the cam plate and the bearing holder.
2. Inspect the friction surface of the cam plate and the bearing holder with the straightedge, and determine if a 0.30 mm (0.012 in.) feeler gauge will fit on the part of wear.
3. If it will fit, resurface.

W1013714

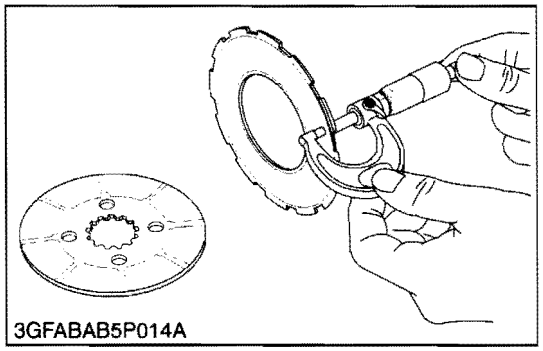

3GFABAB5P013A

Height of Cam Plate and Ball

1. Measure the dimensions of the cam plate with the ball installed.
2. If the measurement is less than the allowable limit, replace the cam plate and balls.
3. Inspect the ball holes of cam plate for uneven wear.
4. If the uneven wear is found, replace it.

Height of cam plate and ball	Factory spec.	22.89 to 22.99 mm 0.9012 to 0.9051 in.
	Allowable limit	22.40 mm 0.8819 in.

W1013814


3GFABAB5P014A

Brake Disc and Friction Plate Wear

1. Measure the brake disc thickness and the friction plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Brake disc thickness	Factory spec.	3.30 to 3.50 mm 0.130 to 0.137 in.
	Allowable limit	3.0 mm 0.12 in.

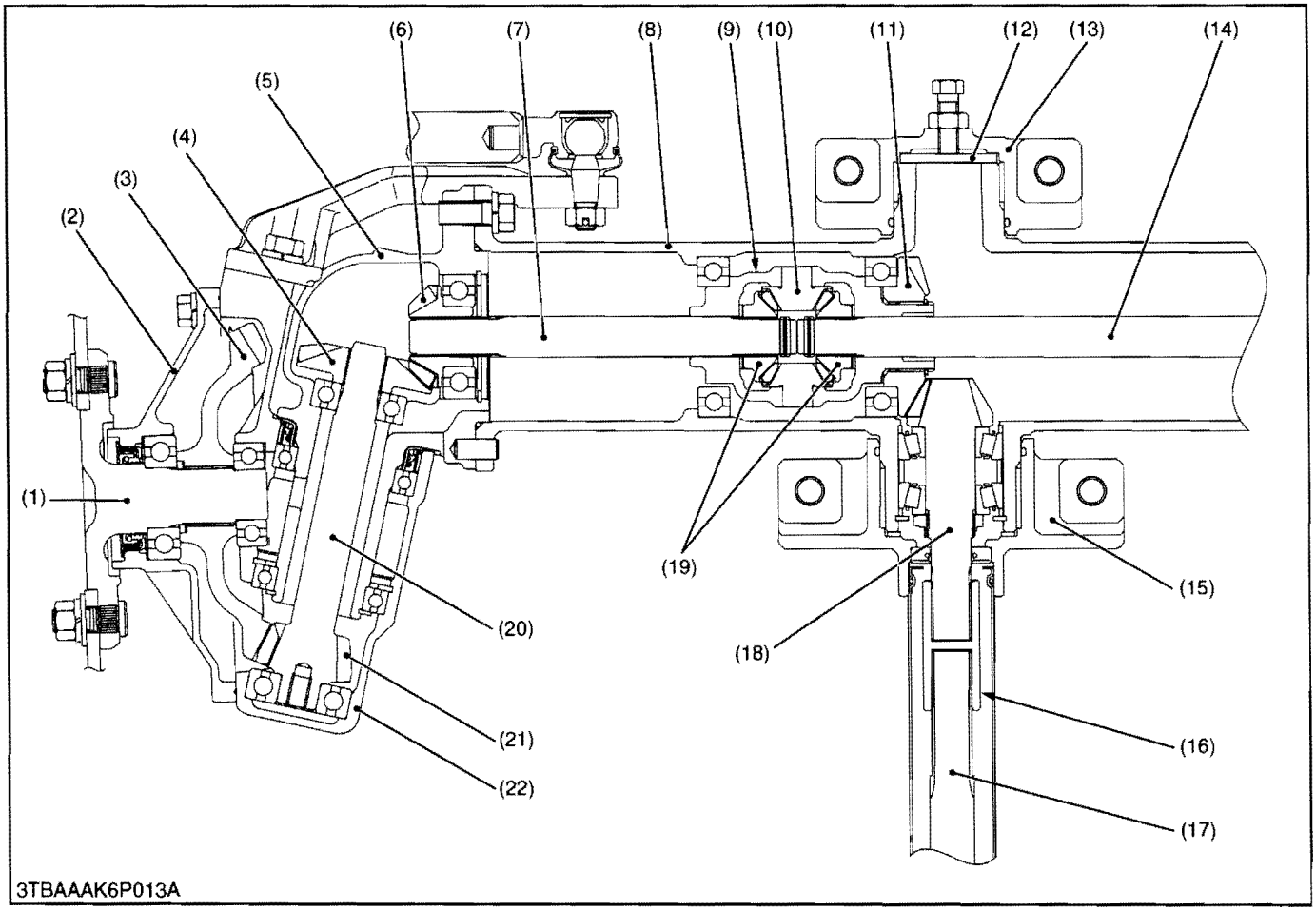
Friction plate thickness	Factory spec.	1.92 to 2.08 mm 0.0758 to 0.0818 in.
	Allowable limit	1.52 mm 0.0598 in.

W1014068

MECHANISM

CONTENTS

1. STRUCTURE



(1) Axle
(2) Axle Flange
(3) Bevel Gear
(4) Bevel Gear
(5) Bevel Gear Case
(6) Bevel Gear
(7) Differential Yoke Shaft, LH
(8) Front Axle Case
(9) Differential Gear Assembly
(10) Differential Pinion Gear
(11) Spiral Bevel Gear
(12) Collar
(13) Front Axle Bracket, Front
(14) Differential Yoke Shaft, RH
(15) Front Axle Bracket, Rear
(16) Coupling
(17) Propeller Shaft
(18) Spiral Bevel Pinion Shaft
(19) Differential Side Gear
(20) Bevel Gear Shaft
(21) Bevel Gear
(22) Bevel Gear Case

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission case through the propeller shaft (17) to the spiral bevel pinion shaft (18), then to the spiral bevel gear (11) and to the differential side gear (19).

The power through the differential side gear is transmitted to the differential yoke shaft (7), (14), and to the bevel gear shaft (20) through the bevel gears (4), (6) in the bevel gear case (5).

The revolution is greatly reduced by the bevel gears (21), (3), then the power is transmitted to the axle (1).

The differential system allows each wheel to rotate at a different speed to make turning easier.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Tire pressure uneven	Adjust	G-49
	Improper toe-in adjustment	Adjust	6-S4
	Clearance between front axle case boss and front axle bracket bushing (front, rear) excessive	Replace	6-S15
	Front axle rocking force too small	Adjust	6-S4
	Tie-rod end loose	Tighten	–
	Air sucked in power steering circuit	Bleed	–
Front Wheels Cam Not Be Driven	Front wheel driving gears in front axle gear case broken	Replace	6-S8
	Universal joint broken	Replace	3-S16
	Front wheel drive gears in transmission broken	Replace	3-S32
	Front differential gear broken	Replace	6-S11
	Coupling displaced	Reassembling	–
Noise	Gear backlash excessive	Adjust or replace	6-S12
	Oil insufficient	Replenish	6-S5
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–
	Spiral bevel pinion shaft turning force improper	Adjust	6-S14

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	0 to 20 mm 0 to 0.78 in.	–
Front Axle	Rocking Force	50.0 to 100 N 5.10 to 10.1 kgf 11.3 to 22.4 lbf	–
Differential Case to Deferential Pinion	Clearance	0.032 to 0.068 mm 0.0013 to 0.0026 in.	0.2 mm 0.008 in.
	Differential Case (I.D.)	15.000 to 15.018 mm 0.59056 to 0.59125 in.	–
	Differential Case (O.D.)	14.950 to 14.968 mm 0.58859 to 0.58929 in.	–
Spiral Bevel Pinion Shaft	Turning Torque	0.80 to 1.0 N·m 0.082 to 0.10 kgf·m 0.59 to 0.73 lbf·ft	–
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.01 in.	–
10T Bevel Gear to 16T Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.01 in.	–
Front Axle Case Boss to Bracket Bushing (Front)	Clearance	0.125 to 0.280 mm 0.00493 to 0.0110 in.	0.45 mm 0.018 in.
	Front Axle Case Boss (O.D.)	49.950 to 49.975 mm 1.9666 to 1.9675 in.	–
	Bracket Bushing (I.D.)	50.10 to 50.23 mm 1.973 to 1.977 in.	–
Front Axle Case Boss to Bracket Bushing (Rear)	Clearance	0.0900 to 0.250 mm 0.00355 to 0.00984 in.	0.45 mm 0.018 in.
	Front Axle Case Boss (O.D.)	64.940 to 64.970 mm 2.5567 to 2.5578 in.	–
	Bracket Bushing (I.D.)	65.06 to 65.19 mm 2.562 to 2.566 in.	–

W1013874

3. TIGHTENING TORQUES

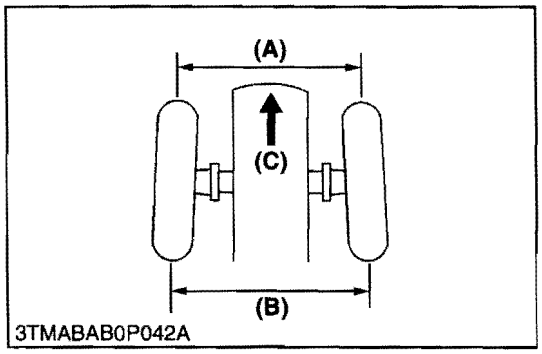
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Front wheel mounting nut	79 to 92	8.1 to 9.1	59 to 67
Drag link slotted nut	18 to 35	1.9 to 3.5	14 to 25
Front axle bracket mounting screw	124 to 147	12.6 to 15.0	91 to 108
Tie-rod slotted nut	18 to 35	1.9 to 3.5	14 to 25
Bevel gear case mounting screw	78 to 90	7.9 to 9.2	58 to 66
Knuckle arm mounting screw	103 to 117	10.5 to 12.0	76.0 to 86.7
Axle flange mounting screw	48 to 55	4.9 to 5.7	36 to 41
Differential case cover mounting screw	30 to 34	3.0 to 3.5	22 to 25

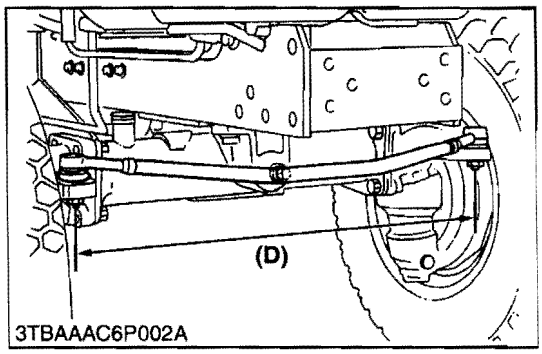
W1012736

4. CHECKING ISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

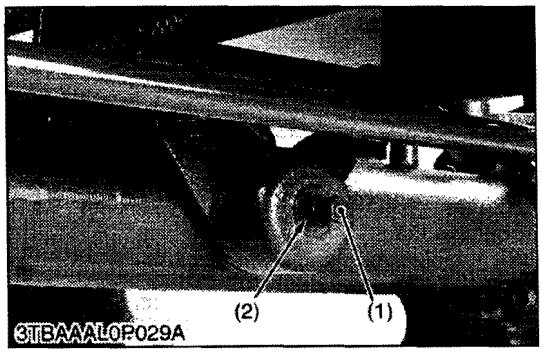


3TMABAB0P042A



3TBAAAC6P002A


3TBAAAL0P028A



3TBAAAL0P029A

Measuring Toe-in

1. Park the tractor on the flat place.
2. Inflate the tires to the specified pressure.
3. Turn steering wheel so front wheels are in the straight ahead position.
4. Lower the implement, lock the parking brake and stop the engine.
5. Measure distance between tire beads at front of tire, hub height.
6. Measure distance between tire beads at rear of tire, hub height.
7. Front distance should be 0 to 20 mm (0 to 0.78 in.) less than rear distance.
8. If the measurement is not within the factory specifications, correct the length **(D)** of tie rod and correct toe-in to be suitable for factory spec.

(Reference)

Length **(D)** : 581.5 to 584.5 mm (22.90 to 23.01 in.)

Toe-in (**B - A**)	Factory spec.	0 to 20 mm 0 to 0.78 in.

(A) Wheel to Wheel Distance at Front **(C) Front**
(B) Wheel to Wheel Distance at Rear **(D) Length of Tie Rod**

W1011400

Front Axle Rocking Force

1. Jack up the front side of tractor.
2. Set a spring balance to the front axle flange.
3. Measure the front axle rocking force.

■ **NOTE**

- **When adjusting the locking force, apply liquid gasket (Three Bond 1206D or equivalent) to the thread part of an adjusting screw.**

4. If the measurement is not within the factory specifications, adjust with the adjusting screw (1).
5. Tighten the lock nut (2) firmly.

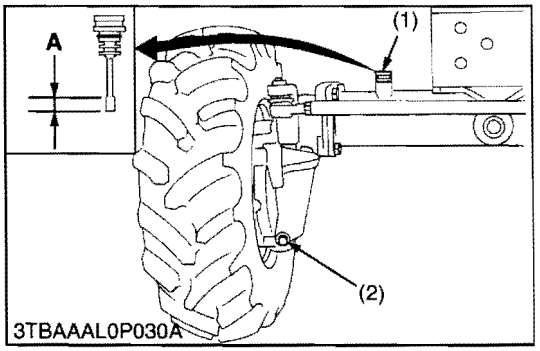
Front axle rocking force	Factory spec.	50.0 to 100 N 5.10 to 10.1 kgf 11.3 to 22.4 lbf

(1) Adjusting Screw (2) Lock Nut

W1011713

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle



Draining Front Axle Case Oil

1. Place the oil pans underneath the front axle case.
2. Remove the both right and left hand side drain plugs (1) and filling plug (2) to drain the oil.
3. After draining, reinstall the drain plugs (1).

(When refilling)

- Fill with new oil up to the upper notch on the dipstick.
- After ten minutes, check the oil level again, add oil to prescribed level.

■ IMPORTANT

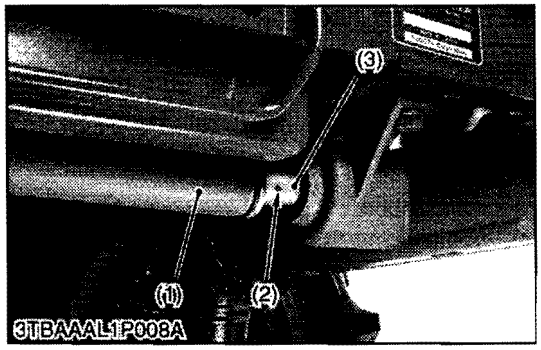
- **Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. Refer to "LUBRICNATS, FUEL AND COOLANT". (See page G-9.)**

Front axle case oil	Capacity	4.5 L 4.8 U.S.qts. 4.0 Imp.qts.

(1) Drain Plug
(2) Filling Plug with Dipstick

A : Oil level is acceptable within this range.

W1011967



Propeller Shaft Cover and Coupling

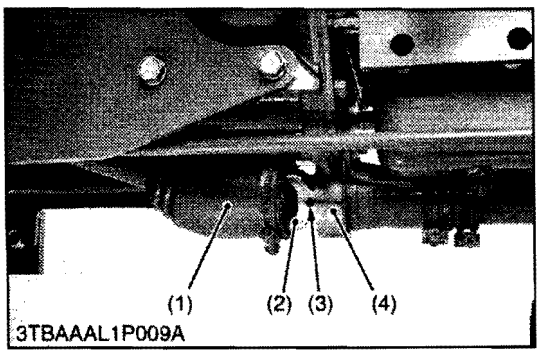
1. Loosen the clamp and slide the propeller shaft cover (1) to the rear.
2. Tap out the spring pin (2) and then slide the coupling (3) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft and coupling.

(1) Propeller Shaft Cover
(2) Spring Pin
(3) Coupling

W1028559

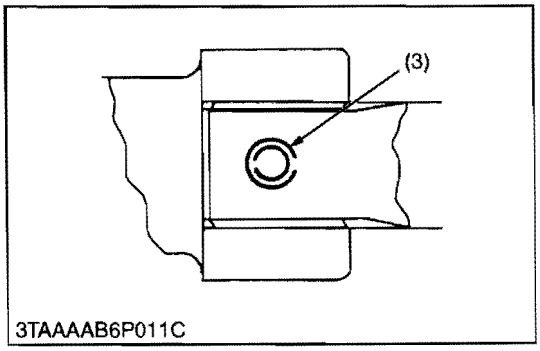


Universal Joint and Bearing Holder

1. Loosen the clamp and slide the universal joint cover (1) to the rear.
2. Tap out the spring pins (3) and then slide the universal joint (2) to the rear.
3. Remove the bearing holder (4) with propeller shaft and universal joint.

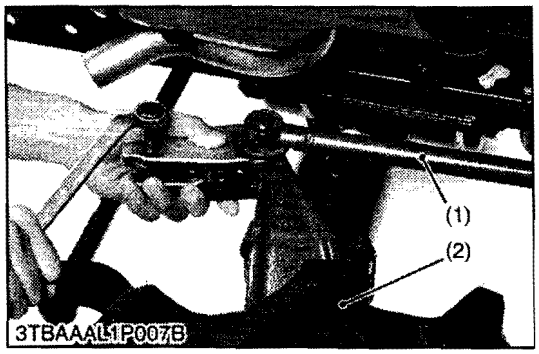
(When reassembling)

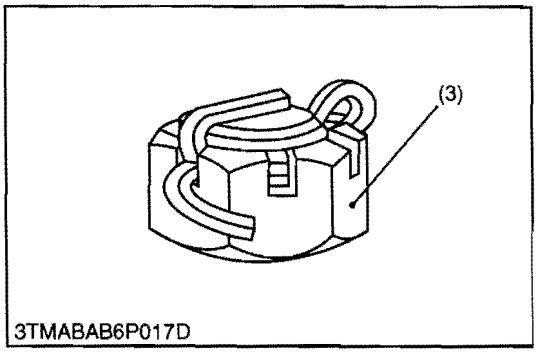
- Apply grease to the splines of the propeller shaft and universal joint.
- Replace the spring pins (3) with new one.
- When inserting the spring pins (3), face their splits in the direction parallel to the universal joint as shown in the figure.

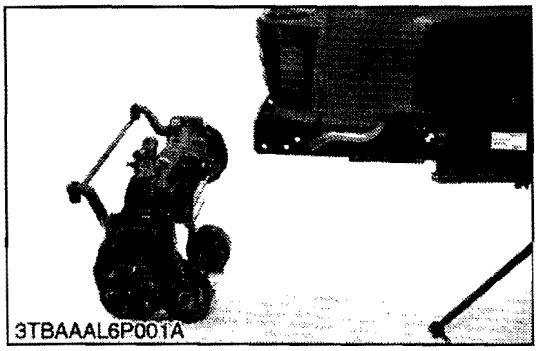


(1) Universal Joint Cover
(2) Universal Joint
(3) Spring Pin
(4) Bearing Holder

W1012047







Front Wheel and Drag Link

1. Place the disassembling stand under the front axle frame.
2. Remove the front wheels (2).
3. Remove the drag link (1) from the knuckle arm.

(When reassembling)

■ IMPORTANT

- **Do not loosen the slotted nut (3) to align the hole.**
- **Install the cotter pin as shown in the figure.**

Tightening torque	Front wheel mounting nut	79 to 92 N·m 8.1 to 9.3 kgf·m 59 to 67 lbf·ft
	Slotted nut	18 to 35 N·m 1.9 to 3.5 kgf·m 14 to 25 lbf·ft

(1) Drag Link
(2) Front Wheel
(3) Slotted Nut

W1012389

Front Axle Assembly

1. Lift up the front side of tractor and place the disassembling stand under the front axle.
2. Remove the front axle brackets (Front side and rear side) mounting screws.
3. Separating the front axle from the front axle frame.

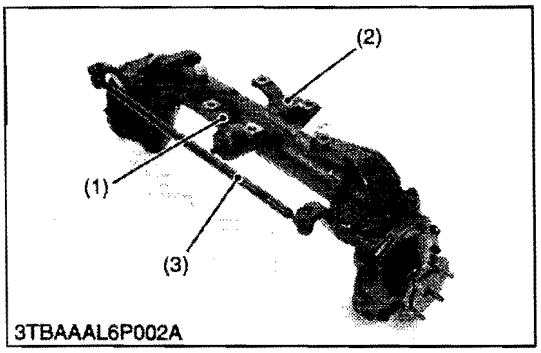
(When reassembling)

- After mounting the front axle assembly to the front axle frame, be sure to adjust the front axle rocking force. (See page 6-S4)

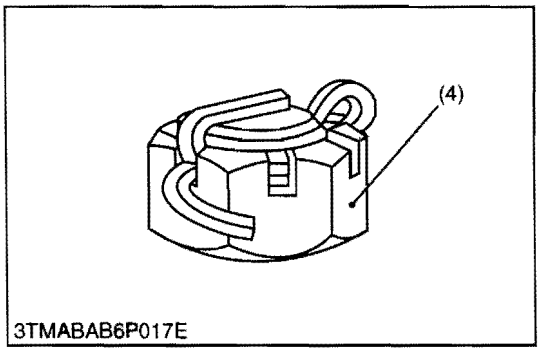
Tightening torque	Front axle bracket mounting screw	124 to 147 N·m 12.6 to 15.0 kgf·m 91 to 108 lbf·ft

W1012609

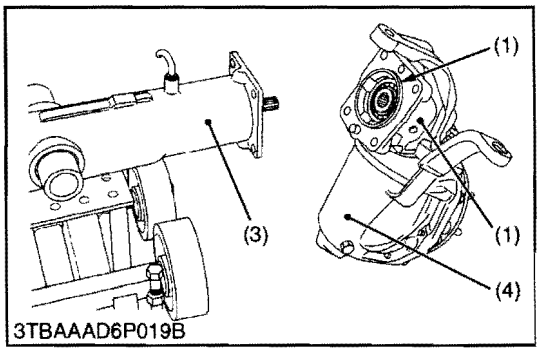
(2) Disassembling Front Axle



3TBAAAL6P002A



3TMABAB6P017E



3TBAAAD6P019B

Tie-rod and Axle Bracket

1. Remove the slotted nut and remove the tie-rod (3).
2. Remove the front axle brackets (1), (2).

(When reassembling)

- Apply grease to the thrust collars, O-ring and oil seal.
- After tightening the slotted nut (4) to the specified torque, install the cotter pin as shown in the figure.

Tightening torque	Slotted nut	18 to 35 N·m 1.9 to 3.5 kgf·m 14 to 25 lbf·ft

(1) Front Axle Bracket (Front)
(2) Front Axle Bracket (Rear)
(3) Tie-rod
(4) Slotted Nut

W1012838

Bevel Gear Case and Front Gear Case

1. Remove the bevel gear case mounting screws.
2. Remove the bevel gear case (1) and front gear case (4) as a unit from the front axle case (3).

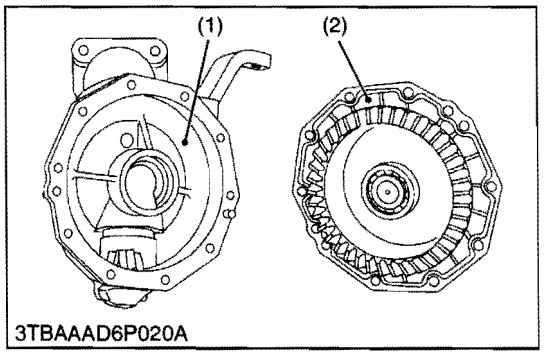
(When reassembling)

- Apply grease to the O-ring (2) and take care not to damage it.
- Do not interchange right and left bevel gear case assemblies and right and left gear case assemblies.

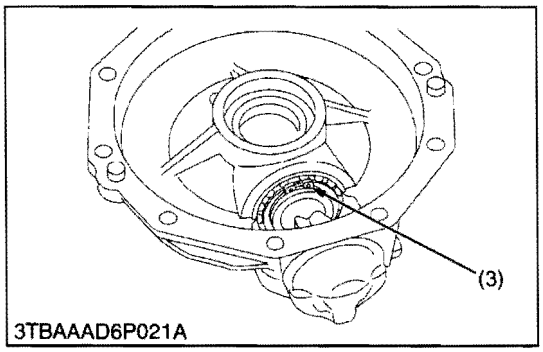
Tightening torque	Bevel gear case mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Bevel Gear Case
(2) O-ring
(3) Front Axle Case
(4) Front Gear Case

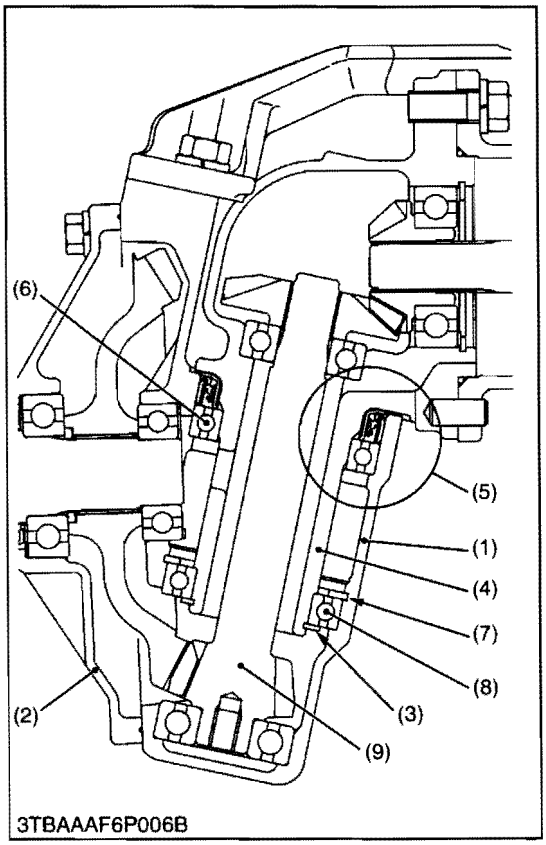
W1013120



3TBAAAD6P020A



3TBAAAD6P021A



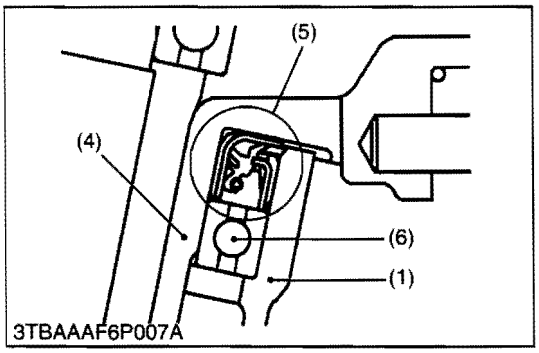
3TBAAAF6P006B

Front Gear Case

1. Remove the knuckle arm (Left side only).
2. Remove the axle flange (2).
3. Remove the external snap ring (3).
4. Remove the bevel gear case (4) from front gear case (1).
5. Remove the oil seal (5).
6. Remove the ball bearing 1 (6).
7. Remove the internal snap ring (7) and remove the ball bearing 2 (8).
8. Remove the bevel gear shaft (9) with ball bearing.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the axle flange (2) and front gear case (1) after eliminate the water, oil and stuck liquid gasket.
- Tighten the axle flange mounting screws and nuts diagonally in several steps.
- Install the oil seal (5) of bevel gear case, noting its direction as shown in the figure.

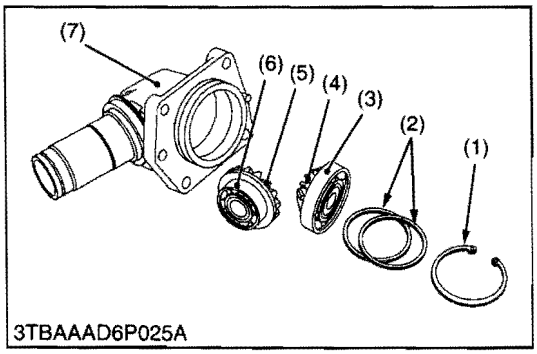


3TBAAAF6P007A

Tightening torque	Knuckle arm mounting screw	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
	Axle flange mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

(1) Front Gear Case
(2) Axle Flange
(3) External Snap Ring
(4) Bevel Gear Case
(5) Oil Seal
(6) Ball Bearing 1
(7) Internal Snap Ring
(8) Ball Bearing 2
(9) Bevel Gear Shaft

W1013333



Bevel Gear Case Gears

1. Remove the internal snap ring (1).
2. Take out the bevel gears (4), (5) with ball bearings (3), (6) and shims (2).

(When reassembling)

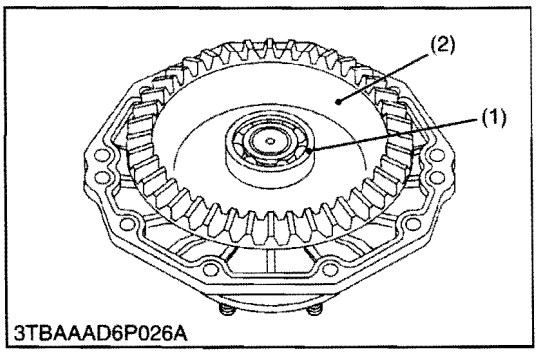
- Install the shims (2) to their original position.

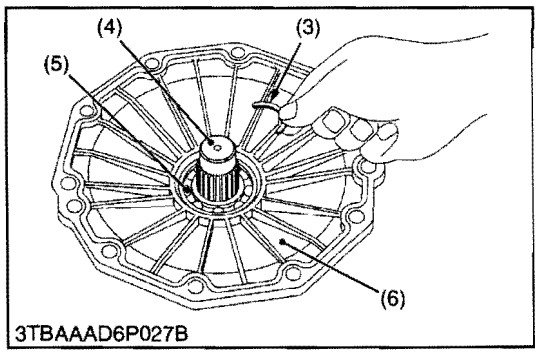
(Reference)

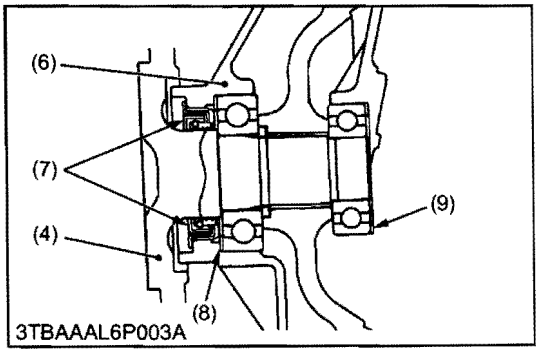
- Thickness of adjusting shims :
  0.8 mm (0.03 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)
  1.4 mm (0.055 in.)

(1) Internal Snap Ring
(2) Shim
(3) Ball Bearing
(4) Bevel Gear
(5) Bevel Gear
(6) Ball Bearing
(7) Bevel Gear Case

W1014040







Axle

1. Remove the ball bearing (1).
2. Take out the bevel gear (2).
3. Take out the collar (3).
4. Tap out the axle (4).

(When reassembling)

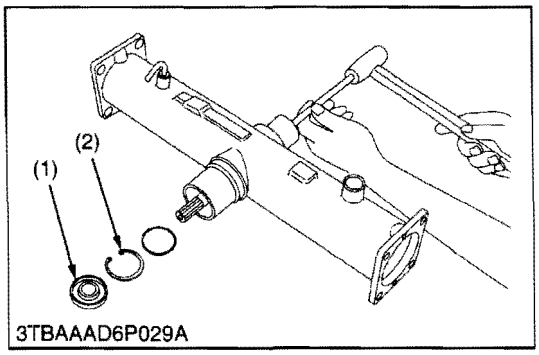
- Install the oil seal (7) of axle flange (6), noting its direction as shown in the figure.
- Install the shims (8), (9) to their original position.

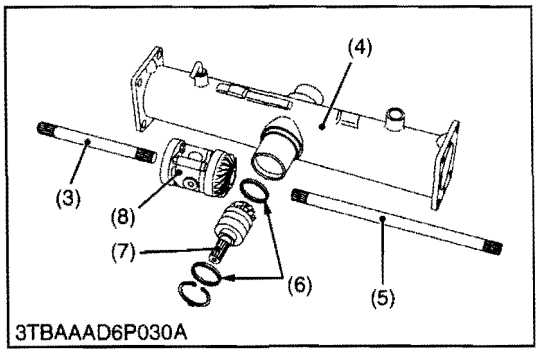
(Reference)

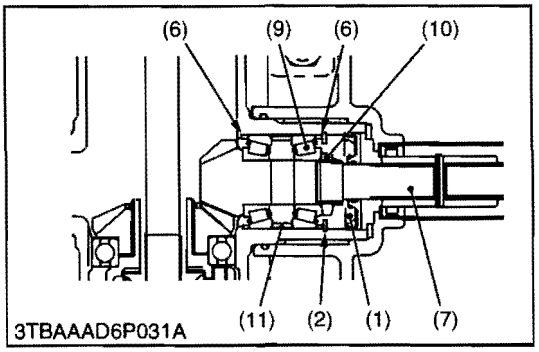
- Thickness of adjusting shim (8) :
  0.8 mm (0.03 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)
  1.4 mm (0.055 in.)
- Thickness of adjusting shim (9) :
  0.8 mm (0.03 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)

(1) Ball Bearing
(2) Bevel Gear
(3) Collar
(4) Axle
(5) Ball Bearing
(6) Axle Flange
(7) Oil Seal
(8) Shim
(9) Shim

W1014352







Spiral Bevel Pinion Shaft and Differential Gear Assembly

1. Take out the differential yoke shaft (3), (5).
2. Remove the oil seal (1).
3. Remove the internal snap ring (2).
4. Tap out the spiral bevel pinion shaft (7) by the brass rod and hammer.
5. Take out the differential gear assembly (8), from right side of front axle case (4).
6. Remove the stake of lock nut (10), and then remove the lock nut (10).
7. Remove the taper roller bearings (9).

(When reassembling)

- Apply gear oil to the taper roller bearings (9) and install them correctly, noting their direction.
- Replace the lock nut (10) and oil seal (1) with new ones.
- After tighten the lock nut (10) to the specified torque, stake it firmly.
- Install the adjusting collars (6) to their original position.

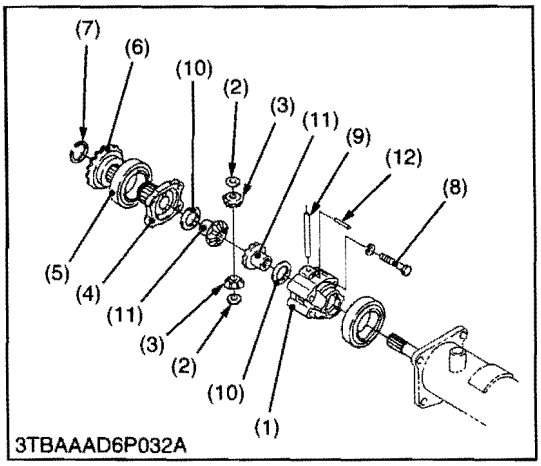
(Reference)

- Thickness of adjusting collars :

3.4 mm (0.134 in.)	4.1 mm (0.161 in.)
3.6 mm (0.142 in.)	4.2 mm (0.165 in.)
3.8 mm (0.150 in.)	4.4 mm (0.173 in.)
4.0 mm (0.157 in.)	4.6 mm (0.181 in.)

(1) Oil Seal
(2) Internal Snap Ring
(3) Differential Yoke Shaft L.H.
(4) Front Axle Case
(5) Differential Yoke Shaft R.H.
(6) Adjusting Collar
(7) Spiral Bevel Pinion Shaft
(8) Differential Gear Assembly
(9) Taper Roller Bearing
(10) Lock Nut
(11) Collar

W1013786



Differential Gear

1. Remove the differential case cover mounting screws (8) and then take out the differential case cover (4), ball bearing (5) and spiral bevel gear (6) as a unit.
2. Remove the external snap ring (7), and then remove the ball bearing (5) and spiral bevel gear (6) as a unit with a puller.
3. Remove the straight pin (12).
4. Pull out the pinion shaft (9) and take out the differential pinions (3) and differential side gears (11).

■ **NOTE**

- **Arrange the parts to know their original position.**

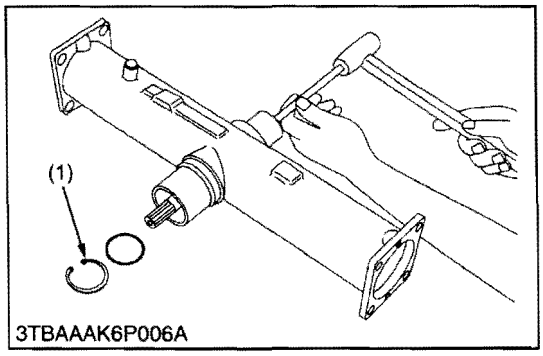
(When reassembling)

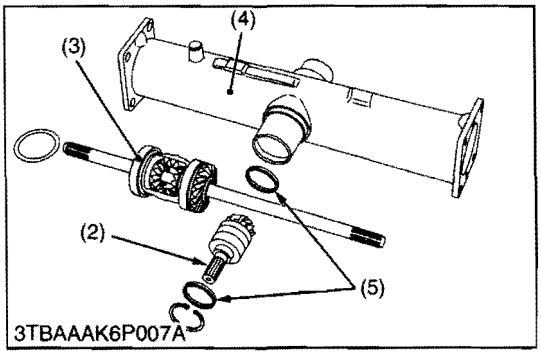
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gears (11) and differential pinions (3).
- Install the pinion shaft (9) so that the hole on it may align with the hole on differential case (1), and install the straight pin (12).

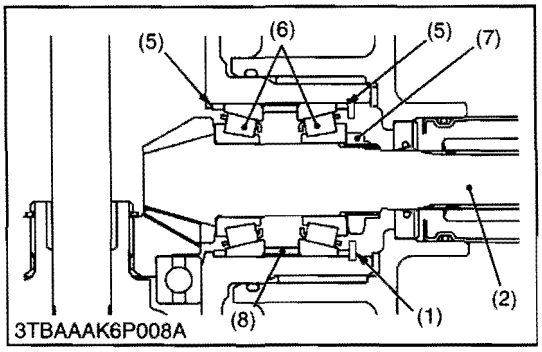
Tightening torque	Differential case cover mounting screw	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

(1) Differential Case
(2) Thrust Collar
(3) Differential Pinion
(4) Differential Case Cover
(5) Ball Bearing
(6) Spiral Bevel Gear
(7) External Snap Ring
(8) Screws
(9) Pinion Shaft
(10) Shim
(11) Differential Side Gear
(12) Straight Pin

W1014498







Spiral Bevel Pinion Shaft and Differential Gear Assembly

1. Remove the internal snap ring (1).
2. Tap out the spiral bevel pinion shaft (2) by the brass rod and hammer.
3. Take out the differential gear assembly (3) with differential yoke shafts, from right side of front axle case (4).
4. Remove the stake of lock nut (7), and then remove the lock nut (7).
5. Remove the taper roller bearings (6).

(When reassembling)

- Apply gear oil to the taper roller bearings (6) and install them correctly, nothing their direction.
- Replace the lock nut (7) with new ones.
- After tighten the lock nut (7), stake it firmly.
- Install the adjusting collars (5) to their original position.

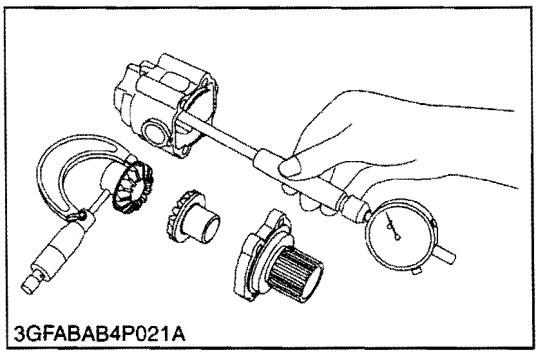
(Reference)

- Thickness of adjusting collars (8) :
  3.40 mm (0.134 in.)
  3.60 mm (0.142 in.)
  3.80 mm (0.150 in.)
  3.90 mm (0.154 in.)
  4.00 mm (0.157 in.)
  4.10 mm (0.161 in.)
  4.20 mm (0.165 in.)
  4.40 mm (0.173 in.)
  4.50 mm (0.177 in.)
  4.60 mm (0.181 in.)

(1) Internal Snap Ring
(2) Spiral Bevel Pinion Shaft
(3) Differential Gear Assembly
(4) Front Axle Case
(5) Adjusting Collar
(6) Taper Roller Bearing
(7) Lock Nut
(8) Collar

W1014712

[3] SERVICING


3GFABAB4P021A

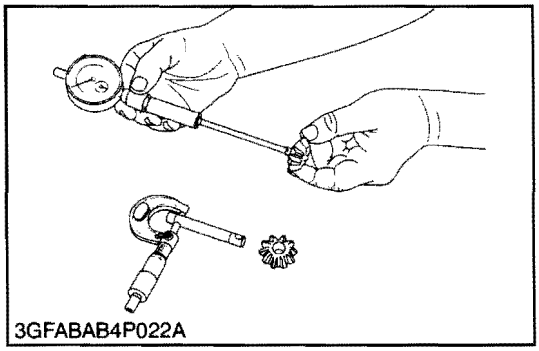
Clearance between Differential Case (Differential Case Cover) and Differential Side Gear

1. Measure the differential side gear boss O.D..
2. Measure the differential case bore I.D., and calculate the clearance.
3. Measure the differential case cover bore I.D., and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (differential case cover) and differential side gear	Factory spec.	0.040 to 0.082 mm 0.00157 to 0.00323 in.
	Allowable limit	0.17 mm 0.0067 in.

Differential case bore I.D.	Factory spec.	26.000 to 26.021 mm 1.02362 to 1.02445 in.
Differential case cover bore I.D.	Factory spec.	26.000 to 26.021 mm 1.02362 to 1.02445 in.
Differential side gear O.D.	Factory spec.	25.939 to 25.960 mm 1.02122 to 1.02205 in.

W1015152


3GFABAB4P022A

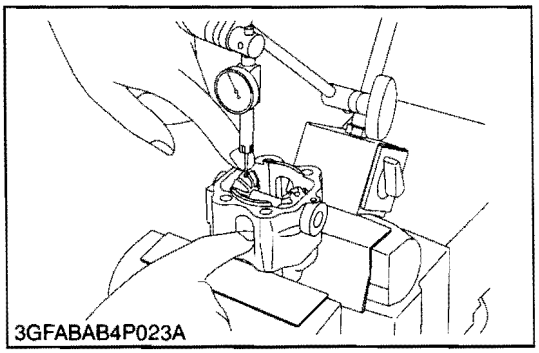
Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D..
2. Measure the differential pinion I.D., and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.038 to 0.068 mm 0.00150 to 0.00268 in.
	Allowable limit	0.17 mm 0.0067 in.

Differential pinion shaft O.D.	Factory spec.	9.972 to 9.987 mm 0.39260 to 0.39312 in.
Differential side gear I.D.	Factory spec.	10.025 to 10.040 mm 0.39469 to 0.39528 in.

W1015351


3GFABAB4P023A

Backlash between Differential Pinion and Differential Side Gear

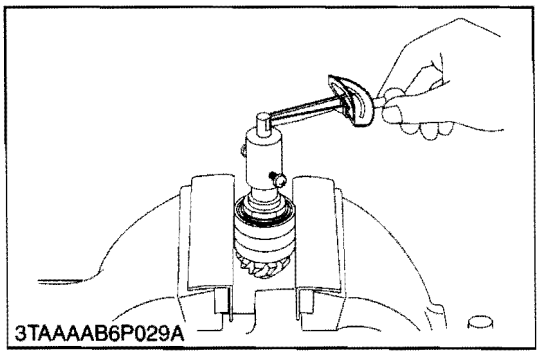
1. Set a dial gauge (lever type) on a tooth of the differential pinion.
2. Fix the differential side gear, and move the differential pinion to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.

(Reference)

- Thickness of adjusting shims :
  0.8 mm (0.031 in.), 1.0 mm (0.039 in.), 1.2 mm (0.047 in.)

W1015517


3TAAAAB6P029A

Turning Torque of Spiral Bevel Pinion Shaft

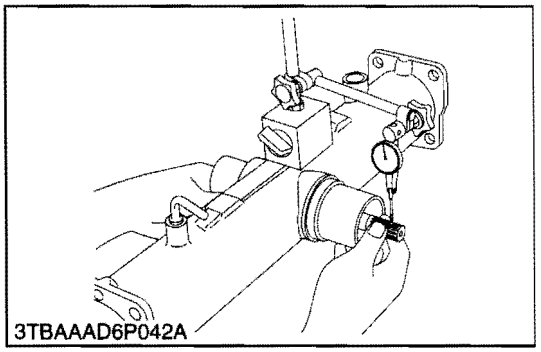
1. Cramp the spiral bevel pinion shaft assembly to the vise and tighten the staking nut.
2. Measure the turning torque of bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut.

Turning torque	Factory spec.	0.8 to 1.0 N·m 0.08 to 0.10 kgf·m 0.59 to 0.73 lbf·ft

■ **NOTE**

- **After turning force adjustment, be sure to stake the lock nut.**

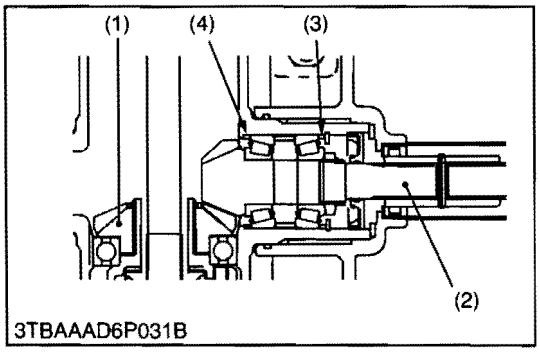
W1015673


3TBAAAD6P042A

Backlash between Spiral Bevel Pinion Shaft and Spiral Bevel Gear

1. Set a dial gauge (lever type) with its finger on the spline of spiral bevel pinion shaft.
2. Measure the backlash be moving the spiral bevel pinion shaft by hand lightly.
3. If the backlash is not within the factory specifications, change the adjusting collars (3), (4). For example change the adjusting collar (4) to 0.1 mm (0.004 in.) smaller size, and change the adjusting collar (3) to 0.1 mm (0.004 in.) larger size.
4. Adjust the backlash properly by repeating the above procedures.

Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory spec.	0.10 to 0.30 mm 0.0039 to 0.0118 in.



3TBAAAD6P031B

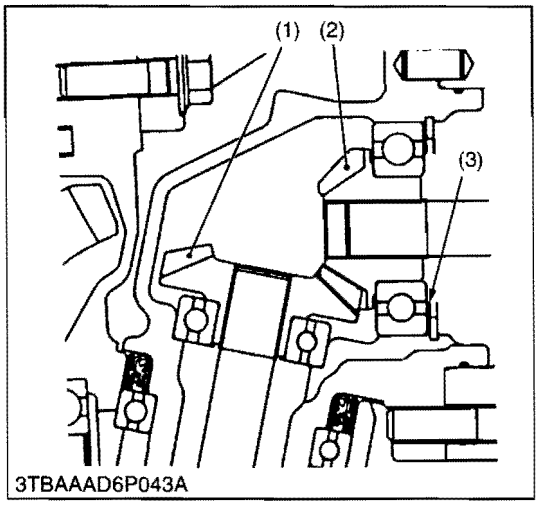
(Reference)

- Above factory specification should be measured on the tooth of spiral bevel pinion. When measuring the backlash on the spline of its shaft, factory specification will be 0.0571 to 0.1714 mm (0.00225 to 0.00675 in.).
- Thickness of adjusting collars (3), (4) :

3.4 mm (0.134 in.)	4.1 mm (0.161 in.)
3.6 mm (0.142 in.)	4.2 mm (0.165 in.)
3.8 mm (0.150 in.)	4.4 mm (0.173 in.)
4.0 mm (0.157 in.)	4.6 mm (0.181 in.)

(1) Spiral Bevel Gear
(2) Spiral Bevel Pinion Shaft
(3) Adjusting Collar
(4) Adjusting Collar

W1015894



Backlash between 11T Bevel Gear and 16T Bevel Gear

1. Stick a strip of fuse to three spots on the 16T bevel gear (1) with grease.
2. Fix the front axle case, bevel gear case and front gear case.
3. Turn the axle.
4. Remove the bevel gear case from front axle case and measure the thickness of the fuses with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

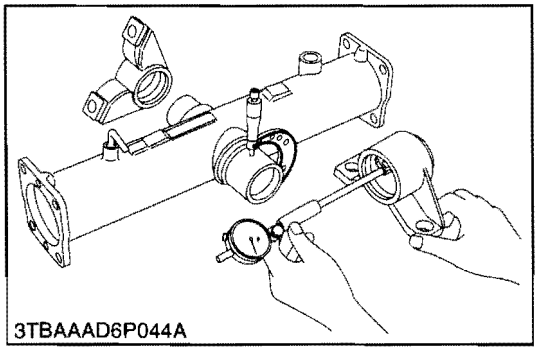
Backlash between 11T bevel gear and 16T bevel gear	Factory spec.	0.10 to 0.30 mm 0.0039 to 0.0118 in.

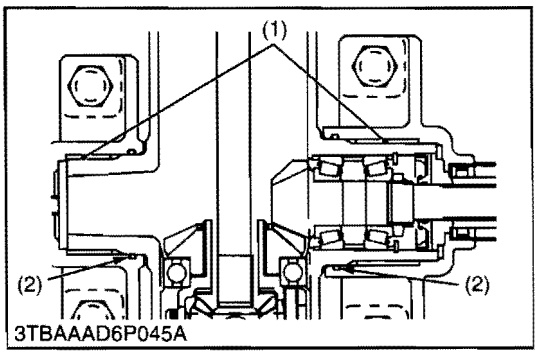
(Reference)

- Thickness of adjusting shims (3) :
  0.8 mm (0.031 in.) 1.2 mm (0.047 in.)
  1.0 mm (0.039 in.) 1.4 mm (0.055 in.)
- Tooth contact : More than 35 %

(1) 16T Bevel Gear (3) Shim
(2) 11T Bevel Gear

W1016200





Clearance between Front Axle Case Bosses and Bracket Bushing

1. Measure the front axle case bosses O.D. with an outside micrometer.
2. Measure the bracket bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bracket bushing.
4. If the clearance still exceeds the allowable limit, replace the front axle case.

Clearance between front axle case boss (front) and bracket bushing (front)	Factory spec.	0.125 to 0.280 mm 0.0049 to 0.0110 in.
	Allowable limit	0.45 mm 0.018 in.
Front axle case boss (front) O.D.	Factory spec.	49.950 to 49.975 mm 1.9665 to 1.9675 in.
Bracket bushing (front) I.D.	Factory spec.	50.10 to 50.23 mm 1.9722 to 1.9774 in.
Clearance between front axle case boss (rear) and bracket bushing (rear)	Factory spec.	0.090 to 0.250 mm 0.0035 to 0.0098 in.
	Allowable limit	0.45 mm 0.018 in.
Front axle case boss (rear) O.D.	Factory spec.	64.94 to 64.97 mm 2.5567 to 2.5579 in.
Bracket bushing (rear) I.D.	Factory spec.	65.06 to 65.19 mm 2.5614 to 2.5665 in.

■ Press-fitting Bushing

- When replacing the bushings (1), press-fit it until bushing contact to inside of front axle case.
- Apply grease to the O-rings (2) and take care not to damage it.

■ NOTE

- **After replacing the bushing, be sure to adjust the front axle rocking force. (See page 6-S4.)**

(1) Bushing (2) O-ring

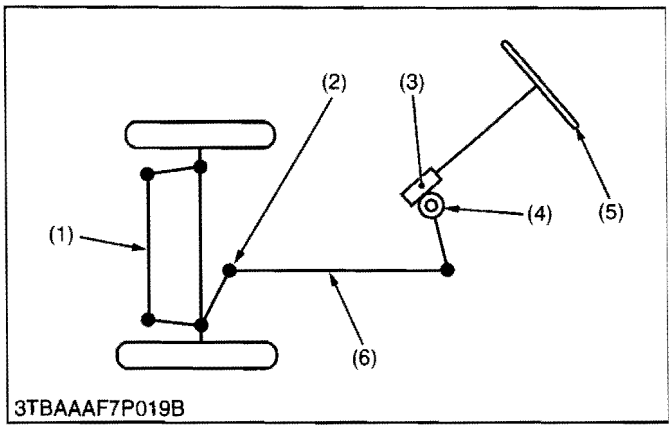
W1016511

MECHANISM

CONTENTS

1. STRUCTURE

[1] STEERING LINKAGE



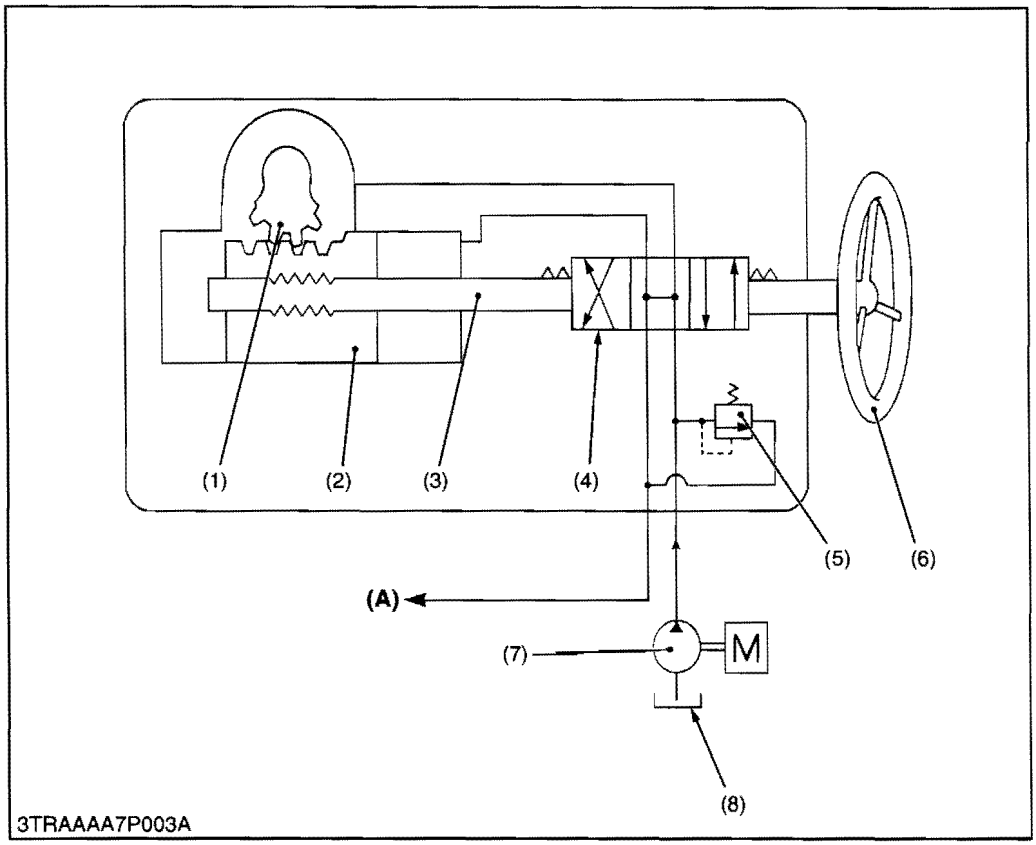
(1) Tie-rod
(2) Knuckle Arm
(3) Steering Gear Box
(4) Pitman Arm
(5) Steering Wheel
(6) Drag Link

W1012703

[2] POWER STEERING

B3200 is equipped with integral type power steering that consists of rotary type control valve with torsion bar. Hydraulic oil flow is shown as follows.

(1) Hydraulic Circuit for Power Steering System

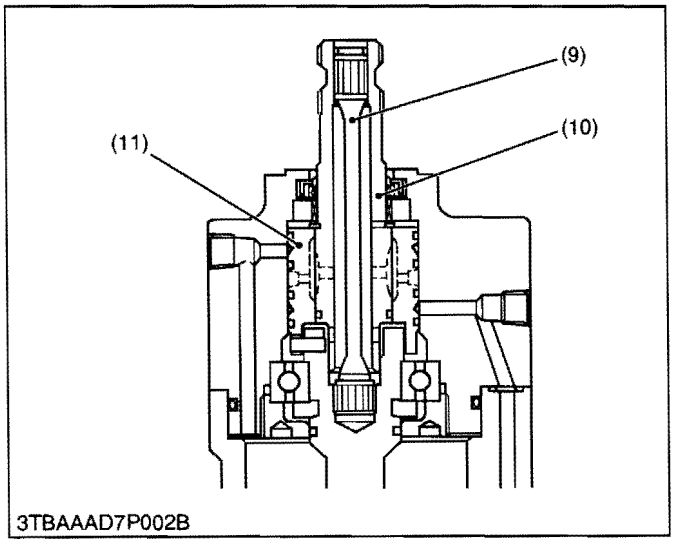


3TRAAAA7P003A

(1) Sector Gear Shaft
(2) Rack (Piston)
(3) Worm Shaft
(4) Control Valve
(5) Relief Valve
(6) Steering Wheel
(7) Pump
(12.2 L/min.
3.22 U.S.gals/min.
2.68 Imp.gals/min.)
(8) Transmission Case
(9) Torsion Bar
(10) Stub Shaft
(11) Sleeve

(A) Return Suction Line and Front Transmission Case

W1012870



3TBAAAD7P002B

This model is equipped with integral type power steering that of rotary type control valve with torsion bar. (Note that this torsion bar doubles as a centering spring)

The mechanical gear section operates in the same way as ordinary manual steering system.

The input shaft (stub shaft) (10) and the worm shaft (3), which can separate from each other, are jointed together via a torsion bar (9). One end of the torsion bar is fixed by a pin with the stub shaft (10), where as the other end is press fitted to the end of the worm shaft (3).

The control valve (4) consists of a sleeve (11) and a spool (10). The sleeve is coupled by a pin to the worm shaft (3), and the spool is provided on the stub shaft (10).

When a turning torque in either direction is given to the stub shaft (10), the counterforce of the tires is produced from the sector gear shaft (1) through the drag link, pitman arm and other parts. The torsion bar (9) then gets under torsional force. In this way, the positional relation between the sleeve (11) and spool (10) changes, thereby switching the direction of the oil flowing into the right and left cylinders.

W1013035

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Steering Wheel Play	Backlash between sector gear shaft and rack (piston) too large	Adjust	7-S5
	Steering linkage worn	Replace	–
	Sector gear shaft worn	Replace	7-S14
Tractor Pulls to Right or Left	Tire pressure uneven	Adjust	G-49
	Steering wheel play too small	Adjust	7-S5
	Improper toe-in adjustment	Adjust	6-S4
Front Wheels Vibration	Steering linkage worn	Replace	–
	Improper toe-in adjustment	Adjust	6-S4
Hard Steering	Transmission fluid improper or insufficient	Change	G-9
	Oil leak from pipe joint	Retighten	–
	Hydraulic pump malfunctioning	Replace	7-S8
	Improper relief valve adjustment	Adjust	7-S6
	Relief valve malfunctioning	Replace	7-S15
	Valve housing and sleeve malfunctioning	Replace	7-S17
	Seals in the steering gear box damaged	Replace	–
	Backlash between sector gear shaft and rack (piston) too small	Adjust	7-S5
	Air in the hydraulic pipes	Air vent	–
Low Operating Pressure	Hydraulic pump malfunctioning	Replace	7-S8
	Improper relief valve adjustment	Adjust	7-S6
	Relief valve malfunctioning	Replace	7-S15
	Seals in the steering gear box damaged	Replace	–
	Rack (piston) malfunctioning	Replace rack (piston) assembly	7-S14
	Oil leak from pipe or pipe broken	Replace	–
Steering Wheel Does Not Return to Neutral Position	Valve housing and sleeve jammed	Repair or Replace	7-S17
	Valve housing oil seal damaged	Replace	–
Steering Force Fluctuates	Insufficient oil	Replenish	G-9
	Insufficient bleeding	Bleed	–
	Valve housing and sleeve malfunctioning	Replace	7-S17
Noise	Insufficient oil	Replenish	G-9
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–

W1013718

2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP FOR POWER STEERING

Item		Factory Specification	Allowable Limit
Pump Delivery	at no pressure	12.2 L/min. 3.22 U.S.gals/min. 2.68 Imp.gals/min.	–
Gear to Casing	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft to Bushing	Clearance	0.020 to 0.091 mm 0.00079 to 0.0035 in.	0.12 mm 0.0047 in.
	Gear Shaft (O.D.)	14.970 to 14.980 mm 0.58937 to 0.58976 in.	–
	Bushing (I.D.)	15.000 to 15.061 mm 0.59056 to 0.59295 in.	–
Side Plate	Thickness	2.48 to 2.50 mm 0.0977 to 0.0984 in.	2.40 mm 0.0945 in.

W1025112

POWER STEERING

Item		Factory Specification	Allowable Limit
Steering Wheel	Operation Force Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	Less than 7 N 0.7 kgf 2 lbf	–
	Play	5.0 to 30 mm 0.20 to 1.1 in.	–
Power Steering Relief Valve	Setting Pressure Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	12.2 to 13.2 MPa 125 to 134 kgf/cm^2 1770 to 1810 psi	–
Steering Gear Box to Rack (Piston)	Clearance	0.030 to 0.079 mm 0.0012 to 0.0031 in.	0.14 mm 0.0055 in.
	Gear Box Bore (I.D.)	61.000 to 61.030 mm 2.4016 to 2.4027 in.	–
	Rack (Piston) (O.D.)	60.951 to 60.970 mm 2.3997 to 2.4003 in.	–
Rack (Piston) Assembly	Axial Play	0 to 0.02 mm 0 to 0.0007 in.	0.004 mm 0.002 in.
Valve Housing to Sleeve	Clearance	0.17 to 0.28 mm 0.0067 to 0.011 in.	0.40 mm 0.016 in.
	Sleeve (O.D.)	35.77 to 35.83 mm 1.409 to 1.410 in.	–
	Valve Housing (I.D.)	36.00 to 36.05 mm 1.418 to 1.419 in.	–
Sector Gear Shaft to Rack (Piston)	Backlash Deflection measured at pitman arm end	Less than 0.30 mm 0.012 in.	–

W1013874

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

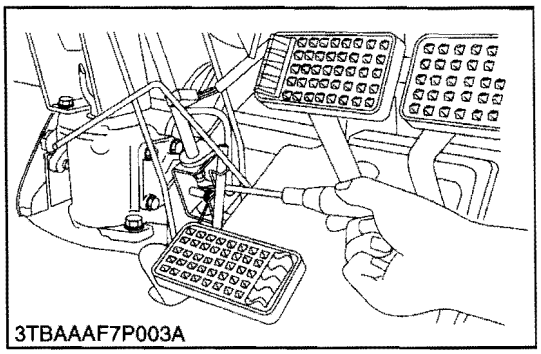
Item	N·m	kgf·m	lbf·ft
Drag link and slotted nut	18 to 35	1.9 to 3.5	14 to 25
Steering wheel mounting nut	30 to 49	3.0 to 5.0	22 to 36
Power steering delivery pipe nut	65 to 75	6.7 to 7.6	48 to 55
Return pipe nut	34 to 39	3.5 to 3.9	25 to 28
Power steering assembly mounting screw	78 to 90	7.9 to 9.2	58 to 66
Steering column mounting screw	28	2.9	21
Hydraulic pump cover mounting screw	35 to 39	3.5 to 4.0	26 to 29
Pitman arm mounting nut	140 to 150	14.3 to 15.3	103 to 111
Side cover mounting screw	20 to 29	2.0 to 3.0	15 to 21
Valve housing mounting hex. head screw	40 to 49	4.0 to 5.0	29 to 36
Plug	8.9 to 10	0.90 to 1.1	6.5 to 7.9
Relief pressure adjusting screw lock nut	49 to 78	5.0 to 8.0	37 to 57

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Power Steering System


3TBAAAF7P003A

Steering Wheel Play

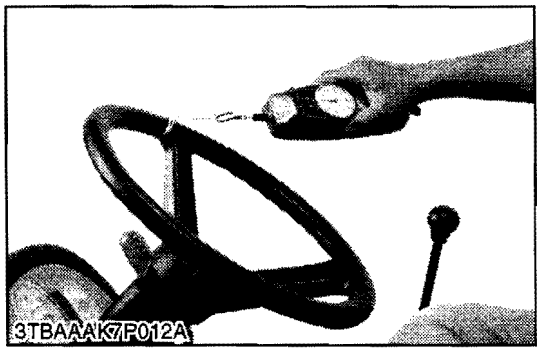
1. Turn the front wheels straight ahead.
2. Move the steering wheel back and forth until slight movement of pitman arm is seen. Measure maximum play of steering wheel at outer rim.
3. If the play is not within the factory specifications, turn the adjusting screw to adjust.

Steering wheel play	Factory spec.	5.0 to 30 mm 0.20 to 1.1 in.

(Adjusting)

1. Remove the steering wheel.
2. Remove the meter panel and panel under cover.
3. Remove the axle lever retaining screw.
4. Install the steering wheel.
5. Loosen the lock nut and turn the adjusting screw with a screw driver to adjust the play. When the adjusting screw is turned clockwise, the play decreases.
6. After adjustment, fix it with the lock nut while holding the adjusting screw.

W1011794


3TBAAAK7P012A

Steering Wheel Operating Force

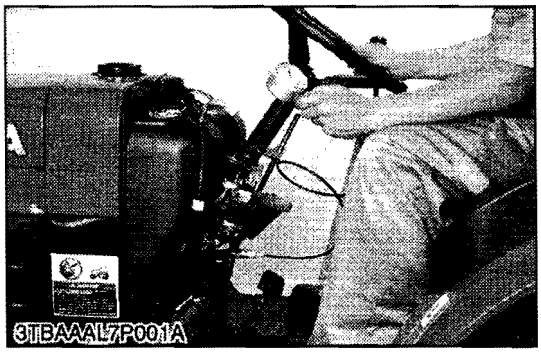
1. Park the tractor on flat concrete place.
2. Start the engine. After warming up, set the engine speed at approx. 2700 min^{-1} (rpm).
3. Set a spring balance to the steering wheel to measure the operating force.
4. If the measurement exceeds the factory specification, check the suction line, delivery line, and the performance of hydraulic pump. And then, check the power steering assembly.

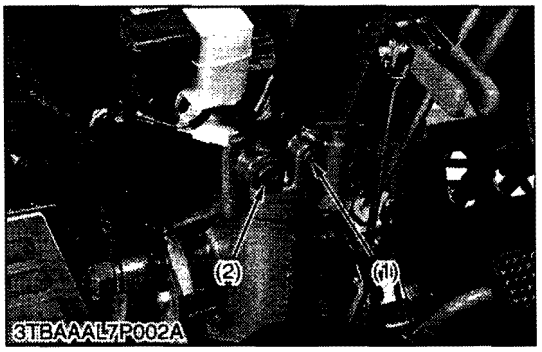
Steering wheel operating force	Factory spec.	Less than 7 N 0.7 kgf 2 lbf

Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Oil temperature ... 50 °C, 122 °F
- Tractor by itself (without any implement and weight)

W1012301





Relief Valve Setting Pressure

1. Open the bonnet and disconnect the battery grounding cord.
2. Remove the meter panel and panel under cover.
3. Remove the plug (1) of power steering body and then set the relief valve pressure tester (use adaptor **D**).
4. Start the engine. After warming up, set the engine speed at approx. 2700 min^{-1} (rpm).
5. Fully turn the steering wheel to the left end to read the relief pressure. After reading, stop the engine.
6. If the pressure is not factory specification, loosen the lock nut and adjust by adjusting screw (2).

Power steering relief valve setting pressure	Factory spec.	12.2 to 13.2 MPa 125 to 134 kgf/cm^2 1770 to 1910 psi

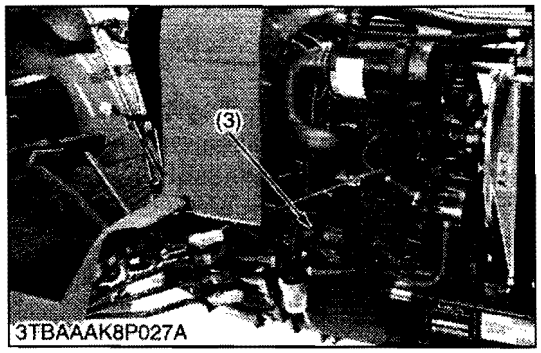
Condition

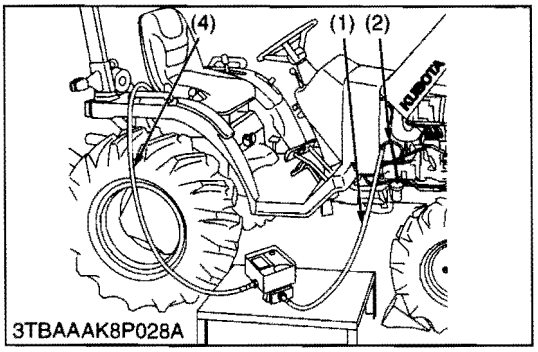
- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Oil temperature ... 50 °C, 122 °F

(1) Plug (2) Adjusting Screw

W1012497

(2) Hydraulic Pump for Power Steering





Flowmeter Connecting and Test Preparation

■ **IMPORTANT**

- **When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with that flowmeter.**
- **In this hook-up, there is no relief valve. Therefore while testing, do not close the flowmeter loading valve completely.**

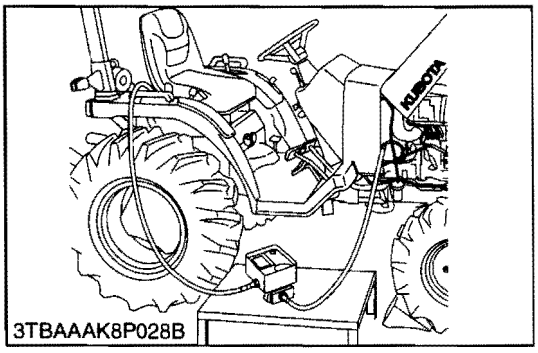
1. Remove the steering wheel, meter panel and panel under cover.
2. Remove the power steering delivery pipe.
3. Set the adaptor **66** (2) to the hydraulic pump (3).
4. Connect the hydraulic test hose (1) (Code No. 07916-52651) to the adaptor **66** and flowmeter (Code No. 07916-52791) inlet port.
5. Connect the another hydraulic test hose (4) to flowmeter outlet port and transmission oil filling port.
6. Open the flowmeter loading valve completely. (Turn counterclockwise)
7. Start the engine and set the engine speed at **2700 min^{-1} (rpm)**.
8. Slowly close the loading valve to generate the pressure **approx. 13.2 MPa (134 kgf/cm^2, 1910 psi)**.
9. Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).

(Reference)

- Adaptor is included in the adaptor set (Code No. 07916-54031).

(1) Hydraulic Test Hose
(2) Adaptor **66**
(3) Hydraulic Pump
(4) Hydraulic Test Hose

W1012786



Pump Test

■ **NOTE**

- **Before pump testing, perform the flowmeter connecting and test preparation.**

1. Open the loading valve completely.
2. Start the engine and set at approx. 2700 min^{-1} (rpm).
3. Read and note the pump delivery at no pressure.

(Reference)

Hydraulic pump delivery at no pressure	Factory spec.	Above 12.2 L/min. 3.22 U.S.gasl/min. 2.68 Imp.gals/min.

Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Rated pressure ... 13.2 MPa, 134 kgf/cm^2, 1910 psi
- Oil temperature ... 50 °C, 122 °F

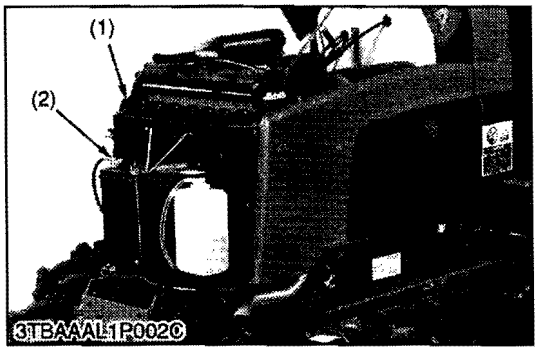
W1013121

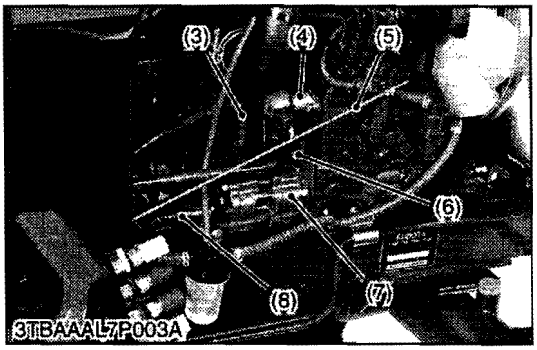
[2] PREPARATION

(1) Hydraulic Pump for Power Steering

■ **IMPORTANT**

- **The hydraulic pump is precision machined and assembled : If disassemble once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assembled except when emergency repair is unavoidable.**
- **When repair is required, follow the disassembly and servicing procedures shown below with utmost care.**
- **Be sure to test the hydraulic pump with a flowmeter before disassembling.**
- **After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.**





Removing Hydraulic Pump

1. Open the bonnet then remove the front grille, side cover (1) and disconnect the battery negative cord (2).
2. Disconnect the accelerator rod (5).
3. Disconnect the **2P** connector from the engine stop solenoid (4).
4. Disconnect the power steering delivery pipe (3) and 3-point hitch delivery pipe (6).
5. Disconnect the suction hose (8) and remove the hydraulic pump (7).

(When reassembling)

■ **NOTE**

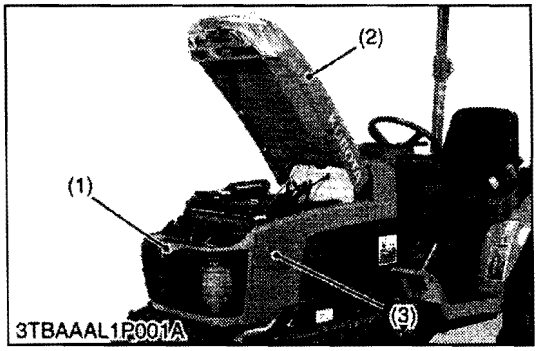
- **For fastening hydraulic pipe nut, use two wrenches. Hold the fitting with a wrench, turn the pipe nut another wrench to avoid damage at fitting installed part.**
- **When disconnecting battery cords, disconnect the negative cord first. When connecting, positive cord first.**

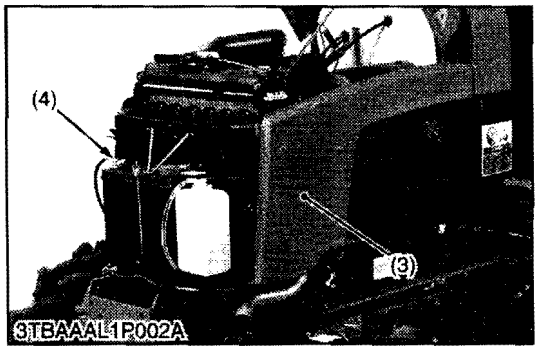
Tightening torque	Power steering delivery pipe nut	65 to 75 N·m 6.7 to 7.6 kgf·m 48 to 55 lbf·ft

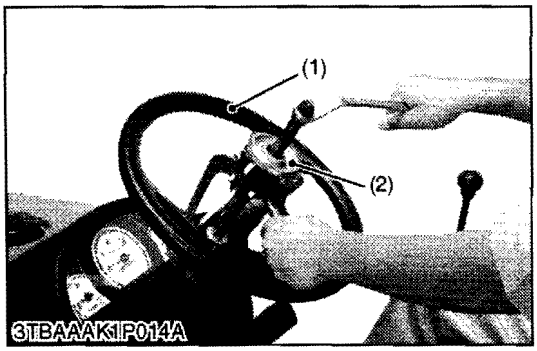
(1) Side Cover
(2) Negative Cord
(3) Power Steering Delivery Pipe
(4) Engine Stop Solenoid
(5) Accelerator Rod
(6) 3-Point Hitch Delivery Pipe
(7) Hydraulic Pump
(8) Suction Hose

W1016773

(2) Separating Power Steering Assembly







Bonnet, Front Grille, Side Cover and Battery Negative Cord

1. Open the bonnet (2) and remove the front grille (1).
2. Disconnect the negative cord (4).
3. Disconnect the head light connectors and remove the bonnet (2).
4. Remove the side covers (3).

■ **NOTE**

- **When disconnecting the battery cords, disconnect the negative cord first. When connecting, positive cord first.**

(1) Front Grille
(2) Bonnet
(3) Side Cover
(4) Battery Negative Code

W1013305

Steering Wheel

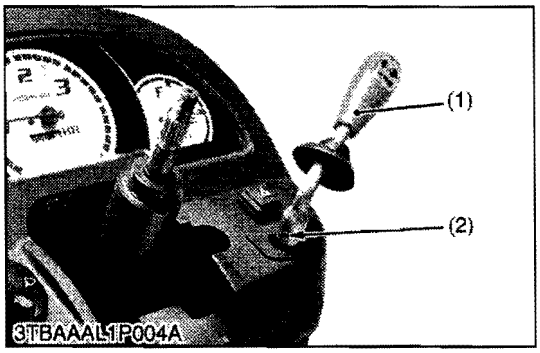
1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and remove the steering wheel (1) with a steering wheel puller (2).

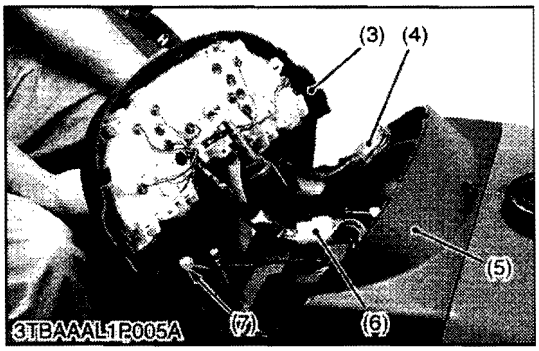
(When reassembling)

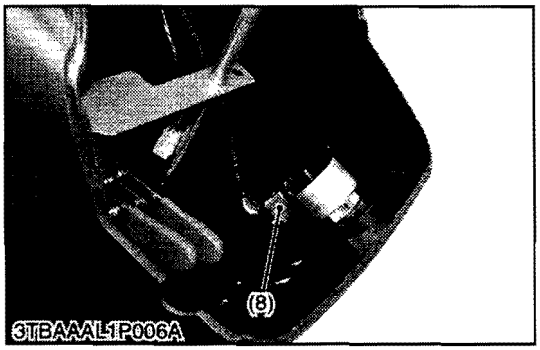
Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

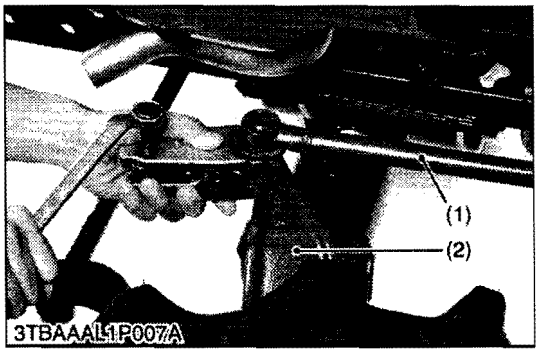
(1) Steering Wheel
(2) Steering Wheel Puller

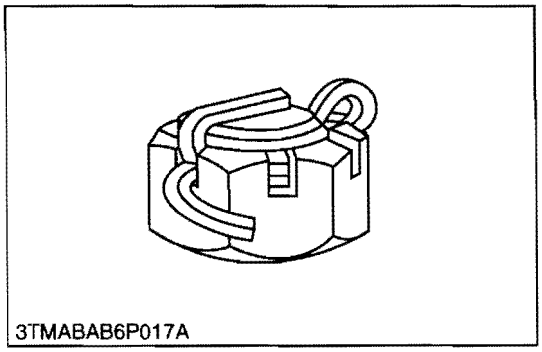
W1013886











Meter Panel and Panel Under Cover

1. Tap out the spring pin (2) and remove the hand accelerator lever (1).
2. Open the meter panel (3) and disconnect the hourmeter cable, meter panel connector (6), combination switch connector (4) and hazard switch connector (7). Then remove the meter panel (3).
3. Disconnect the main switch connector (8) and remove the panel under cover (5).

(1) Hand Accelerator Lever
(2) Spring Pin
(3) Meter Panel
(4) Combination Switch Connector
(5) Panel Under Cover
(6) Meter Panel Connector
(7) Hazard Switch Connector
(8) Main Switch Connector

W1013577

Drag Link

1. Remove the cotter pin and loosen the slotted nut.
2. Disconnect the drag link (1) with a pitman arm puller from the knuckle arm (2).

(When reassembling)

■ **IMPORTANT**

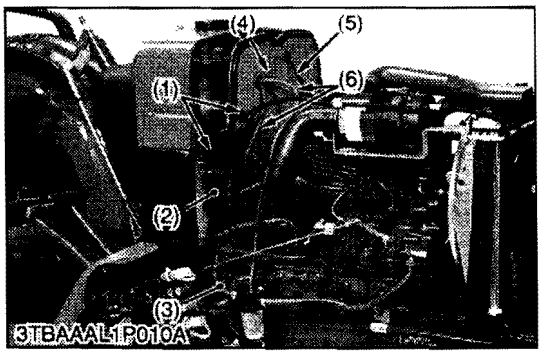
- **Do not loosen the slotted nut to align the hole.**
- **Install the cotter pin as shown in the figure.**

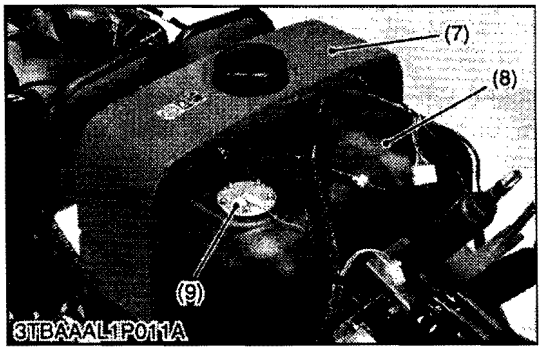
(Reference)

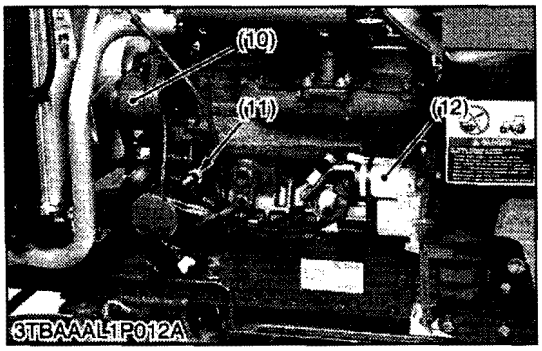
Tightening torque	Slotted nut	17.7 to 34.5 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 lbf·ft

(1) Drag Link
(2) Knuckle Arm

W1013707





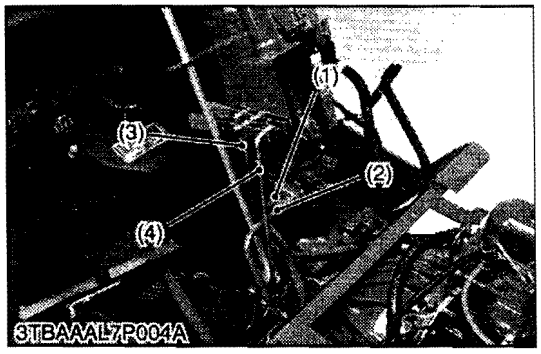


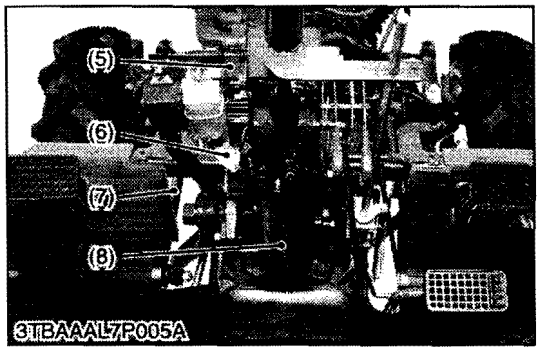
Fuel Tank and Wire Harness

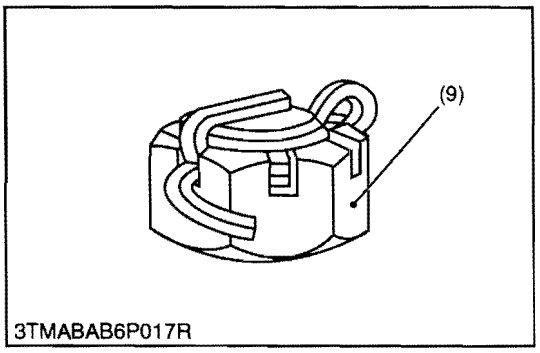
1. Disconnect the fuel hose (3) at the fuel filter side, then drain fuel completely.
2. Remove the fuse box (2) and disconnect the wire harness clamp (1).
3. Remove the fuel tank frame stay bolt (4). Disconnect the overflow hoses (6) and pull out the hour meter cable (5).
4. Disconnect the lead wires for fuel gauge and disconnect the wire harness clamps.
5. Remove the fuel tank (8) with tank frame (7).
6. Disconnect the glow plug lead wire, thermo sensor lead wire, engine stop solenoid connector, engine oil pressure switch lead wire, dynamo connector and starter motor lead wire.

(1) Wire Harness Clamp
(2) Fuse Box
(3) Fuel Hose
(4) Bolt
(5) Hour Meter Cable
(6) Overflow Hose
(7) Tank Frame
(8) Fuel Tank
(9) Fuel Gauge
(10) Dynamo
(11) Engine Oil Pressure Switch
(12) Starter Motor

W1013863







Power Steering Assembly

1. Remove the cruise control lever rod (3).
2. Remove the parking brake lever rod (4).
3. Remove the power steering delivery pipe (2).
4. Remove the return pipe (1) with return hose.
5. Remove the relay bracket (5) with relays and disconnect the connector (6) of wire harness.
6. Remove the drag link (7) from the pitman arm.
7. Remove the power steering assembly (8).

■ **IMPORTANT**

- **Do not loosen the slotted nut (9) to align the hole.**
- **Install the cotter pin as shown in the figure.**

■ **NOTE**

- **For fastening hydraulic pipe nut, use two wrenches. Hold the fitting with a wrench, turn the pipe nut with another wrench to avoid damage at fitting installed part.**

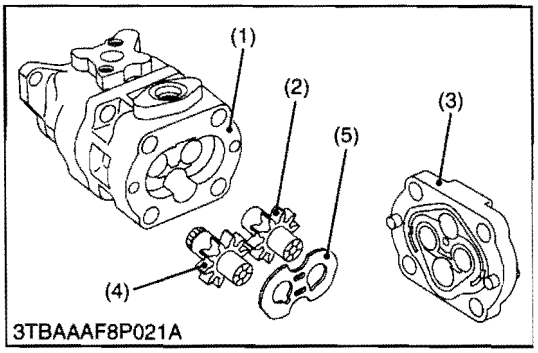
Tightening torque	Power steering delivery pipe nut	65 to 75 N·m 6.7 to 7.6 kgf·m 48 to 55 lbf·ft
	Return pipe nut	34 to 39 N·m 3.5 to 3.9 kgf·m 25 to 28 lbf·ft
	Slotted nut	18 to 35 N·m 1.9 to 3.5 kgf·m 14 to 25 lbf·ft
	Power steering assembly mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Return Pipe
(2) Power Steering Delivery Pipe
(3) Cruise Control Lever Rod
(4) Brake Lever Rod
(5) Bracket
(6) Connector
(7) Drag Link
(8) Power Steering Assembly
(9) Slotted Nut

W1022275

[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump for Power Steering



Hydraulic Pump Cover, Side Plate and Gear

1. Secure the hydraulic pump with a vise, and remove the hydraulic pump cover.
2. Remove the side plate (5).
3. Remove the drive gear (4) and driven gear (2) from the casing (1).

(When reassembling)

- Take care not to damage the O-ring.
- Align the holes of the cover and casing.
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

Tightening torque	Cover mounting screw	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 29 lbf·ft

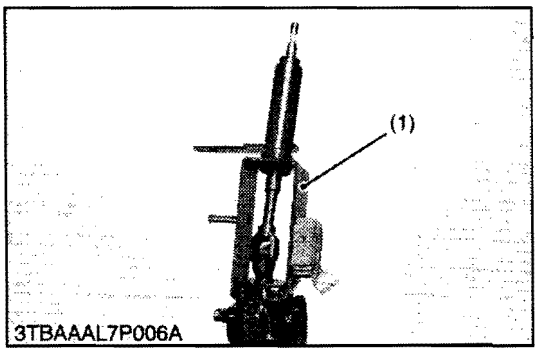
(1) Casing
(2) Driven Gear
(3) Hydraulic Pump Gear
(4) Drive Gear
(5) Side Plate

W1026263

(2) Power Steering Body

■ **NOTE**

- **Replace all the disassembled sealing parts (O-ring, U-seal, oil seal, slipper seal, etc.) with new ones.**
- **Check all the cleaned-up part for scratches, excessive wear, cracks and other defects. Place them in order on a clean workbench. Be also careful to keep off dust and dirt.**



Steering Column

1. Turn the steering shaft several times to drain oil.
2. Loose the steering column mounting screws, and remove the steering column with steering shaft and universal joint.

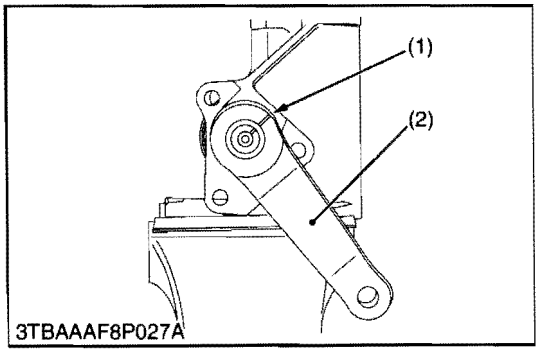
(When reassembling)

- Apply liquid lock (Three Bond 1324B or equivalent) to the steering column mounting screw.

Tightening torque	Steering column mounting screw	28 N·m 2.9 kgf·m 21 lbf·ft

(1) Steering Column

W1015617



Pitman Arm

1. Remove the pitman arm mounting nut and remove the pitman arm with pitman arm puller (Code No. 07909-39011).

(When reassembling)

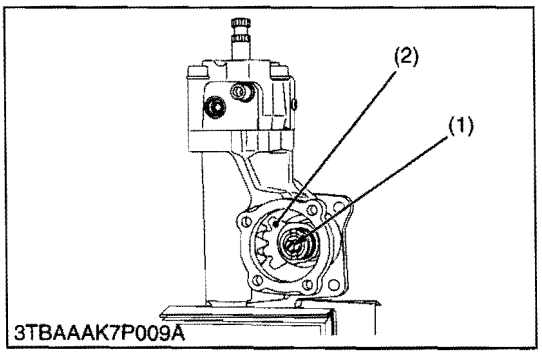
■ **IMPORTANT**

- **Install the pitman arm to the sector gear shaft so that their marks align.**

Tightening torque	Pitman arm mounting nut	140 to 150 N·m 14.3 to 15.3 kgf·m 103 to 111 lbf·ft

(1) Alignment Mark
(2) Pitman Arm

W1015792



Side Cover and Sector Gear Shaft

1. Loosen the lock nut.
2. Remove the side cover mounting screws.
3. Screw in the adjusting screw (1) to remove the side cover.
4. Tap out the sector gear shaft (2) toward the side cover.

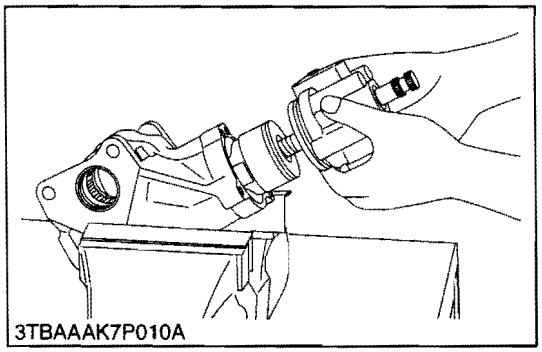
(When reassembling)

- Turn the worm shaft so that the rack (piston) is centered in its travel. Then, install the sector gear shaft so that the center of its teeth engages the center teeth of the rack (piston).
- Be sure to adjust the backlash between sector gear shaft and rack (piston).

Tightening torque	Side cover mounting screw	20 to 29 N·m 2.0 to 3.0 kgf·m 15 to 21 lbf·ft

(1) Adjusting Screw (2) Sector Gear Shaft

W1015962



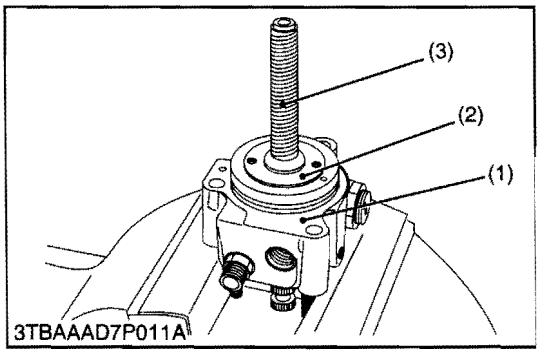
Valve Assembly and Rack (Piston)

1. Remove the valve housing mounting hex. head screws.
2. Draw out the valve assembly and rack (piston) as a unit.

(When reassembling)

Tightening torque	Valve housing mounting hex. head screw	40 to 49 N·m 4.0 to 5.0 kgf·m 29 to 36 lbf·ft

W1016198



Valve Assembly

1. Remove the plug (2).
2. Pull out the worm shaft (3) with sleeve and stub shaft from valve housing (1).

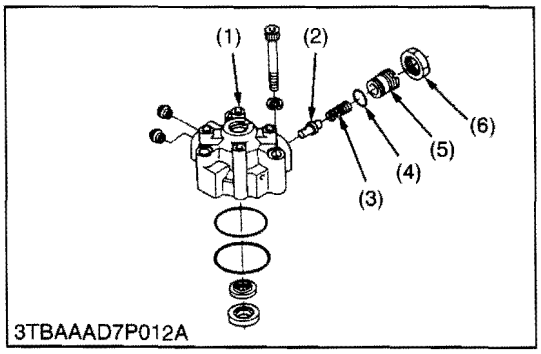
(When reassembling)

- When tighten the plug, use the PS plug wrench (Refer to G-48).
- Be sure to tighten the plug to specified torque and staking the plug (2). If the plug is tightened to excessive torque, it may cause damage to the thrust races and thrust bearings.

Tightening torque	Plug	8.9 to 10 N·m 0.90 to 1.1 kgf·m 6.5 to 7.9 lbf·ft

(1) Valve Housing (3) Worm Shaft
(2) Plug

W1016320



Disassembling Valve Housing

1. Loosen the lock nut (6) and remove the adjusting screw (5).
2. Remove the relief spring (3) and the relief valve poppet (2).

(When reassembling)

■ IMPORTANT

- **Do not disassemble the relief valve needlessly, since it has been factory-adjusted.**
- **If the relief valve is disassembled, replace the adjusting screw with new one, and after reassembly, be sure to adjust the setting pressure, then stake the adjusting screw with a punch.**

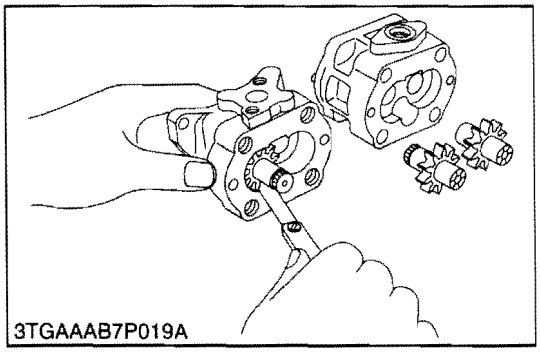
Tightening torque	Relief pressure adjusting screw lock nut	49 to 78 N·m 5.0 to 8.0 kgf·m 37 to 57 lbf·ft

(1) Valve Housing
(2) Relief Valve Poppet
(3) Relief Spring
(4) O-ring
(5) Adjusting Screw
(6) Lock Nut

W1016541

[4] SERVICING

(1) Hydraulic Pump for Power Steering

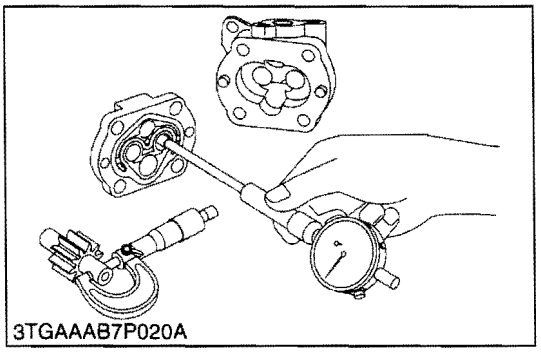

3TGAAAB7P019A

Clearance between Tip of Gear Tooth and Casing

1. Measure the clearance between gear and casing at several points with feeler gauge.
2. If the clearance exceeds the allowable limit, replace the hydraulic pump assembly.

Clearance between tip of gear tooth and casing	Allowable limit	0.15 mm 0.0059 in.

W1022533


3TGAAAB7P020A

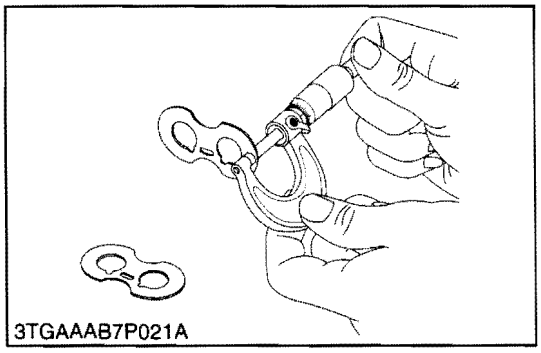
Clearance between Bushing and Shaft

1. Measure the gear shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between busing and shaft	Factory spec.	0.020 to 0.091 mm 0.00079 to 0.0035 in.
	Allowable limit	0.12 mm 0.0047 in.

Gear shaft O.D.	Factory spec.	14.970 to 14.980 mm 0.58937 to 0.58976 in.
Bushing I.D.	Factory spec.	15.000 to 15.061 mm 0.59056 to 0.59295 in.

W1022650


3TGAAAB7P021A

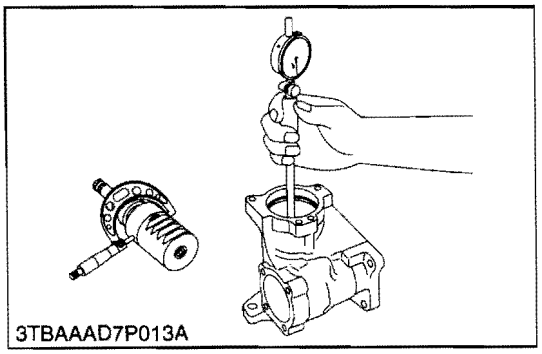
Side Plate Thickness

1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0977 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

W1022982

(2) Power Steering Body

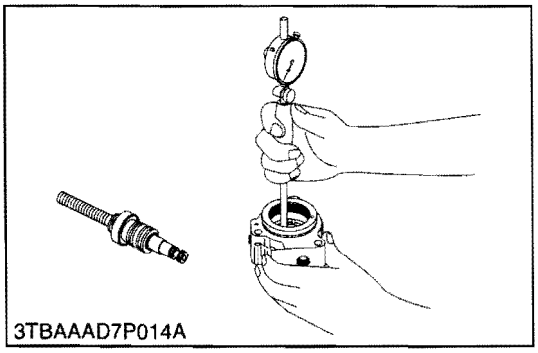

3TBAAAD7P013A

Clearance between Steering Gear Box and Rack (Piston)

1. Measure the steering gear box cylinder I.D. with a cylinder gauge.
2. Measure the rack (piston) O.D. with an outside micrometer, and calculate this clearance.
3. If the clearance exceeds the allowable limit, replace the steering gear box or rack (piston) assembly.

Clearance between steering gear box and rack (piston)	Factory spec.	0.030 to 0.079 mm 0.0012 to 0.0031 in.
	Allowable limit	0.14 mm 0.0055 in.

W1021951



Clearance between Valve Housing and Sleeve

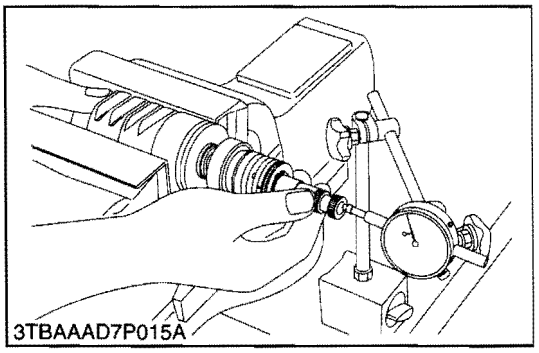
1. Measure the valve housing I.D. with a cylinder gauge and the sleeve O.D. with an outside micrometer, and calculate this clearance.
2. If the clearance exceeds the allowable limit, replace the valve housing or sleeve assembly.

■ **IMPORTANT**

- **Check to see if the slipper seals of sleeve do not have excessive wear.**

Clearance between valve housing and sleeve	Factory spec.	0.17 to 0.28 mm 0.0067 to 0.011 in.
	Allowable limit	0.40 mm 0.016 in.

W1022090

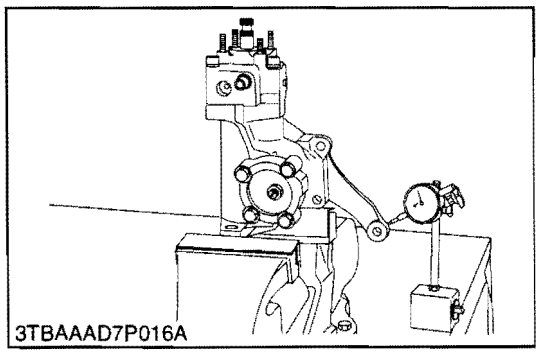


Axial Play of Rack (Piston) Assembly

1. Secure the rack (piston) assembly in a vise.
2. Set dial indicator with its finger on the worm shaft of the rack (piston) assembly.
3. Move the worm shaft axially and measure the play.
4. If the play exceeds the allowable limit, replace the rack (piston) assembly.

Axial play of rack (piston) assembly	Factory spec.	0 to 0.02 mm 0 to 0.0007 in.
	Allowable limit	0.04 mm 0.002 in.

W1022226



Backlash between Sector Gear Shaft and Rack (Piston)

1. Attach the pitman arm having no play.
2. Set a dial indicator with its finger on the pitman arm.
3. Move the pitman arm lightly, and measure the deflection.
4. If the measurement is not within the factory specification, adjust the backlash with the adjusting screw.

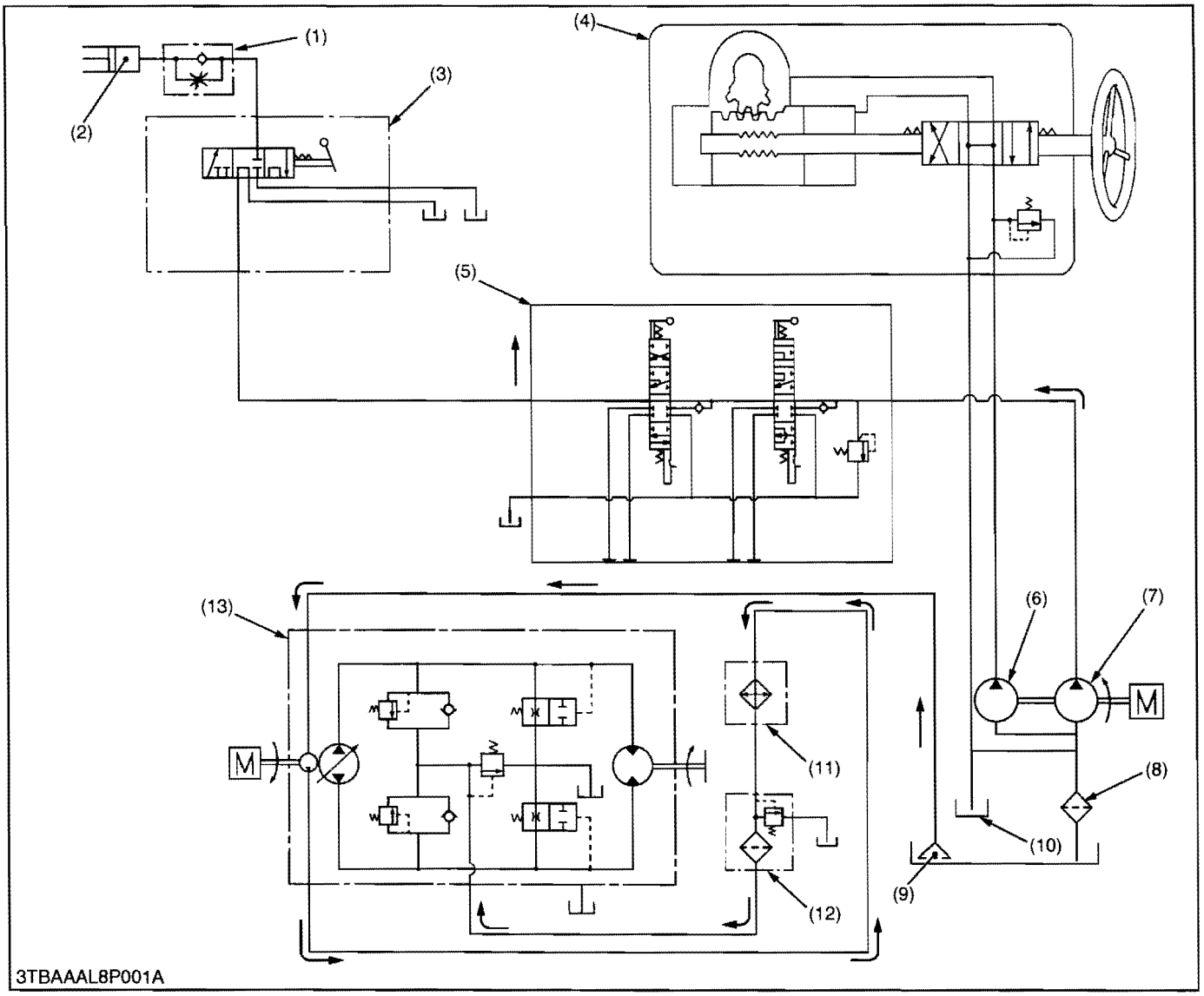
Backlash between sector gear shaft and rack (piston)	Factory spec.	Less than 0.30 mm 0.012 in.

W1022374

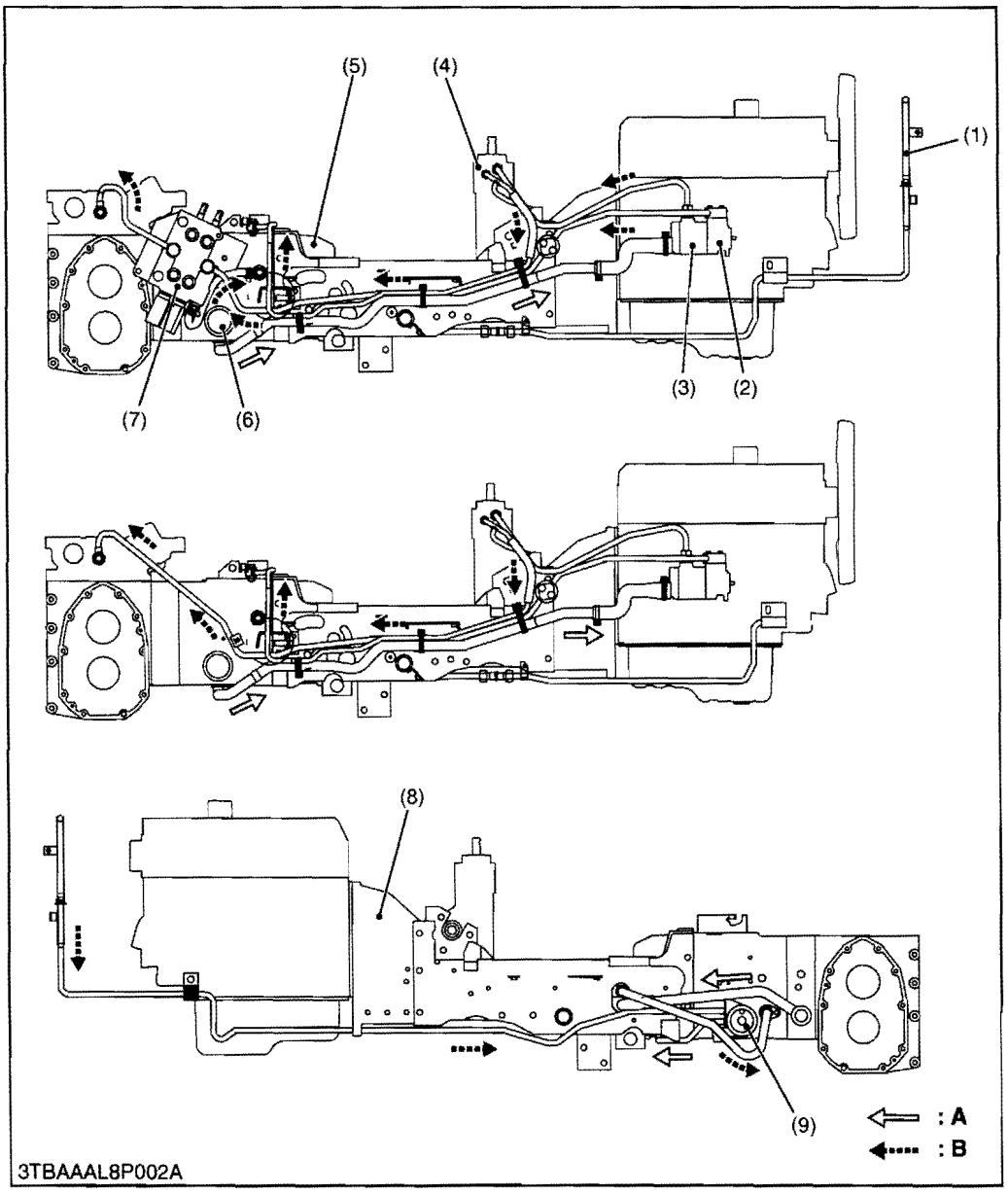
MECHANISM

CONTENTS

1. HYDRAULIC CIRCUIT



(1) Lowering Speed Adjusting Valve
(2) Hydraulic Cylinder
(3) Hydraulic Control Valve
(4) Power Steering
(5) Front Loader Valve
(6) Hydraulic Pump (for Power Steering)
(7) Hydraulic Pump (for 3-Point Hitch)
(8) Oil Filter
(9) Transmission case
(10) Clutch Housing Front Transmission
(11) Oil Cooler
(12) Oil Filter (For HST)
(13) Hydrostatic Transmission (HST)

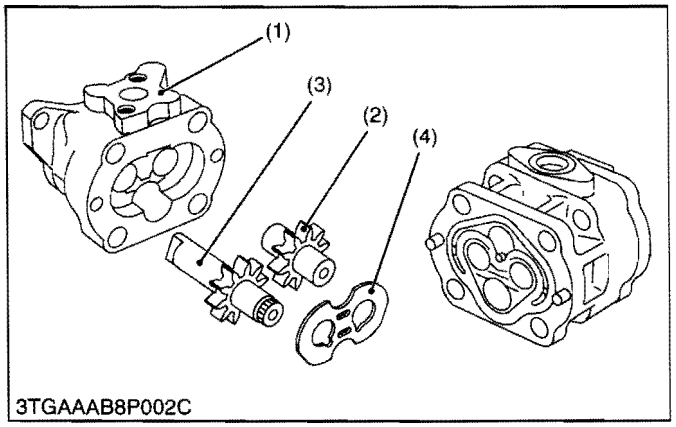


(1) Oil Cooler
(2) Hydraulic Pump (for 3-Point Hitch)
(3) Hydraulic Pump (for Power Steering)
(4) Power Steering
(5) Hydrostatic Transmission (HST)
(6) Oil Filter
(7) Front Loader Valve (If equipped)
(8) Clutch Housing Front Transmission
(9) Oil Filter (For HST)

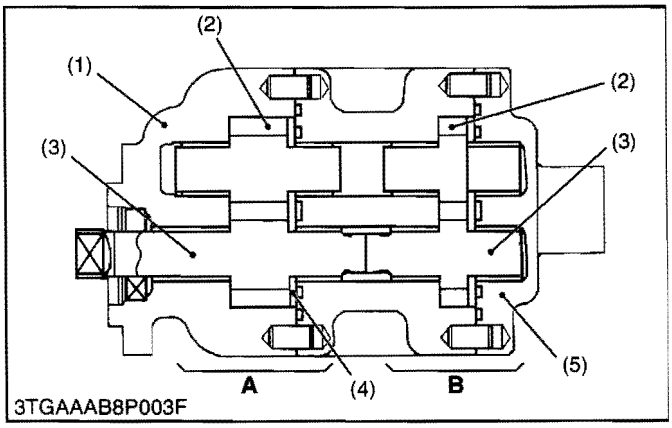
A : Suction Oil
B : Low Pressure Oil

W1012872

2. HYDRAULIC PUMP



3TGAAAB8P002C



3TGAAAB8P003F

The hydraulic pump is composed of the casing (1), cover (5), side plate (4), and two spur gears (drive gear (3) and driven gear (2)) that are in mesh.

Hydraulic pump is driven by the fuel camshaft.

Maximum displacement is as follows.

Hydraulic pump (for Power Steering)

Displacement	Engine speed	Condition
12.2 L/min. 3.22 U.S.gal/min. 2.68 Imp.gal/min.	At 2700 min^{-1} (rpm)	at no load

Hydraulic pump (for 3-Point Hitch)

Displacement	Engine speed	Condition
25.3 L/min. 6.68 U.S.gal/min. 5.57 Imp.gal/min.	At 2700 min^{-1} (rpm)	at no load

(1) Casing
(2) Driven Gear
(3) Drive Gear
(4) Side Plate
(5) Cover

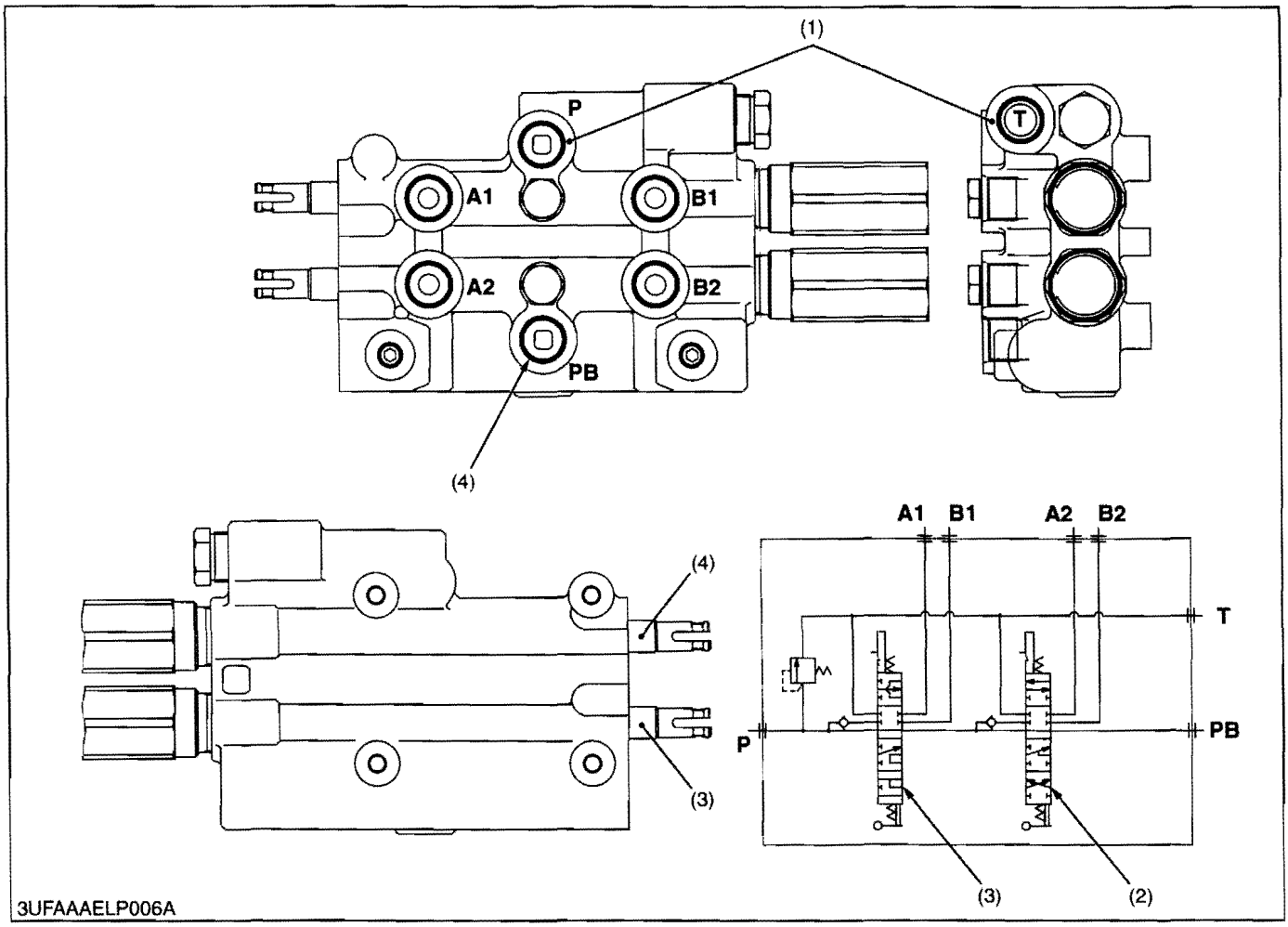
A : Pump for 3-Point Hitch Hydraulic System
B : Pump for Power Steering

W1013659

3. CONTROL VALVE ASSEMBLY

[1] FRONT LOADER CONTROL VALVE (IF EQUIPPED)

(1) Structure



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

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 one casting block and four major section as shown above.

1) Inlet and Outlet Section

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

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 hydraulic block by the hydraulic hose.

2) Boom Control Section

The boom control valve is consists of 4-position, 6-connection, detent, spring center type, consisting of a mono block 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 Section

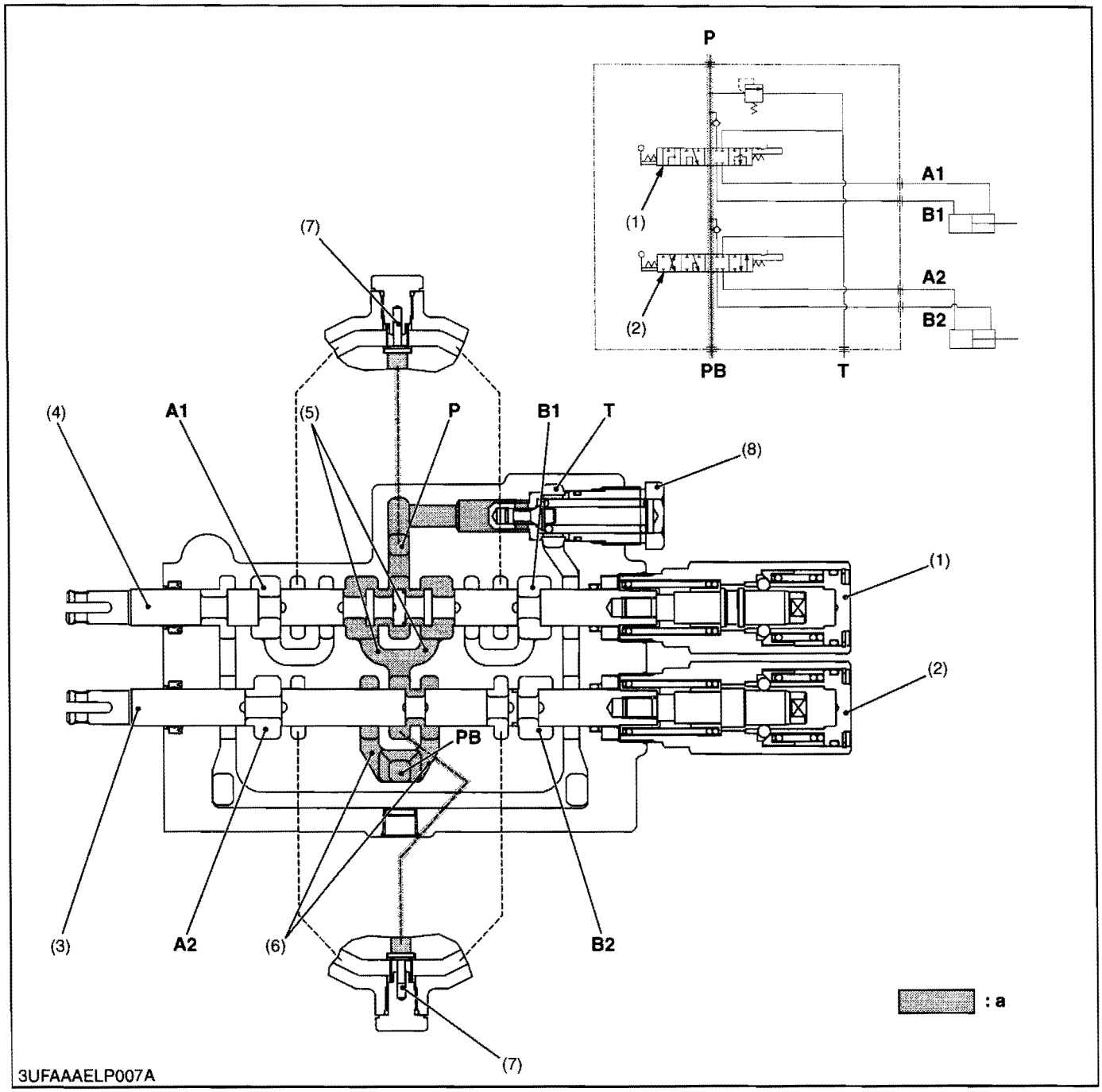
The bucket control valve is consists of 4-position, 6-connection, no detent, spring center type, consisting of a mono block valve housing, spool, load check valve, etc. This valve has **A2** and **B2** ports and controls oil flow to the bucket cylinder.

4) Power Beyond

This section has **PB** port which is connected to the **INLET** port of hydraulic block by the hydraulic hose, and feeds oil to the 3-point hitch hydraulic control valve.

(2) Operation

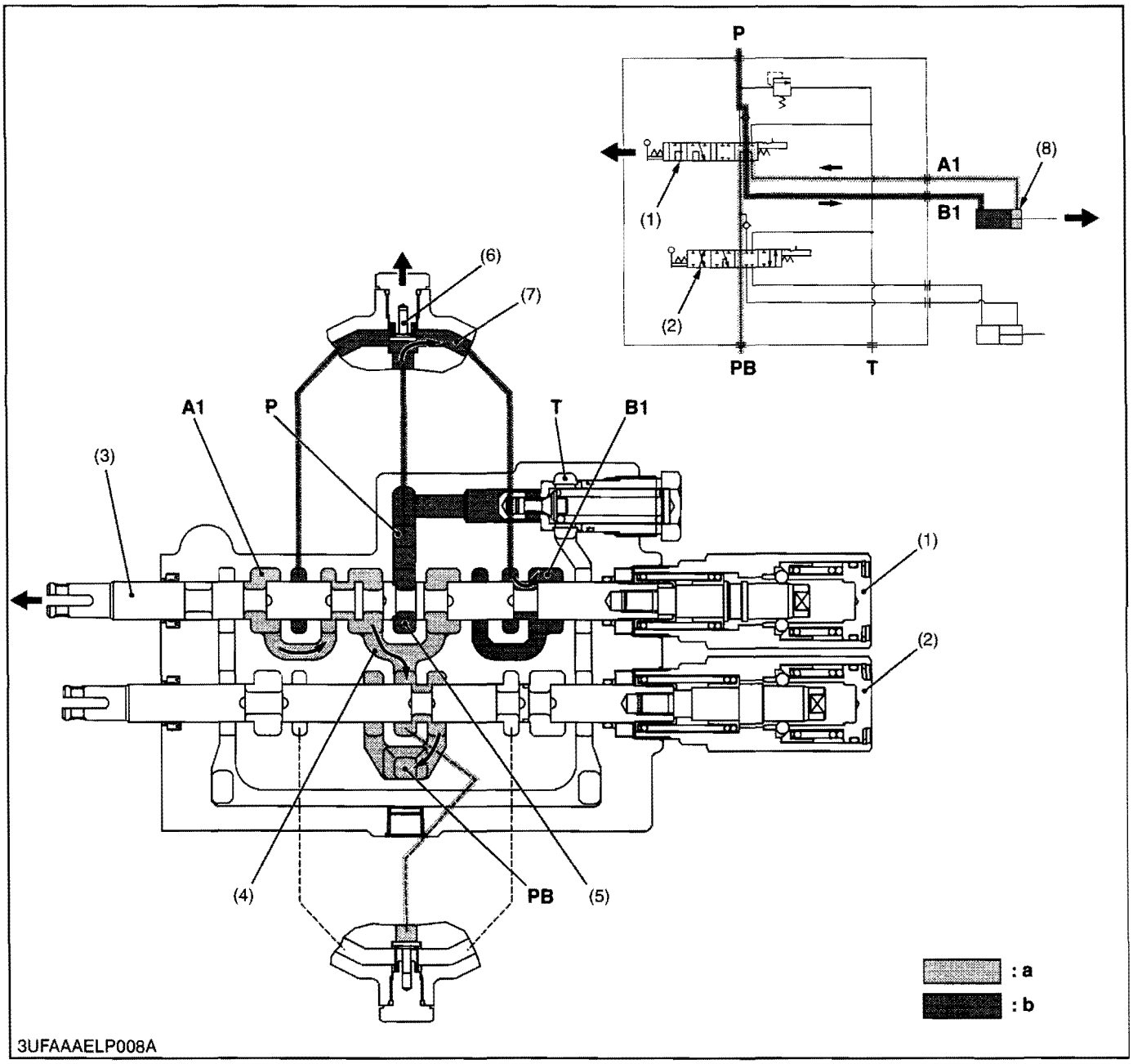
■ Neutral



(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) Spool
(5) **PB** Passage 1
(6) **PB** Passage 2
(7) Load Check Valve
(8) Relief Valve

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

■ Up



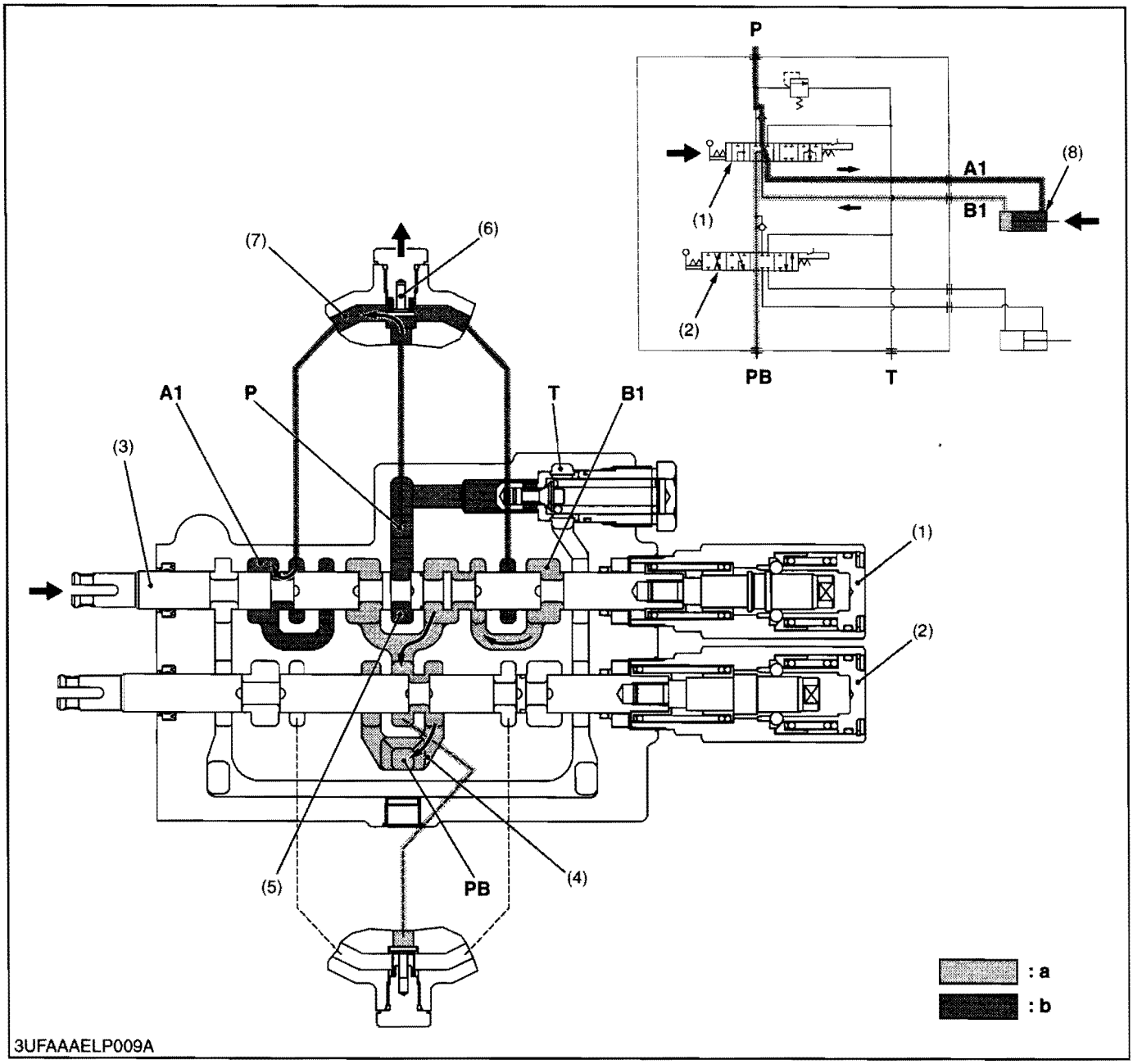
(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Neutral Passage 1
(6) Load Check Valve
(7) Passage 1
(8) Boom Cylinder

P : P Port
T : T Port

A1 : A1 Port (From Boom Cylinder)
B1 : B1 Port (To Boom Cylinder)
PB : PB Port
a : Low Pressure
b : High Pressure

1. When the hydraulic control lever is set to the **"UP"** position, the spool (3) of the boom control section (1) moves to the left, which forms oil passages between passage 1 (7) and **B1** port, and between **A1** port and **PB** passage 1 (4).
2. As the oil passage from the neutral passage 1 (5) to the **PB** passage 1 (4) is closed by the spool (3), the pressure-fed oil from the **P** port opens the load check valve (6) and flows through the notched section of the spool (3) and **B1** port to extend the boom cylinder (8).
3. Return oil from the boom cylinder (8) flows from the **A1** port through the passage in the spool (3) and **PB** passage 1 (4) to the bucket control section (2).

■ Down



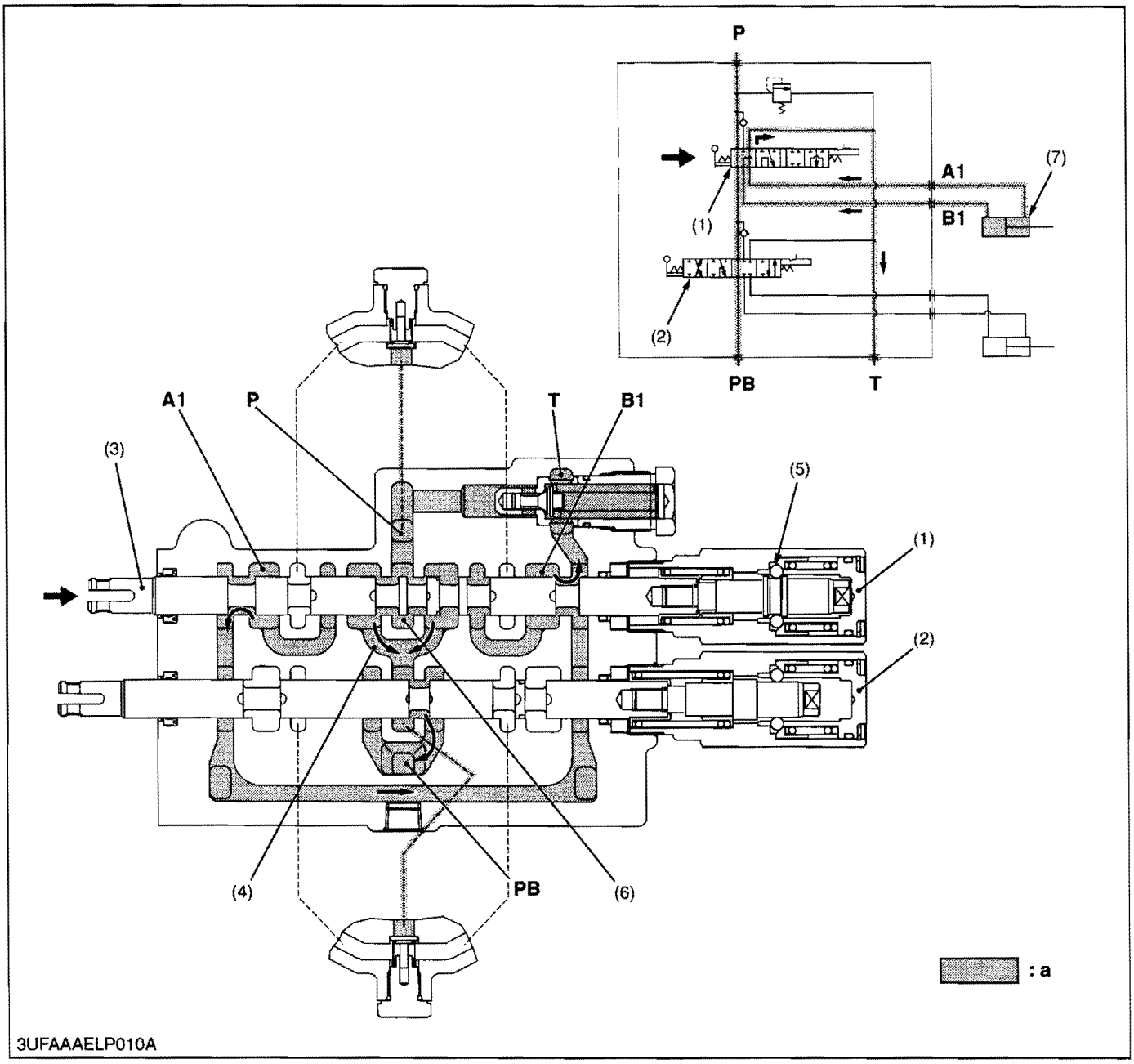
(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Neutral Passage 1
(6) Load Check Valve
(7) Passage 1
(8) Boom Cylinder

P : P Port
T : T Port

A1 : A1 Port (To Boom Cylinder)
B1 : B1 Port (From Boom Cylinder)
PB : PB Port
a : Low Pressure
b : High Pressure

1. When the hydraulic control lever is set to the **"DOWN"** position, the spool (3) moves to the right, which forms oil passages between passage 1 (7) and **A1** port, and between **B1** port and **PB** passage 1 (4).
2. As the oil passage from the neutral passage 1 (5) to the **PB** passage 1 (4) is closed by the spool (3), the pressure-fed oil from the **P** port opens the load check valve (6) and flows through the notched section of the spool (3) and **A1** port to retract the boom cylinder (8).
3. Return oil from the boom cylinder (8) flows from the **B1** port through the passage in the spool (3) and **PB** passage 1 (4) to the bucket control section (2).

■ Floating



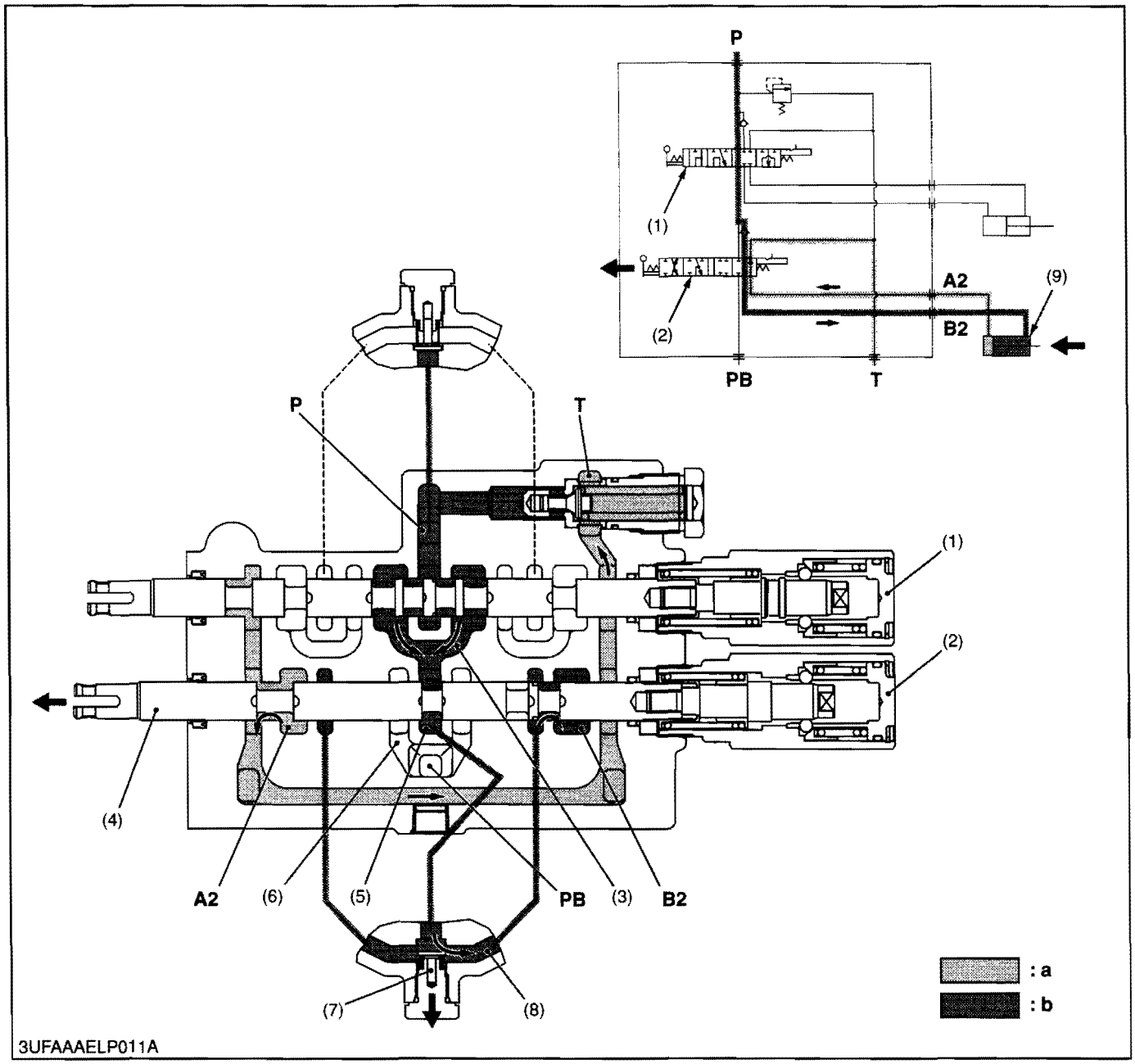
(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Detent Mechanism
(6) Neutral Passage 1
(7) Boom Cylinder

P : P Port
T : T Port

A1 : A1 Port
B1 : B1 Port
PB : PB Port
a : Low Pressure

1. When the hydraulic control lever is set to the **"FLOAT"** position, the spool (3) moves further to the right from the **"DOWN"** position and is retained by the detent mechanism (5).
2. This forms oil passages among the **A1** port, **B1** port and **T** port. As a result, oil in the boom cylinder (7) flows freely from the **A1** port and **B1** port through the **T** port to the transmission case.
3. Oil entering the **P** port flows to the bucket control section (2) through the neutral passage 1 (6) and **PB** passage 1 (4).

■ Roll-back

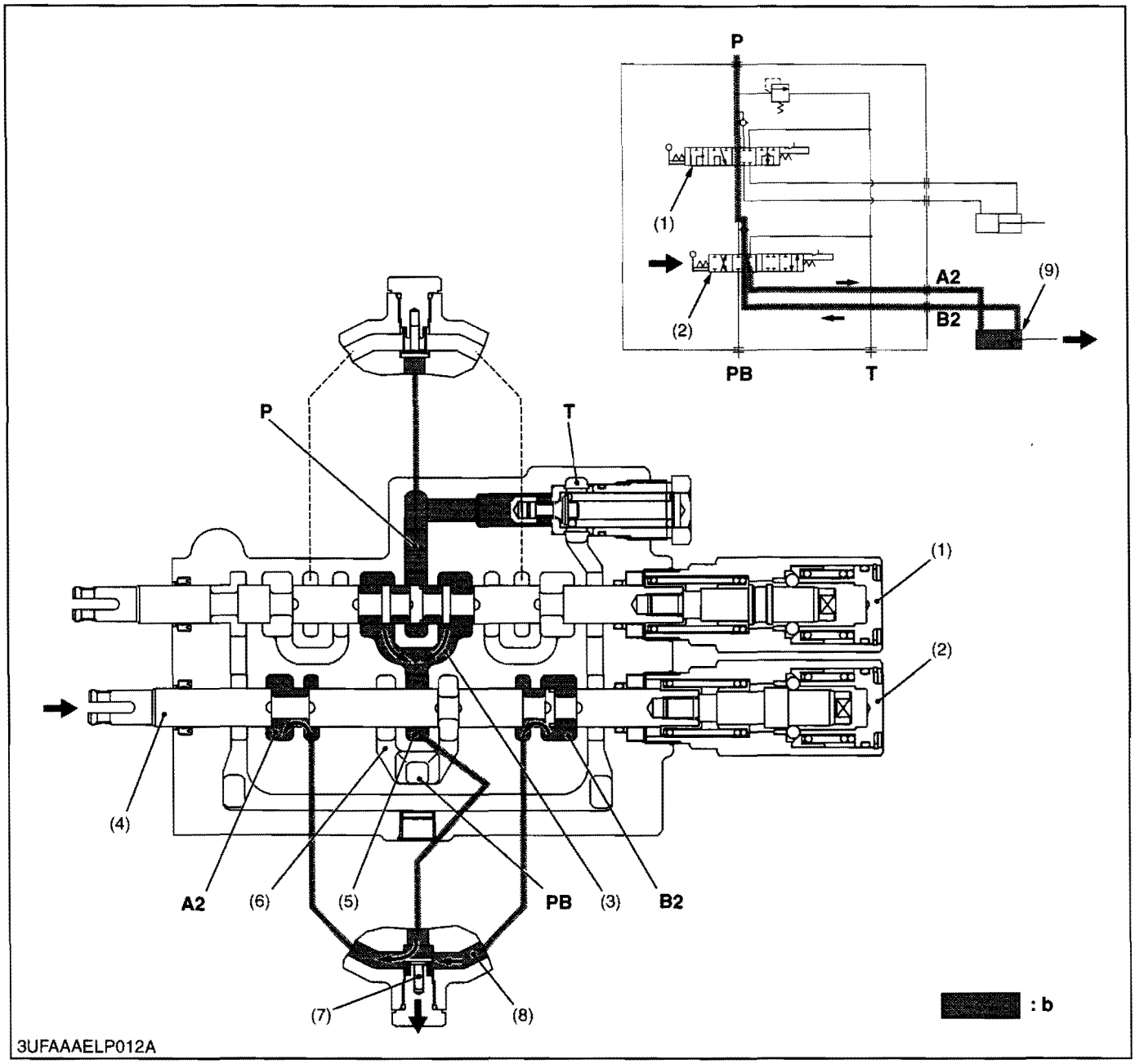


(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

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

1. When the hydraulic control lever is set to the **"ROLL-BACK"** position, the spool (4) of the bucket control section (2) moves to the left, which forms oil passages between passage 2 (8) and **B2** port, and between **A2** port and **T** port.
2. The pressure-fed oil from the **P** port flows to the neutral passage 2 (5) through the boom control section (1) and **PB** passage 1 (3). As the oil passage from the neutral passage 2 (5) to the **PB** passage 2 (6) is closed by the spool (4), this oil opens the load check valve (7), and flows through the notched section of the spool (4) and **B2** port to retract the bucket cylinder (9).
3. Return oil from the bucket cylinder (9) flows to the transmission case through the **A2** port and **T** port.

■ Dump 1



(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

P : P Port
T : T Port
PB :PB Port

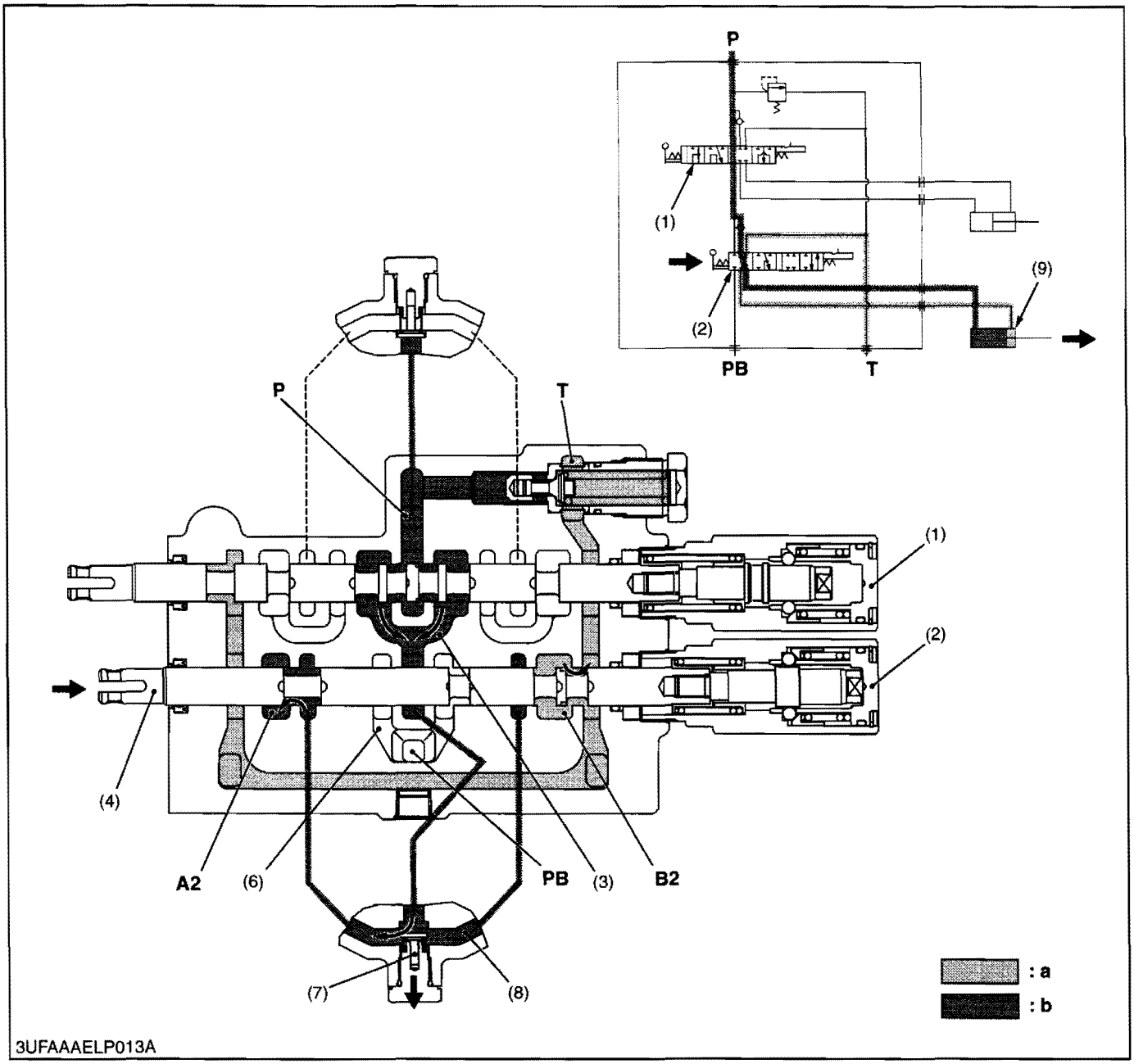
A2 : A2 Port (To Bucket Cylinder)
B2 : B2 Port (From Bucket Cylinder)
b : High Pressure

1. When the hydraulic control lever is set to the **"DUMP 1"** position, the spool (4), which forms oil passages among passage 2 (8), **A2** port and **B2** port.
2. The pressure-fed oil from the **P** port flows through the boom control valve, opens the load check valve, and flows to the bucket cylinder to extend the cylinder through the notched section of the spool and **A2** port.
3. Return oil from the bucket cylinder (9) flows from the **B2** port to the passage 2 (8), and flows to the **A2** port together with the pressure-fed oil from the **P** port.
   As a result, the dump speed is increased.

(Reference)

- The oil pressure of the **A2** port and **B2** port is identical, but the bucket cylinder extend by the difference of received pressure area (cylinder rod part).

■ Dump 2



(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

P : P Port
T : T Port
PB :PB Port

A2 : A2 Port (To Bucket Cylinder)
B2 : B2 Port (From Bucket Cylinder)
a : Low Pressure
b : High Pressure

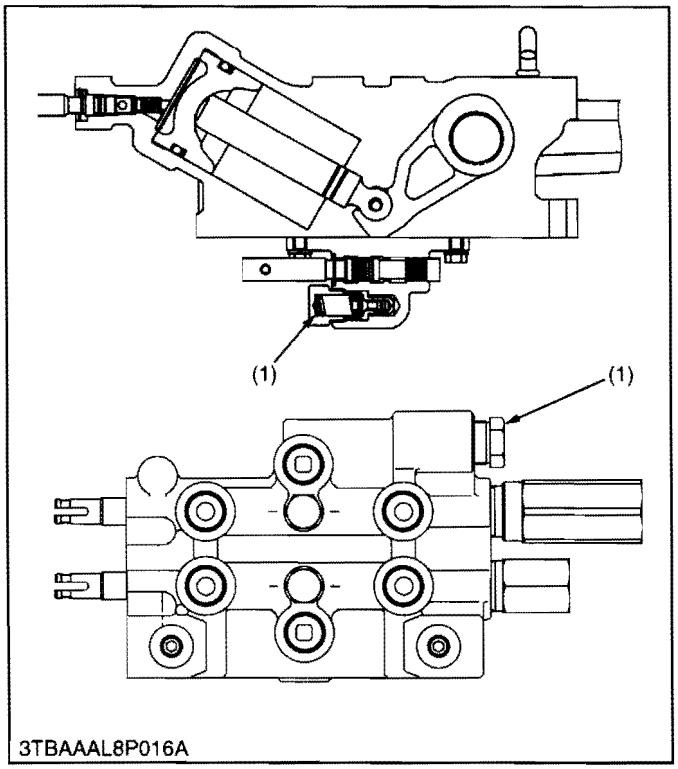
1. When the hydraulic control lever is set to the **"DUMP 2"** position, the spool (4) of the bucket control section (2) moves to the right of the bucket control section (2) moves further to the right from the **"DUMP 1"** position, which forms oil passages between passage 2 (8) and **A2** port, and between **B2** port and **T** port.
2. The pressure-fed oil from the **P** port flows to the neutral passage 2 (5) through the boom control section (1) and **PB** passage 1 (3). As the oil passage from the neutral passage 2 (5) to the **PB** passage 2 (6) is closed by the spool (4), this oil opens the load check valve (7) and flows through the notched section of the spool (4) and **B2** port to extend the bucket cylinder (9).
3. Return oil from the bucket cylinder (9) flows to the transmission case through the **B2** port and **T** port.

[2] 3-POINT HITCH CONTROL VALVE

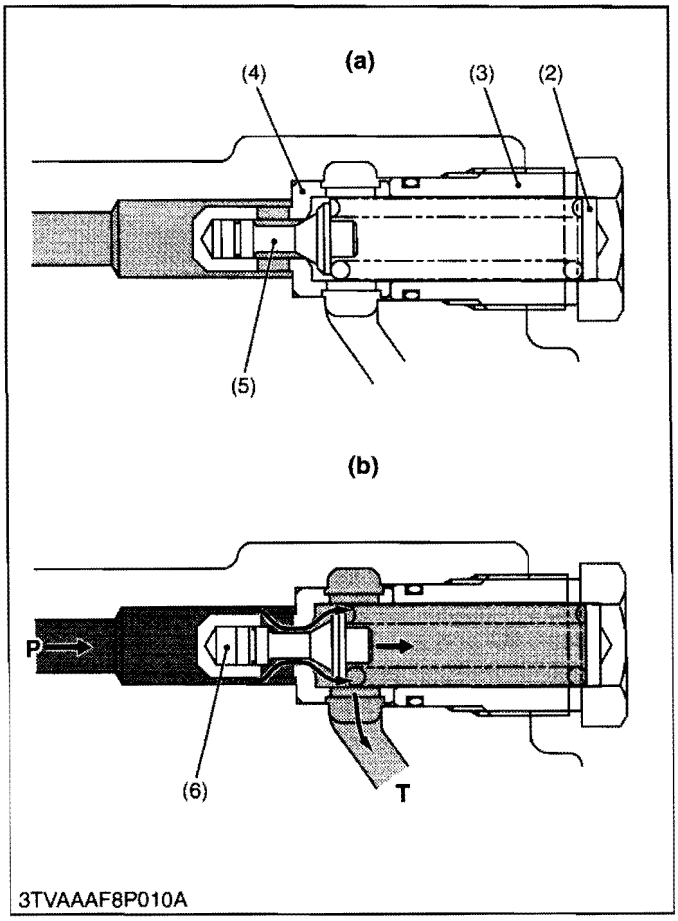
(1) Structure

Refer to the Workshop Manual of TRACTOR MECHANISM (Code No. 9Y021-18201).

[3] RELIEF VALVE



3TBAAAL8P016A



3TVAAAF8P010A

The hydraulic raising and lowering circuit is fitted with a relief valve to control the maximum pressure.

This is a guide piston relief valve with damper, a direct acting relief valve suitable for relatively high pressure and capacity, and constructed so as to prevent chattering and other unstableness associated with direct acting relief valves. As shown in the diagram, poppet (5) has a guide, and there is a valve chamber called a damping chamber (6) in the base of this guide piston. The valve inlet is connected to this chamber through the clearance between the guide surface and the seat so that the chamber provides a damping effect, controlling valve vibration.

When the pressure in the circuit rises, the pressure in the damping chamber also rises, and when it exceeds the relief pressure setting (150 to 160 kgf/cm^2) the spring is compressed, making a clearance between the poppet and the seat. The hydraulic oil can escape to the transmission case through this clearance, controlling the pressure rise.

- Relief valve setting pressure for loader valve (if equipped)
  14.4 to 15.2 MPa
  147 to 154 kgf/cm^2
  2090 to 2200 psi
- Relief valve setting pressure for 3-point hitch control valve
  13.3 to 14.3 MPa
  136 to 145 kgf/cm^2
  1930 to 2070 psi

Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Oil temperature .. 50 °C
  122 °F

(1) Relief Valve
(2) Shim
(3) Plug
(4) Seat
(5) Poppet
(6) Damping Chamber

(a) Normal State
(b) Active State
T : T Port (To Transmission Case)
P : P Port (From Pump)

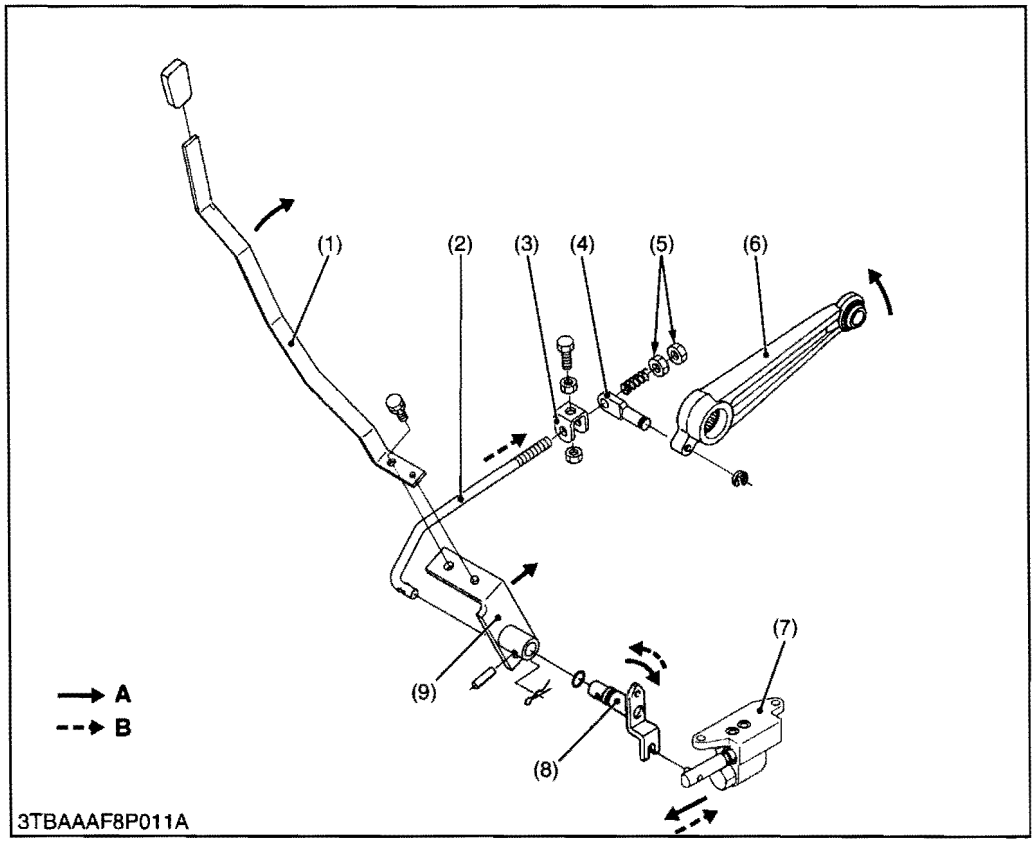
W1020101

4. 3-POINT HITCH HYDRAULIC SYSTEM

[1] FEEDBACK LINKAGE

When the hydraulic control lever (1) is moved to rearward to lift the implement, the spool of the control valve (7) is pulled out to form a raising circuit. Then the lift arm begins to rise.

And after the lift arm (6) gets to the uppermost position, the spool is pushed in and returned to form a neutral circuit by the motions of feedback pin (4), lock nut (5), feedback rod (2), control lever arm (9) and control lever shaft (8).



(1) Hydraulic Control Lever
(2) Feedback Rod
(3) Interlocker
(4) Feedback Pin
(5) Lock Nut
(6) Lift Arm
(7) Control Valve
(8) Control Lever Shaft
(9) Control Lever Arm
A : When the hydraulic control lever is moved to rearward
B : When the lift arm gets to the uppermost position

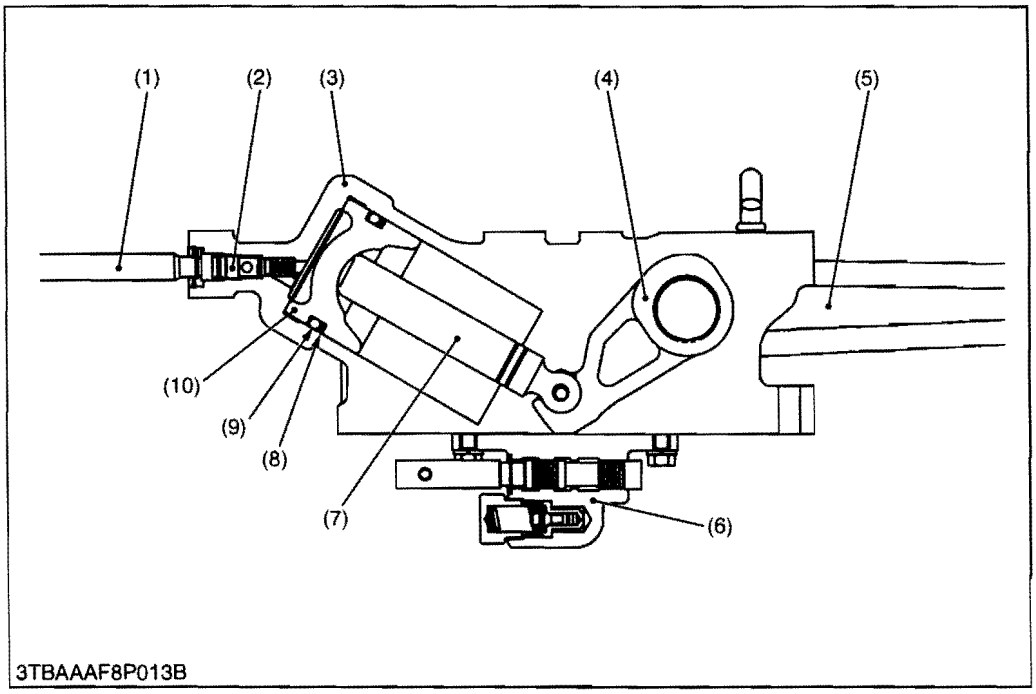
W1014360

[2] CONTROL VALVE

The models are equipped with the manual control valve.

Refer to the Workshop Manual of TRACTOR MECHANISM (Code No. 9Y021-18201).

[3] HYDRAULIC CYLINDER



3TBAAAF8P013B

(1) Lowering Speed Adjusting Shaft
(2) Lowering Speed Adjusting Valve
(3) Hydraulic Cylinder
(4) Hydraulic Arm
(5) Lift Arm
(6) Control Valve
(7) Hydraulic Rod
(8) Back-up Ring
(9) O-ring
(10) Piston

W1014888

The main components of the hydraulic cylinder are shown in the figure above. While the lift arm (5) is rising, oil from the hydraulic pump flows into the hydraulic cylinder through the control valve (6). Then oil pushes out the piston (10).

While the lift arm (5) is lowering, oil in the hydraulic cylinder is discharged to the transmission case through the control valve (6) by the weight of the implement. At this time, the lowering speed of the implement can be controlled by the lowering speed adjusting valve (2) attached to the hydraulic cylinder (3). Turning the lowering speed adjusting knob clockwise decreases the lowering speed, and counterclockwise increases lowering speed. When the lowering speed adjusting valve (2) is completely closed, the lift arm (5) is held at its position since oil in the hydraulic cylinder is sealed between the piston (10) and lowering speed adjusting valve (2).

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rise (No Noise)	Control valve broken	Replace	8-S14
	Control valve improperly adjusted	Adjust	8-S7
	Control valve improperly assembled	Repair	8-S14
	Relief valve improperly assembled	Replace	8-S15
	Spool sticks	Repair	8-S14
	Piston O-ring or cylinder damaged	Replace	8-S14
Implement Does Not Rise (Noise)	Oil filter cartridge clogged	Clean or Replace	–
	Suction pipe loosen or broken	Repair or Replace	–
	Suction pipe connecting hose loosen or broken	Repair or Replace	–
	Suction pipe O-ring broken	Replace	–
	Insufficient transmission oil	Refill	–
	Relief valve setting pressure too low	Adjust or Replace	8-S14
	Hydraulic pump broken	Replace	8-S9
Implement Does Not Reach Maximum Height	Feedback rod improperly adjusted	Adjust	8-S7
Implement Does Not Lower	Control valve malfunctioning	Repair or Replace	8-S14
Implement Drops by Its Weight	Hydraulic cylinder worn or damaged	Replace	–
	Piston O-ring worn or damaged	Replace	8-S14
	Control valve malfunctioning	Replace	8-S14

W1014322

2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP FOR 3-POINT HITCH HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Pump Delivery	At no pressure Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	25.3 L/min. 6.68 U.S.gals/min. 5.57 Imp.gals/min.	–
Gear to Casing	Clearance	–	0.15 mm 0.059 in.
Gear Shaft to Bushing	Clearance	0.020 to 0.091 mm 0.00079 to 0.0035 in.	0.12 mm 0.0047 in.
	Gear Shaft (O.D.)	14.970 to 14.980 mm 0.58937 to 0.58976 in.	–
	Bushing (I.D.)	15.000 to 15.061 mm 0.5906 to 0.5930 in.	–
Side Plate	Thickness	2.48 to 2.50 mm 0.0977 to 0.0984 in.	2.40 mm 0.0945 in.

W1013874

3-POINT HITCH HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	13.3 to 14.3 MPa 136 to 145 kgf/cm^2 1930 to 2070 psi	–
Lift Arm		5.0 to 15 mm 0.20 to 0.59 in.	–
Hydraulic Cylinder	I.D.	70.05 to 70.10 mm 2.758 to 2.759 in.	70.15 mm 2.762 in.
Hydraulic Arm Shaft to Bushing	Clearance	0.020 to 0.11 mm 0.00079 to 0.0043 in.	0.30 mm 0.012 in.
	Hydraulic Arm Shaft, Right (O.D.)	37.925 to 37.950 mm 1.4932 to 1.4940 in.	–
	Hydraulic Arm Shaft, Left (O.D.)	33.925 to 33.950 mm 1.3357 to 1.3366 in.	–
	Bushing, Right (I.D.)	37.970 to 38.035 mm 1.4949 to 1.4974 in.	–
	Bushing, Left (I.D.)	33.970 to 34.035 mm 1.3374 to 1.3399 in.	–

W1013874

FRONT LOADER HYDRAULIC SYSTEM (IF EQUIPPED)

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure Condition : Engine Speed ; Approx. 2700 min^{-1} (rpm) Oil Temperature ; 50 °C, 122 °F	14.4 to 15.2 MPa 147 to 154 kgf/cm^2 2090 to 2200 psi	–

W1018803

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-11.)

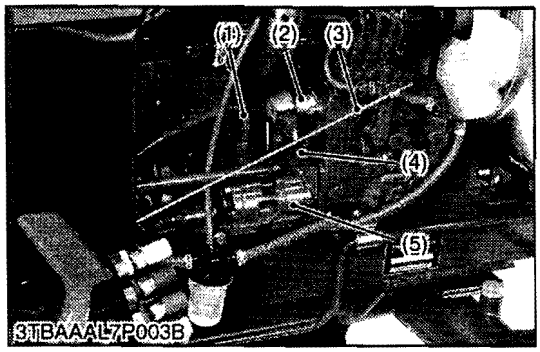
Item	N·m	kgf·m	lbf·ft
Power steering delivery pipe nut	65 to 75	6.7 to 7.6	48 to 55
Top link bracket mounting screw	78 to 90	7.9 to 9.2	58 to 66
3-point hitch delivery pipe 2 joint bolt (front loader control valve side)	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 2 joint bolt (hydraulic cylinder case side)	50 to 60	5.1 to 6.1	37 to 44
3-point hitch delivery pipe joint bolt [Without front loader valve model]	50 to 60	5.1 to 6.1	37 to 44
Connecting plate mounting screw	40 to 44	4.0 to 4.5	29 to 32
Hydraulic cylinder assembly mounting screw	40 to 44	4.0 to 4.5	29 to 32
Rear wheel mounting nut	145 to 150	14.8 to 15.3	107 to 111
Front loader pipe joint bolt	48 to 56	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 1 joint bolt [With front loader valve model]	48 to 56	4.9 to 5.7	36 to 41
Hydraulic pump cover mounting screw	35 to 39	3.5 to 4.0	26 to 29
Control valve mounting screw	24 to 27	2.4 to 2.8	18 to 20
Relief valve plug	49 to 68	5.0 to 7.0	37 to 50

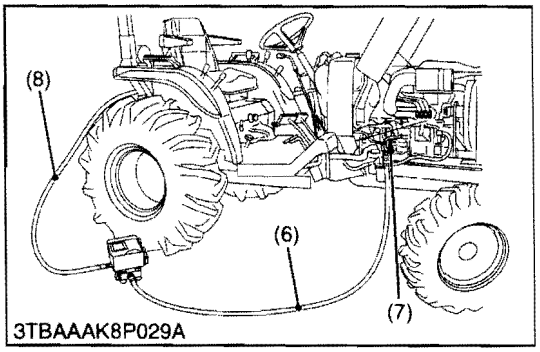
W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Hydraulic Pump for 3-Point Hitch Hydraulic System





Flowmeter Connection and Test Preparation

■ **IMPORTANT**

- **When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with that flowmeter.**
- **In this hook-up, there is no relief valve. Therefore while testing, do not close the flowmeter loading valve completely.**

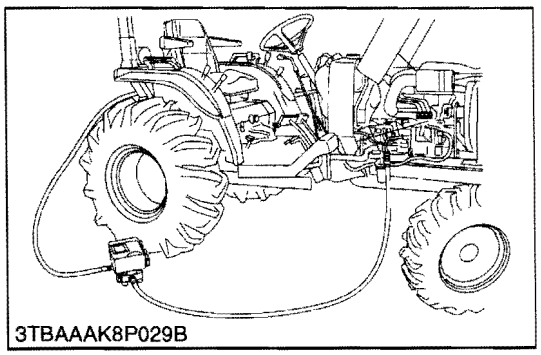
1. Open the bonnet, then remove the front grille, side cover (R.H.) and disconnect the battery grounding cord.
2. Remove the accelerator rod (3).
3. Disconnect the **2P** connector from the engine stop solenoid (2).
4. Remove the fuel filter retaining nut.
5. Disconnect the hydraulic delivery pipe (4).
6. Install the adaptor **61** (7) to the hydraulic pump (5).
7. Reinstall the accelerator rod (3).
8. Connect the hydraulic test hose (6) (Code No. 07916-52651) to the adaptor **61** and flowmeter (Code No. 07916-52791) inlet port.
9. Connect the another hydraulic test hose (8) to flowmeter outlet port and transmission oil filling port.
10. Open the flowmeter loading valve completely. (Turn counterclockwise)
11. Start the engine and set the engine speed at **2700 min^{-1} (rpm)**.
12. Slowly close the loading valve to generate the pressure **approx. 14.4 MPa (146 kgf/cm^2, 2080 psi)**.
13. Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).

(Reference)

- Adaptor is included in the adaptor set (Code No. 07916-54031).

(1) Power Steering Delivery Pipe
(2) Engine Stop Solenoid
(3) Accelerator Rod
(4) Hydraulic Delivery Pipe
(5) Hydraulic Pump
(6) Hydraulic Test Hose
(7) Adaptor **61**
(8) Hydraulic Test Hose

W1013445



Pump Test

■ **NOTE**

- **Before pump testing, perform the flowmeter connecting and test preparation.**

1. Open the loading valve completely.
2. Start the engine and set at approx. 2700 min^{-1} (rpm).
3. Read and note the pump delivery at no pressure.
4. Stop the engine.

(Reference)

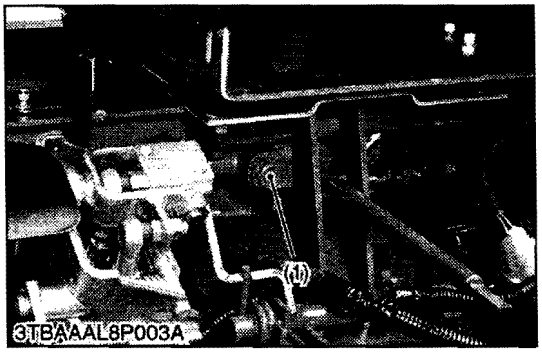
Hydraulic pump delivery at no pressure	Factory spec.	Above 25.3 L/min. 6.68 U.S.gals/min. 5.57 Imp.gals/min.

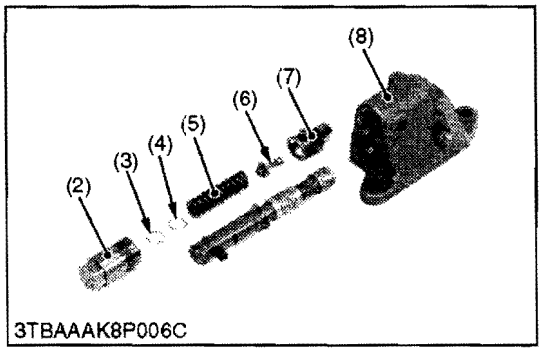
Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Rated pressure ... 14.4 MPa, 146 kgf/cm^2, 2080 psi
- Oil temperature ... 50 °C, 122 °F

W1013914

(2) Relief Valve





Relief Valve Setting Pressure

1. Remove the seat under cover.
2. Remove the plug (1) from the hydraulic cylinder case.
3. Install the adaptor. Then connect the cable and the pressure gauge to the adaptor **58**.
4. Remove the feedback rod lock nut.
5. Start the engine and set the engine speed at approx. 2700 min^{-1} (rpm).
6. Move the hydraulic control lever all way up to operate the relief valve and measure the pressure.
7. If the pressure is not factory specifications, adjust the relief valve setting pressure with the adjusting shims (4).
8. After checking the pressure, reinstall the feed back rod lock nut and the plug (1).

Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Oil temperature ... 50 °C, 122 °F

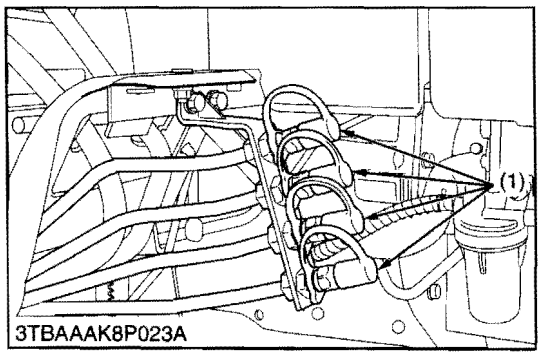
(Reference)

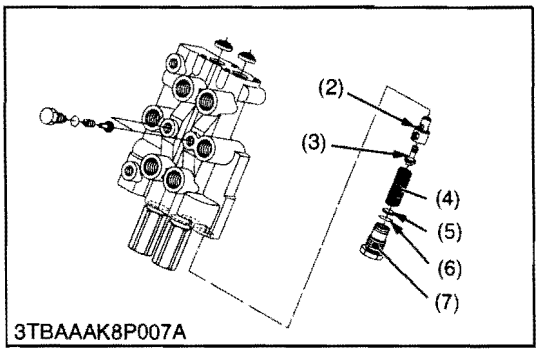
Thickness of shims (4) : 0.10 mm (0.0039 in.)
0.20 mm (0.0079 in.)
0.40 mm (0.016 in.)
0.60 mm (0.024 in.)

Relief valve setting pressure	Factory spec.	13.3 to 14.3 MPa 136 to 145 kgf/cm^2 1960 to 2070 psi

(1) Plug
(2) Plug
(3) Plain Washer
(4) Shim
(5) Spring
(6) Poppet
(7) Valve Seat
(8) Hydraulic Control Valve

W1012497





Loader Relief Valve Setting Pressure (If equipped)

1. Remove the protective plug (1).
2. Install the adaptor. Then connect the cable and the pressure gauge to the adaptor (Size 1/4).
3. Start the engine and set the engine speed at 2700 min^{-1} (rpm).
4. Set the front loader valve lever to the down ward position and read the pressure gauge when the relief valve is actuated.
5. If the pressure is not factory specifications, adjust the relief valve setting pressure with the adjusting shims (5).

Condition

- Engine speed ..... Approx. 2700 min^{-1} (rpm)
- Oil temperature ... 50 °C, 122 °F

(Reference)

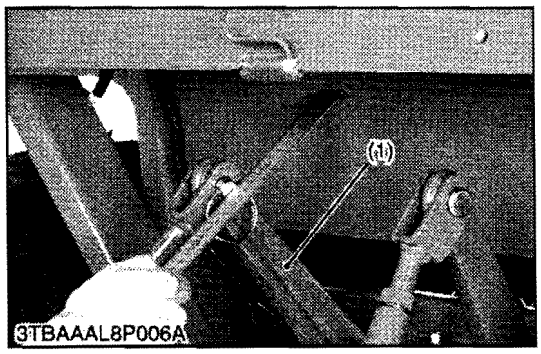
Thickness of shims (5) : 0.10 mm (0.0039 in.)
0.20 mm (0.0079 in.)
0.40 mm (0.016 in.)
0.60 mm (0.024 in.)

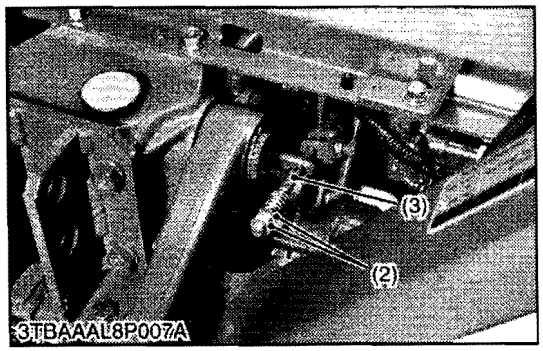
Relief valve setting pressure	Factory spec.	14.4 to 15.2 MPa 147 to 154 kgf/cm^2 2090 to 2200 psi

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

W1037308

(3) Lift Arm





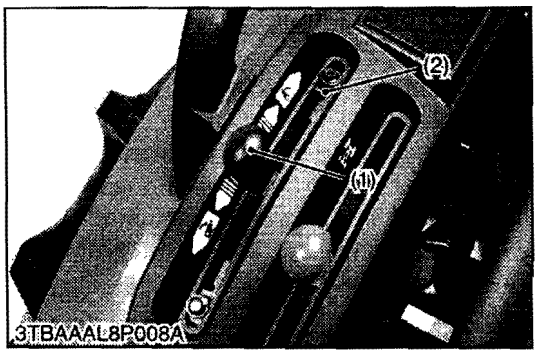
Lift Arm Free Play

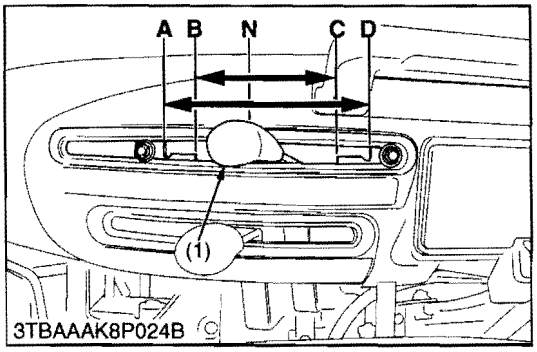
1. Set the hydraulic control lever to the lowest position.
2. Start the engine, and set at the idling speed.
3. Move the hydraulic control lever to lift position until the lift arm moves to the uppermost position.
4. Move the lift arm (1) to the upper end by hand and measure the free play.
5. If the measurement is not within the factory specifications, adjust the free play by changing the set position of feedback rod lock nut (2).

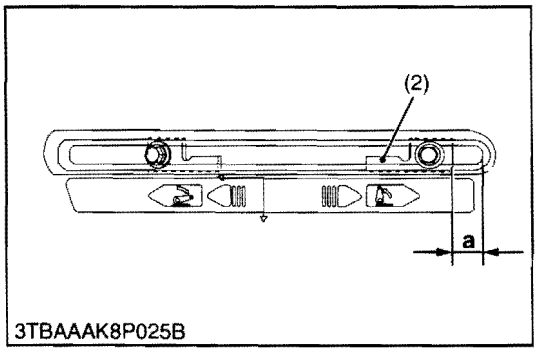
Lift arm free play	Factory spec.	5.0 to 15 mm 0.20 to 0.59 in.

(1) Lift Arm
(2) Lock Nut
(3) Feedback Rod

W1013137







Position Control Lever

CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Attach the approx. 1960 N (200 kg, 441 lbf) weight to the end of the lower links.
2. Loosen lever stopper (2). Temporally render it immovable.
3. Start the engine and set the engine revolutions at 2000 min^{-1} (rpm).
4. When moving the hydraulic control lever (1) to the inching up position **C**, the 3-point hitch has to move up (inching up) slowly.
5. When moving the hydraulic control lever (1) to highest position **D**, the 3-point hitch has to move up (uninterrupted moving up) fast.
6. When moving the hydraulic control lever (1) to the inching up position and releasing your hand from the hydraulic control lever (1), the hydraulic control lever (1) has to automatically return to the neutral position **N**.
7. If the lever does not automatically return to the neutral position **N** when moving the hydraulic control lever (1) to the inching up position **C** and releasing your hand from the hydraulic control lever (1), readjust the position of the lever stopper (2). Recheck the inching operation following the above procedures.

(Reference)

Distance **a** : 19 mm (0.75 in.)

(1) Hydraulic Control Lever
(2) Lever Stopper

A : Down Position
B : Slow Down Position
C : Slow Up Position
D : Up Position
N : Neutral Position

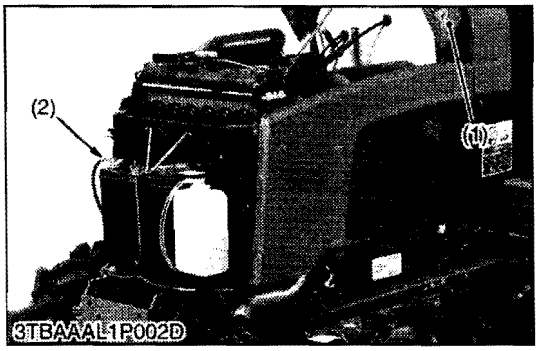
W1013121

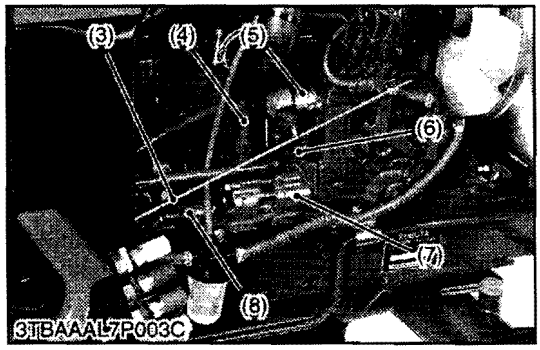
[2] PREPARATION

(1) Hydraulic Pump

■ **IMPORTANT**

- **The hydraulic pump is precision machined and assembled : If disassemble once, it may be unable to maintain its original performance. Therefore, when the hydraulic pump fails, replacement should be carried out with the hydraulic pump assembled except when emergency repair is unavoidable.**
- **When repair is required, follow the disassembly and servicing procedures shown below with utmost care.**
- **Be sure to test the hydraulic pump with a flowmeter before disassembling.**
- **After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.**





Removing Hydraulic Pump

1. Open the bonnet (1) then remove the front grille, side cover (R.H.) and disconnect the battery negative cord (2).
2. Disconnect the accelerator rod (3).
3. Disconnect the **2P** connector from the engine stop solenoid (5).
4. Disconnect the power steering delivery pipe (4) and 3-point hitch delivery pipe (6).
5. Disconnect the suction hose (8) and remove the hydraulic pump (7).

(When reassembling)

■ **NOTE**

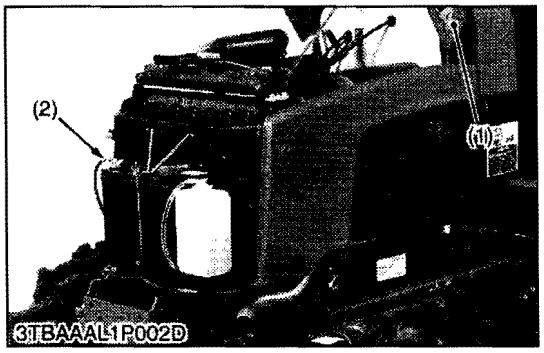
- **For fastening hydraulic pipe nut, use two wrenches. Hold the fitting with a wrench, turn the pipe nut another wrench to avoid damage at fitting installed part.**
- **When disconnecting battery cords, disconnect the negative cord first. When connecting, positive cord first.**

Tightening torque	Power steering delivery pipe nut	65 to 75 N·m 6.7 to 7.6 kgf·m 48 to 55 lbf·ft

(1) Bonnet
(2) Battery Negative Cord
(3) Accelerator Rod
(4) Power Steering Delivery Pipe
(5) Engine Stop Solenoid
(6) 3-Point Hitch Delivery Pipe
(7) Hydraulic Pump
(8) Suction Hose

W1016773

(2) Hydraulic Cylinder and Control Valve



Battery Negative Cord

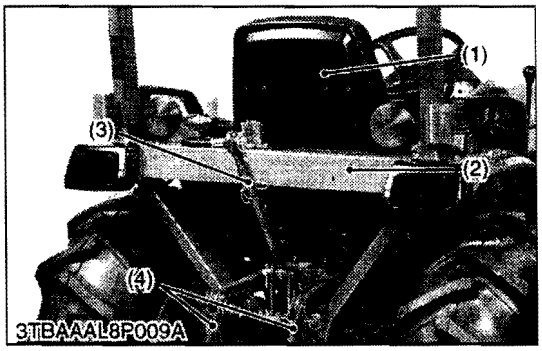
1. Open the bonnet (1) then remove the front grille and disconnect the battery negative cord (2).

■ **NOTE**

- **When disconnecting battery cords, disconnect the negative cord first. When connecting, positive cord first.**

(1) Bonnet
(2) Battery Negative Cord

W1021287

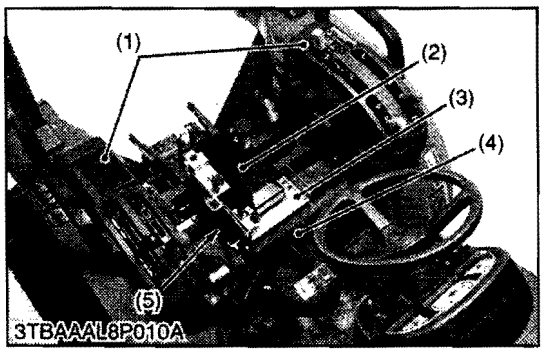


Seat and Lift Rod

1. Remove the seat (1).
2. Remove the top link (3) and disconnect the lift rods (4).
3. Remove the fender stay (2).

(1) Seat
(2) Fender Stay
(3) Top Link
(4) Lift Rod

W1021549

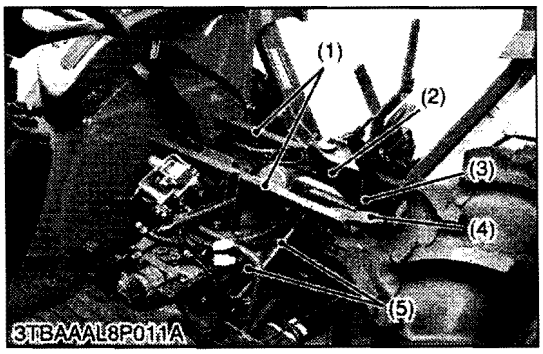


Tail Lamp, Lever Guides, Tool Box and Seat Bracket

1. Remove the front loader lever (5). [If equipped]
2. Remove the lowering speed adjusting knob and the seat under cover.
3. Remove the lever grips and lever guides (1).
4. Remove the tool box (2).
5. Disconnect the seat switch connectors and remove the seat bracket (3).

(1) Lever Guide
(2) Tool Box
(3) Seat Bracket
(4) Seat Under Cover
(5) Front Loader Lever

W1022039

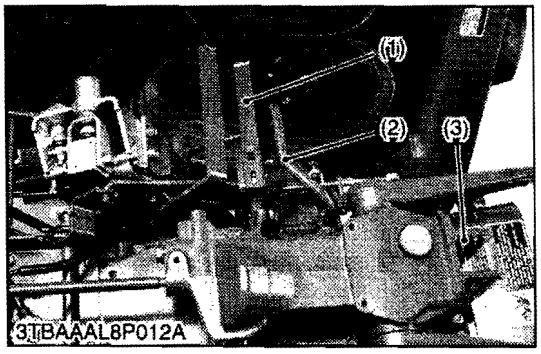


PTO Shift Lever and Range Gear Shift Lever

1. Remove the seat stay (1).
2. Remove the PTO shift rod (5).
3. Remove the external snap ring and remove the mid-PTO shift lever (2) and range gear shift lever (4).

(1) Seat Stay
(2) Mid-PTO Shift Lever
(3) Rear PTO Shift Lever
(4) Range Gear Shift Lever
(5) PTO Shift Rod

W1022217



3-Point Hitch Delivery Pipe and Hydraulic Control Lever

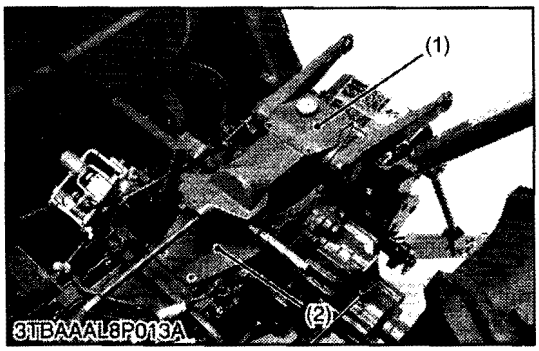
1. Remove the hydraulic control lever (1).
2. Remove the 3-point hitch delivery pipe 2 (2).
3. Remove the pipe clamp and disconnect the 3-point hitch delivery pipe at hydraulic cylinder block side. [Without front loader valve model].
4. Remove the top link bracket (3).

(When reassembling)

Tightening torque	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	3-point hitch delivery pipe joint bolt	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Top link bracket mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Hydraulic Control Lever (3) Top Link Bracket
(2) 3-Point Hitch Delivery Pipe 2

W1018061



Hydraulic Cylinder Assembly

1. Remove the hydraulic cylinder assembly (1) with connecting plate (2).

(When reassembling)

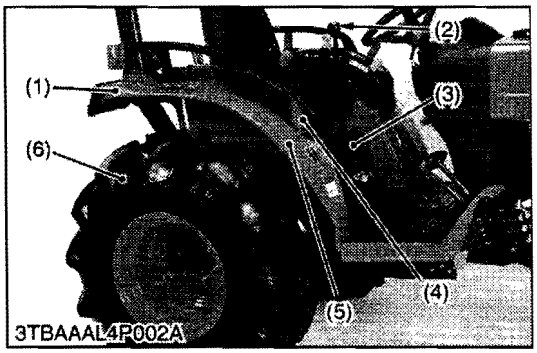
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the differential case and the hydraulic cylinder.

Tightening torque	Connecting plate mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Hydraulic cylinder assembly mounting screw and nut	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Hydraulic Cylinder Assembly (2) Connecting Plate

W1022846

(3) Removing Front Loader Control Valve Assembly [If Equipped]



Rear Wheel, Fender and Seat Under Cover

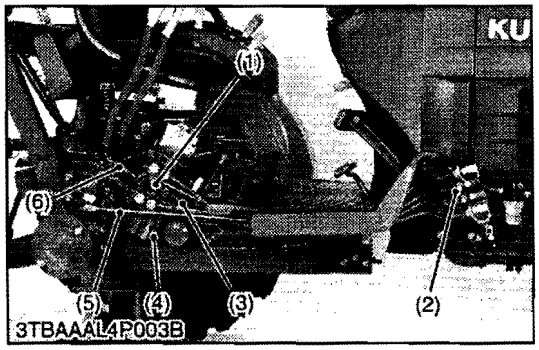
1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel mounting nuts.
3. Remove the rear wheel, R.H. (6).
4. Disconnect the wire harness and remove the tail lamp (1).
5. Remove the lever grips (R.H.).
6. Remove the lever guide, R.H. (4) and remove the fender, R.H. (5).
7. Remove the front loader lever (2).
8. Remove the seat under cover (3).

(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) Tail Lamp
(2) Front Loader Lever
(3) Seat Under Cover
(4) Lever Guide, R.H.
(5) Fender, R.H.
(6) Rear Wheel, R.H.

W1026167



Front Loader Control Valve Assembly

1. Remove the brake rod, R.H. (5).
2. Remove the front loader pipes (2).
3. Remove the pipe clamp and disconnect the 3-point hitch delivery pipe 1 (3) from front loader control valve side.
4. Remove the 3-point hitch delivery pipe 2 (6).
5. Remove the hose clamp and hydraulic hose (4).
6. Remove the front loader control valve assembly (1).

(When reassembling)

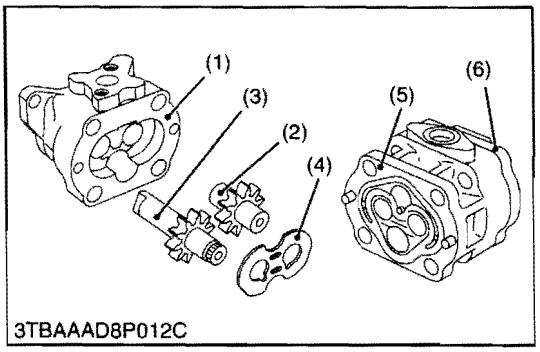
Tightening torque	Front loader pipe joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader control valve side)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft

(1) Front Loader Control Valve Assembly
(2) Front Loader Pipes
(3) 3-Point Hitch Delivery Pipe 1
(4) Hydraulic Hose
(5) Brake Rod, R.H.
(6) 3-Point Hitch Delivery Pipe 2

W1026464

[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump



3TBAAAD8P012C

Hydraulic Pump Cover, Side Plate and Gear

1. Secure the hydraulic pump with a vise, and remove the hydraulic pump cover (6) with casing (5).
2. Remove the side plate (4).
3. Remove the drive gear (3) and driven gear (2) from the casing (1).

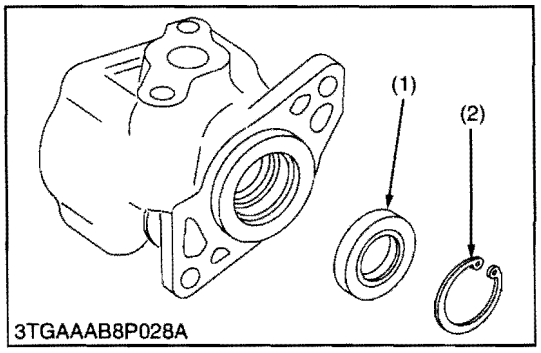
(When reassembling)

- Take care not to damage the O-ring.
- Align the holes of the cover and casing.
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

Tightening torque	Hydraulic pump cover mounting screw	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 29 lbf·ft

(1) Casing
(2) Driven Gear
(3) Drive Gear
(4) Side Plate
(5) Casing
(6) Hydraulic Pump Cover

W1017436



3TGAAAB8P028A

Oil Seal

1. Remove the internal snap ring (2), and remove the oil seal (1).

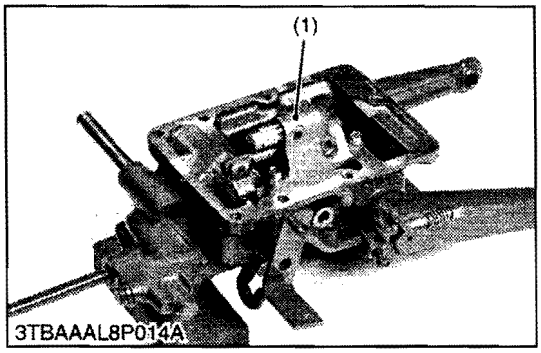
(When reassembling)

- If the oil seal is defective, worn or scratched, replace it.

(1) Oil Seal
(2) Internal Snap Ring

W1017691

(2) Hydraulic Cylinder



Control Valve

1. Remove the control valve mounting screws, and remove the control valve (1).

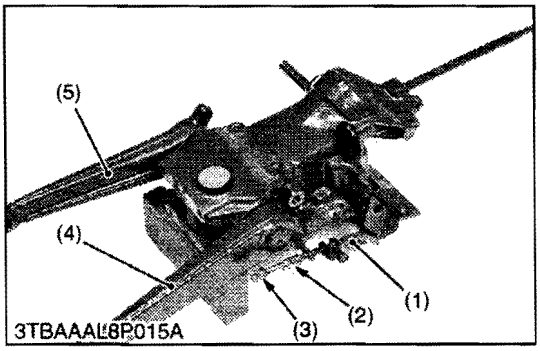
(When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Control valve mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Control Valve

W1016344

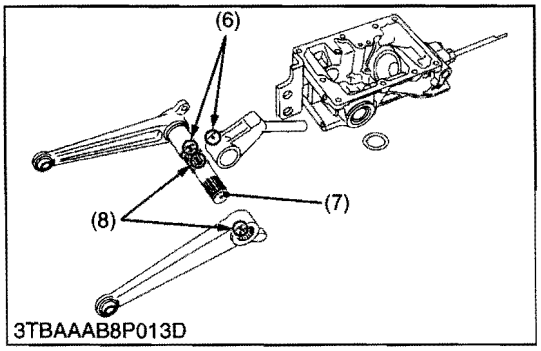


Lift Arm, Hydraulic Arm Shaft and Hydraulic Arm

1. Remove the feedback rod lock nuts (3) and spring (2).
2. Remove the lift arm, L.H. (5).
3. Remove the hydraulic arm shaft (7) and lift arm, R.H. (4) as a unit.

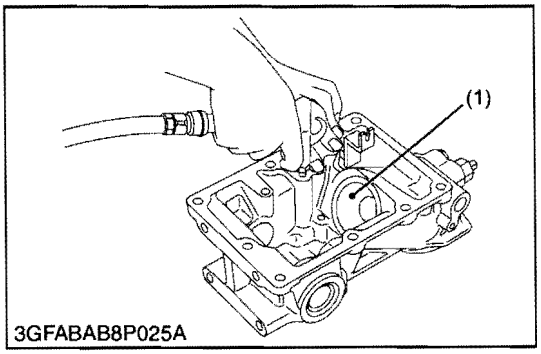
(When reassembling)

- Align the alignment marks (6) of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks (8) of the lift arm, L.H. and hydraulic arm shaft.
- Apply grease to the right and left bushings and O-rings.
- Take care not to damage the O-rings.



(1) Feedback Rod
(2) Spring
(3) Feedback Rod Lock Nut
(4) Lift Arm, R.H.
(5) Lift Arm, L.H.
(6) Alignment Mark
(7) Hydraulic Arm Shaft
(8) Alignment Mark

W1016683

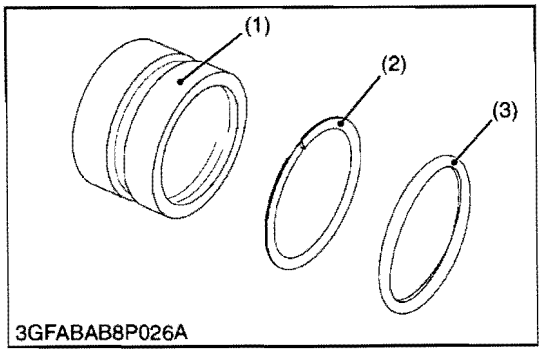


Hydraulic Piston

1. Inject the compressed air into the hydraulic cylinder, and take out the hydraulic piston (1).

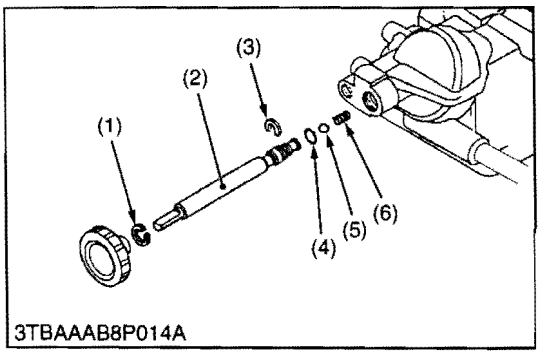
(When reassembling)

- Take care not to damage the O-ring (3) and backup ring (2).
- Apply transmission fluid to the O-ring.
- Replace the O-ring if it is defective, worn or scratched, and it cause the oil leakage.



(1) Hydraulic Piston
(2) Backup Ring
(3) O-ring

W1019016



Lowering Speed Adjusting Valve

1. Remove the internal snap ring (1) and pull out the lowering speed adjusting valve with shaft (2).
2. Draw out the ball (5) and spring (6).

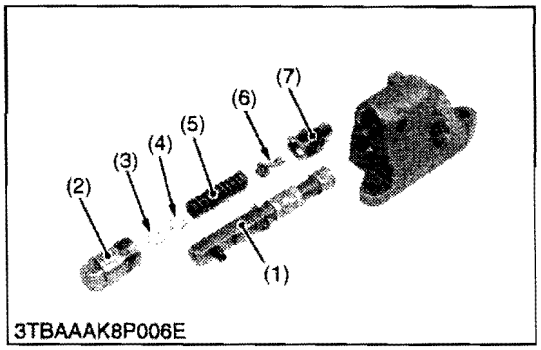
(When reassembling)

- Take care not to damage the O-rings.

(1) Internal Snap Ring
(2) Lowering Speed Adjusting Valve with Shaft
(3) Stopper
(4) O-ring
(5) Ball
(6) Spring

W1019216

(3) Hydraulic Control Valve



Disassembling Control Valve

1. Remove the spool (1).
2. Remove the plug (2) and draw out the washer (3), shims (4) spring (5), poppet (6) and valve seat (7).

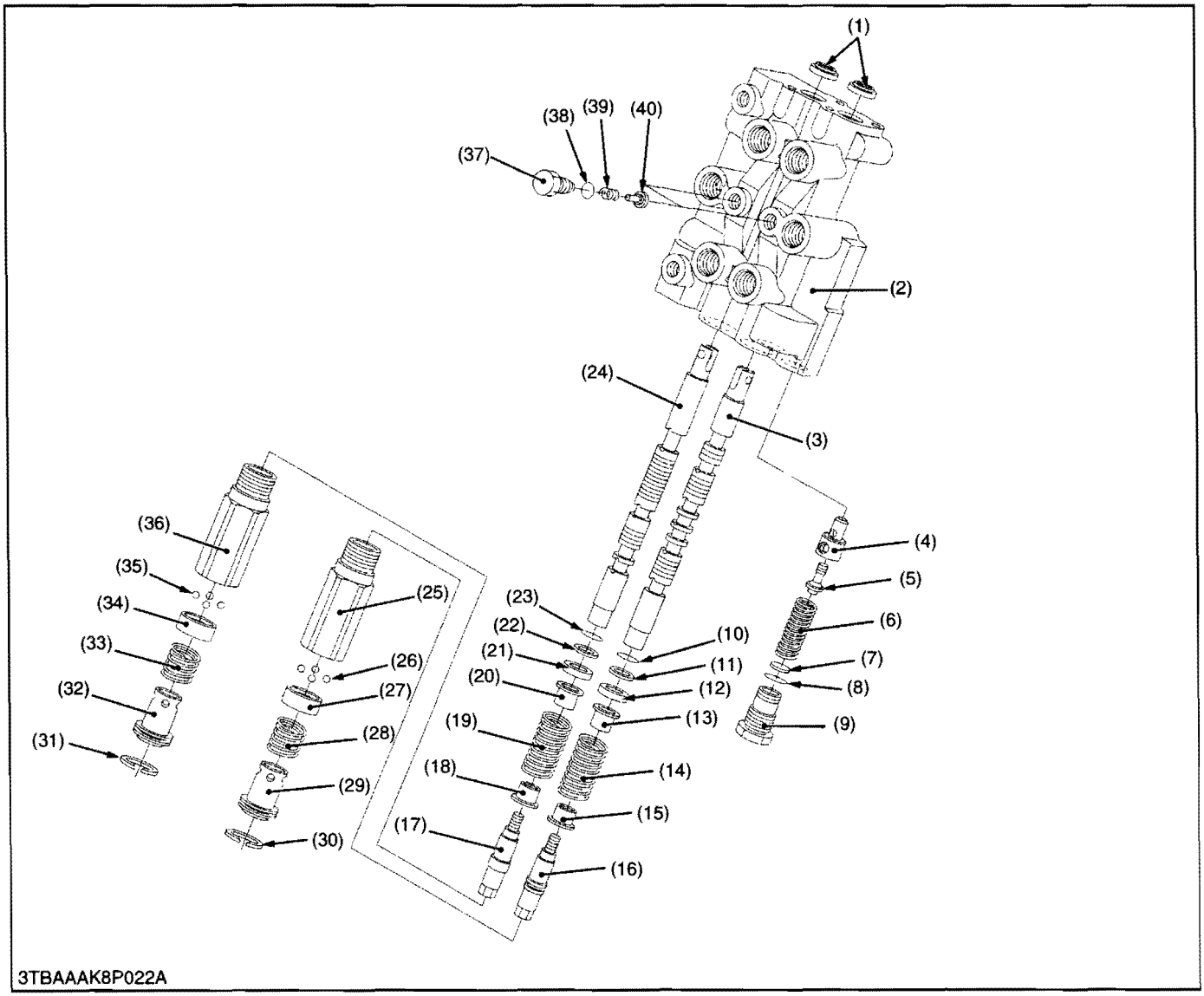
(When reassembling)

Tightening torque	Relief valve plug	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft

(1) Spool
(2) Relief Valve Plug
(3) Washer
(4) Shim
(5) Spring
(6) Poppet
(7) Valve Seat

W1029109

(4) Disassembling Front Loader Control Valve and Relief Valve [If Equipped]



(1) Dust Seal
(2) Valve Body
(3) Spool for Boom
(4) Corn
(5) Poppet
(6) Spring
(7) Shim
(8) O-ring
(9) Plug
(10) O-ring
(11) Backup Ring
(12) Collar
(13) Spring Holder 1
(14) Spring
(15) Spring Holder 1
(16) Detente Bolt 1
(17) Detente Bolt 2
(18) Spring Holder 2
(19) Spring
(20) Spring Holder 2
(21) Collar
(22) Backup Ring
(23) O-ring
(24) Spool for Bucket
(25) Plug
(26) Ball
(27) Detente Ring
(28) Detente Spring
(29) Stopper
(30) Ring
(31) Ring
(32) Stopper
(33) Detente Spring
(34) Detente Ring
(35) Ball
(36) Plug
(37) Plug
(38) O-ring
(39) Spring
(40) Check Valve

■ Boom Control Section and Bracket Control Section

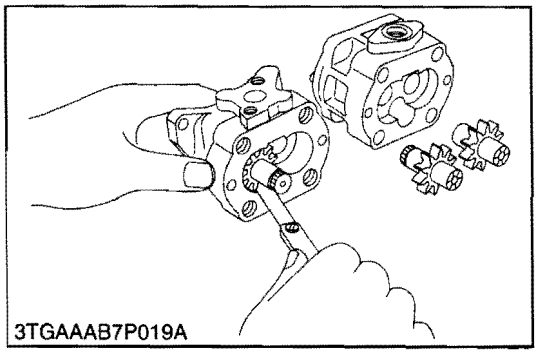
1. Remove the plug (37) and take out the spring (39) and load check valve (40).
2. Remove the plug (25), (36) from valve body (2).
3. Remove the ring (30), (31) and take out the stopper (29), (32), detente spring (28), (33), detente ring (27), (34) and ball (26), (35).
4. Draw out the spool (3), (24) with other component parts from valve body (2).

■ Relief Valve

1. Remove the plug (9) and take out the spring (6), poppet (5) and corn (4).

[4] SERVICING

(1) Hydraulic Pump

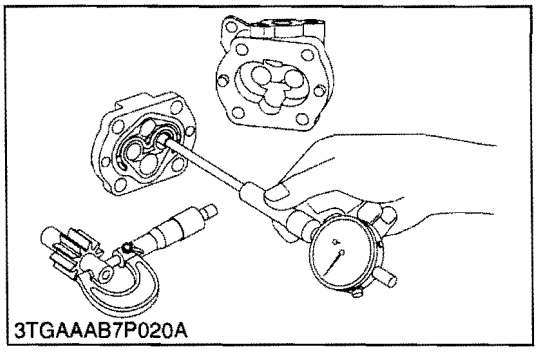

3TGAAAB7P019A

Clearance between Tip of Gear Tooth and Casing

1. Measure the clearance between gear and casing at several points with feeler gauge.
2. If the clearance exceeds the allowable limit, replace the assembly.

Clearance between tip of gear tooth and casing	Allowable limit	0.15 mm 0.059 in.

W1022533


3TGAAAB7P020A

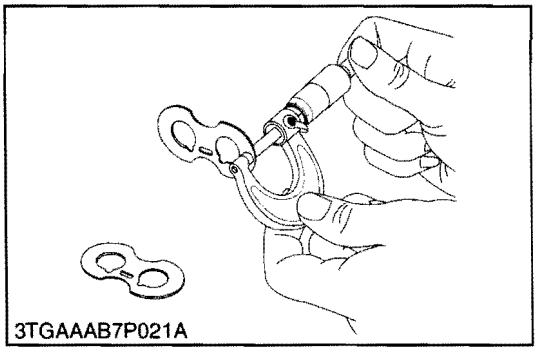
Clearance between Bushing and Gear Shaft

1. Measure the gear shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between busing and shaft	Factory spec.	0.020 to 0.091 mm 0.00079 to 0.0035 in.
	Allowable limit	0.12 mm 0.0047 in.

Gear Shaft O.D.	Factory spec.	14.970 to 14.980 mm 0.58937 to 0.58976 in.
Bushing I.D.	Factory spec.	15.000 to 15.061 mm 0.59056 to 0.59295 in.

W1022650


3TGAAAB7P021A

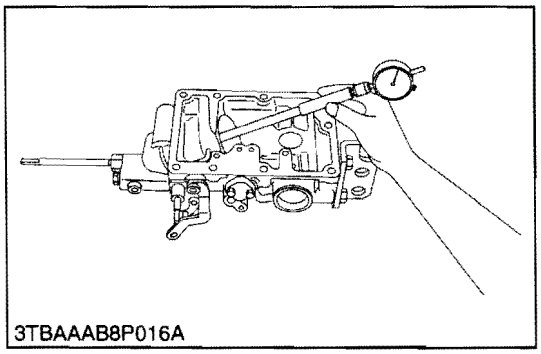
Side Plate Thickness

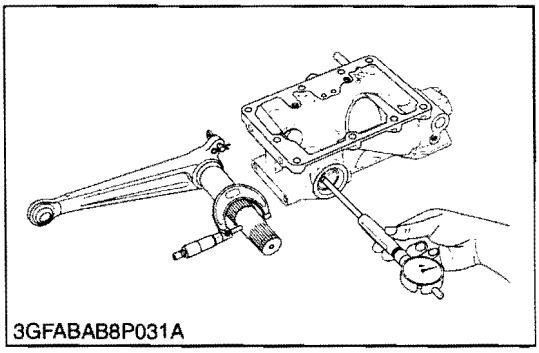
1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0977 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

W1022982

(2) Hydraulic Cylinder


3TBAAAB8P016A


3GFABAB8P031A

Hydraulic Cylinder Bore

1. Check the cylinder internal surface for scratch or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace the hydraulic cylinder block.

Cylinder I.D.	Factory spec.	70.05 to 70.10 mm 2.758 to 2.759 in.
	Allowable limit	70.15 mm 2.762 in.

W1023111

Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

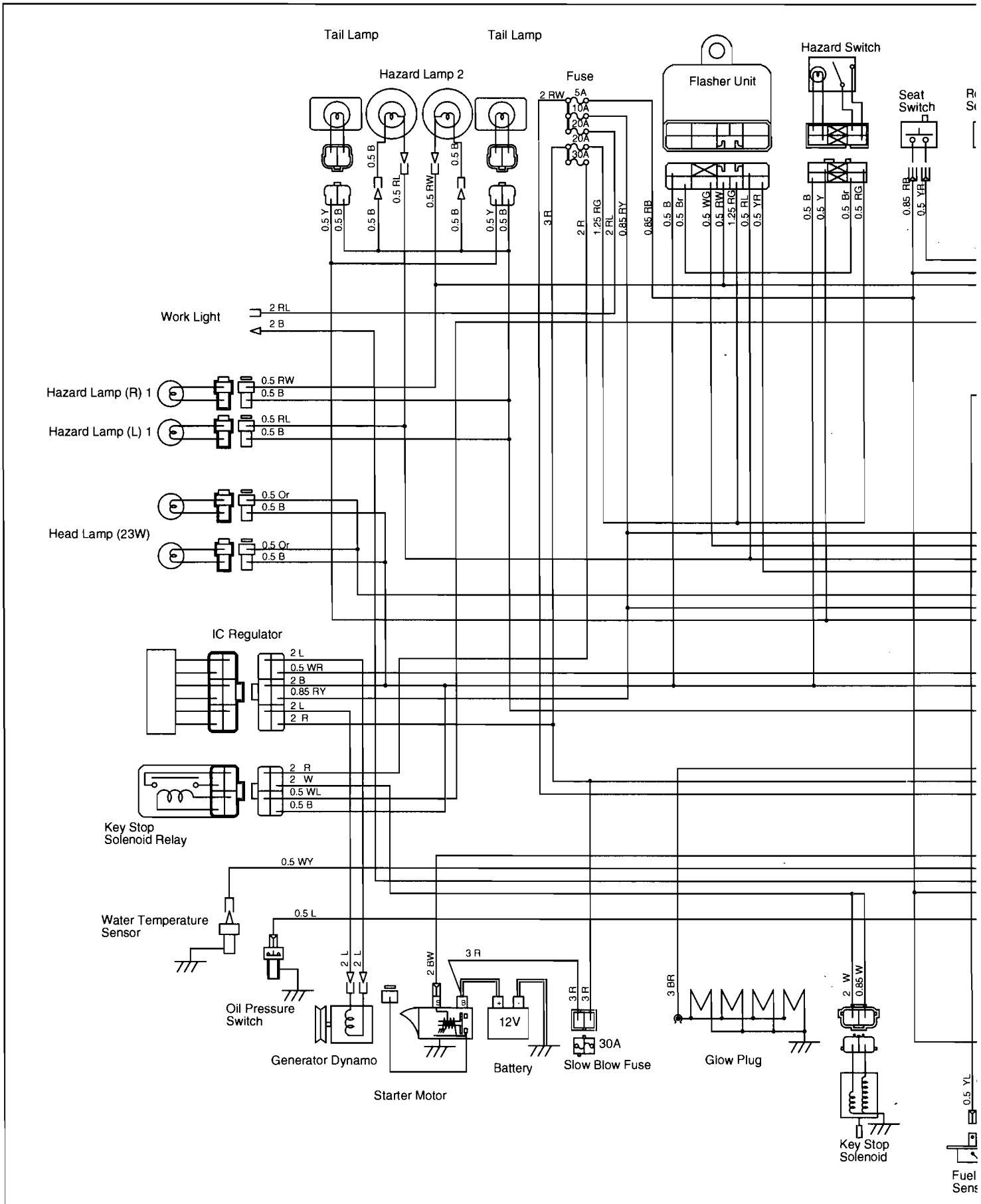
Clearance between hydraulic arm shaft and bushing	Factory spec.		0.020 to 0.11 mm 0.00079 to 0.0043 in.
	Allowable limit		0.30 mm 0.012 in.
Hydraulic arm shaft O.D.	Factory spec.	Right	37.925 to 37.950 mm 1.4932 to 1.4940 in.
		Left	33.925 to 33.950 mm 1.3357 to 1.3366 in.
Bushing I.D. (after press fitted)	Factory spec.	Right	37.970 to 38.035 mm 1.4949 to 1.4974 in.
		Left	33.970 to 34.035 mm 1.3374 to 1.3399 in.

W1023373

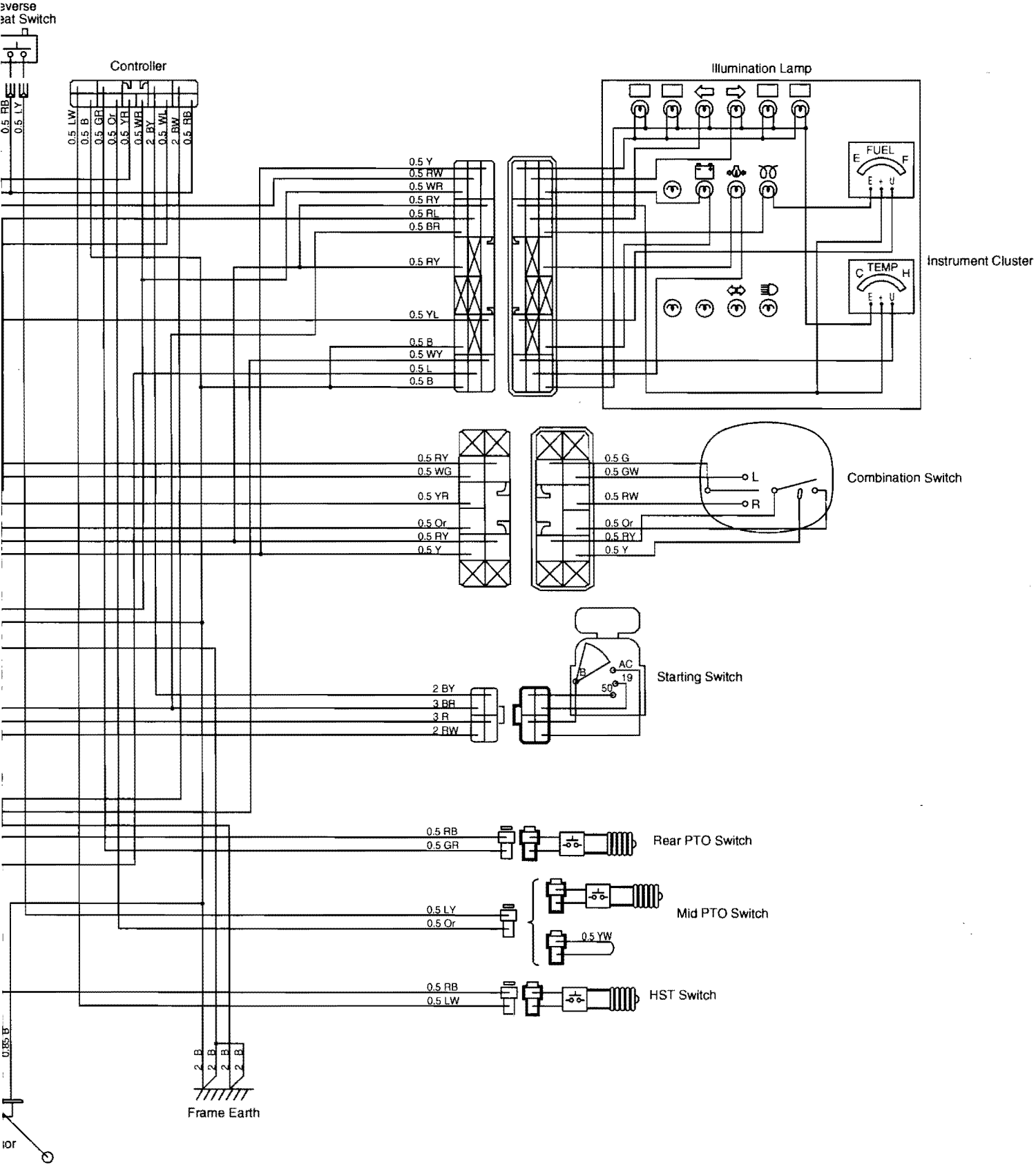
MECHANISM

CONTENTS

1. WIRING DIAGRAM



3TBAAAL9P001A


everse
eat Switch
Controller
0.5 RB
0.5 LY
0.5 LW
0.5 B
0.5 GR
0.5 Or
0.5 YR
0.5 WR
2 BY
0.5 WL
2 BW
0.5 RB
Illumination Lamp
FUEL
E
F
E + U
TEMP
C
H
E + U
Instrument Cluster
0.5 Y
0.5 RW
0.5 WR
0.5 RY
0.5 RL
0.5 BR
0.5 RY
0.5 YL
0.5 B
0.5 WY
0.5 L
0.5 B
0.5 RY
0.5 WG
0.5 YR
0.5 Or
0.5 RY
0.5 Y
0.5 G
0.5 GW
0.5 RW
0.5 Or
0.5 RY
0.5 Y
L
R
Combination Switch
2 BY
3 BR
3 R
2 RW
B
AC
19
50
Starting Switch
0.5 RB
0.5 GR
Rear PTO Switch
0.5 LY
0.5 Or
0.5 YW
Mid PTO Switch
0.5 RB
0.5 LW
HST Switch
2 B
2 B
2 B
2 B
Frame Earth
ior

Color of Wiring

W ..... White	WR ..... White / Red	LW ..... Blue / White
R ..... Red	WY ..... White / Yellow	LG ..... Blue / Green
L ..... Blue	WL ..... White / Blue	LR ..... Blue / Red
Y ..... Yellow	RW ..... Red / White	LB ..... Blue / Black
B ..... Black	RL ..... Red / Blue	LOr ..... Blue / Orange
G ..... Green	RY ..... Red / Yellow	YG ..... Yellow / Green
P ..... Pink	RB ..... Red / Black	YR ..... Yellow / Red
Lg ..... Light Green	RG ..... Red / Green	YB ..... Yellow / Black
Br ..... Brown	BW ..... Black / White	YL ..... Yellow / Blue
Or ..... Orange	BL ..... Black / Blue	GR ..... Green / Red
Sb ..... Sky Blue	BR ..... Black / Red	GW ..... Green / White
WG ..... White / Green	BY ..... Black / Yellow	LgY ..... Light Green / Yellow
WB ..... White / Black	LY ..... Blue / Yellow	LgB ..... Light Green / Blue

W1012736

2. ENGINE STARTING SYSTEM AND STOPPING SYSTEM

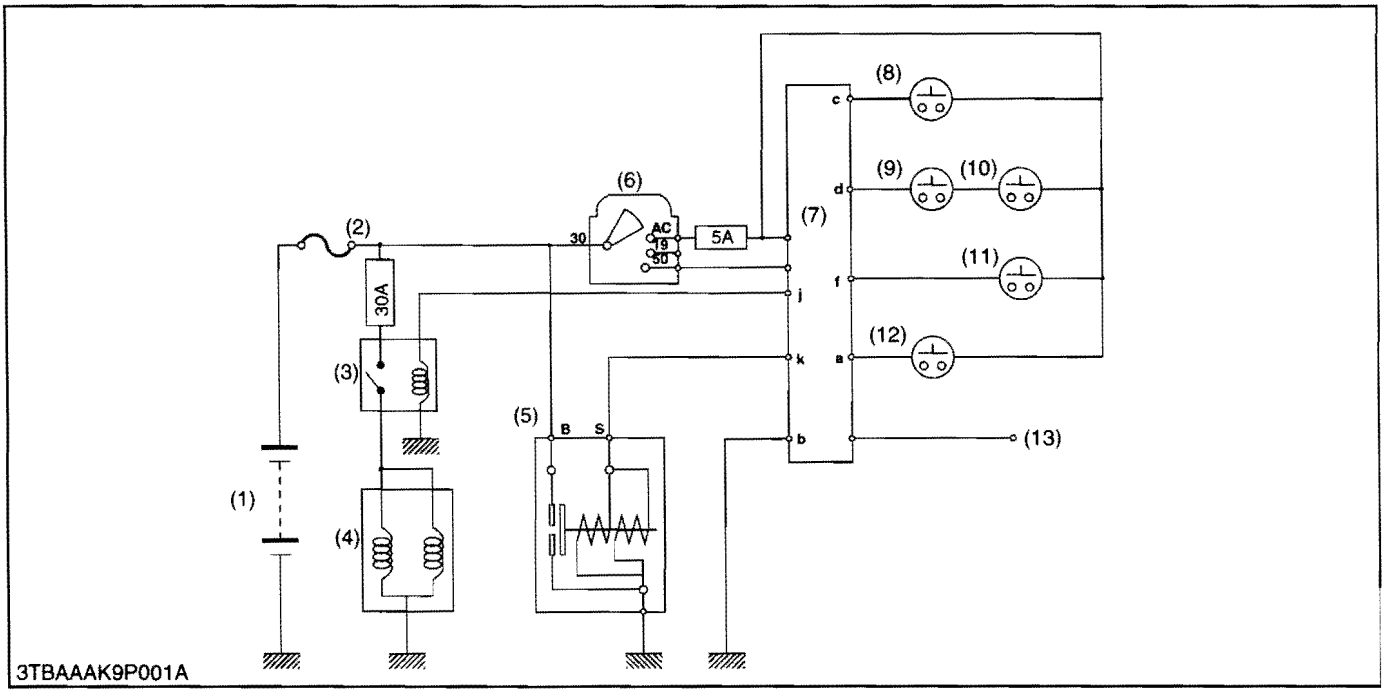
B3200 tractor equipped operator presence control (OPC) system. This system will automatically stop the engine when operator stands up from the seat while shifting the PTO gear shift lever or depressing the HST pedal.

This system is controlled by five switches, (PTO switch 1, PTO switch 2, seat switch, seat tilt switch, HST safety switch) and controller.

Engine starting is operated with starter after current flowing from controller to stator motor.

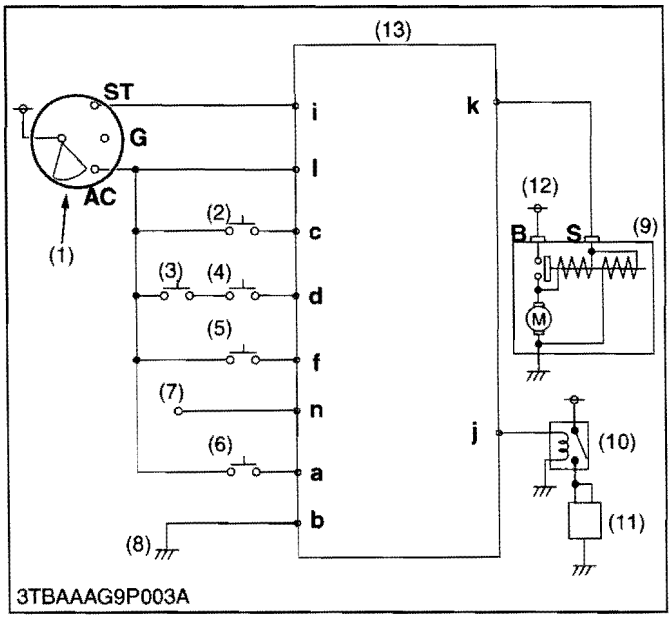
Engine stopping is operated with key stop solenoid after current flowing from controller through key stop solenoid relay to key stop solenoid.

[1] OPC SYSTEM CIRCUIT



(1) Battery
(2) Slow Blow Fuse
(3) Key Stop Solenoid Relay
(4) Key Stop Solenoid
(5) Starter
(6) Main Switch
(7) Operator Presence Controller
(8) PTO Switch 1
(9) PTO Switch 2
(10) Seat Tilt Switch
(11) Seat Switch
(12) HST Pedal Switch
(13) Regulator L Terminal

[2] CONTROLLER



■ Operator Presence Control (OPC) System

B3200 is configured with an **"Operator Presence Control (OPC)"** system to control engine starting and engine automatically stopping.

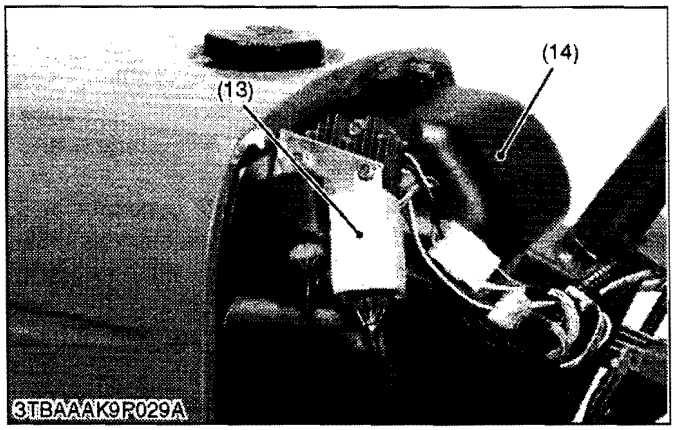
This OPC system mainly consists of controller and engine starting / stopping control switches such as HST pedal switch, seat switch, seat tilt switch, PTO switch 1 and PTO switch 2.

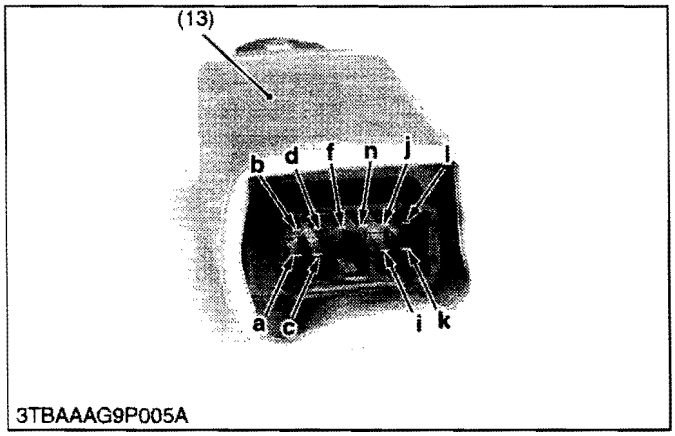
Main parts regarding OPC system are laid out as shown in the electrical circuit.

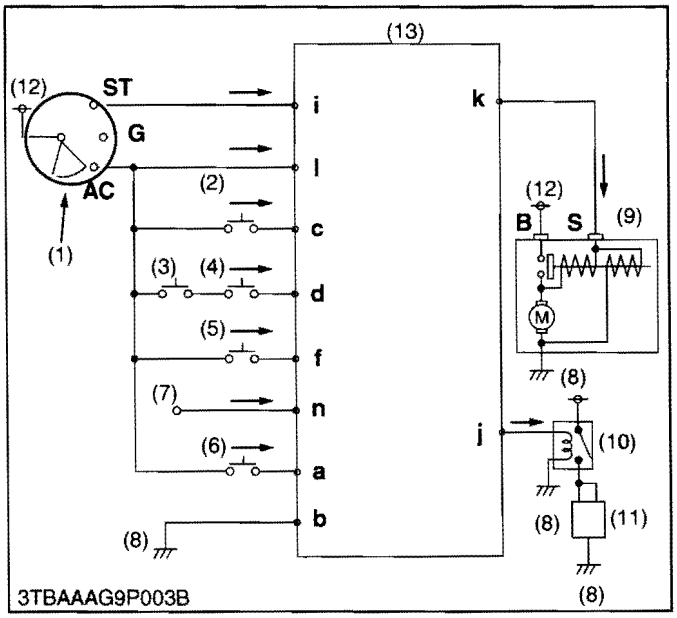
(1) Main Switch
(2) PTO Switch 1
(3) Seat Tilt Switch
(4) PTO Switch 2
(5) Seat Switch
(6) HST Pedal Switch
(7) Regulator **L** Terminal
(8) Body Earth
(9) Starter Motor
(10) Key Stop Solenoid Relay
(11) Key Stop Solenoid
(12) Battery
(13) OPC Controller

a to l :Controller Terminal
ST : Main Switch ST Terminal
G : Main Switch G Terminal
AC :Main Switch AC Terminal
B : Starter Motor B Terminal
S : Starter Motor S Terminal

W1013417







■ Controller

Controller is located inside the panel board.

A current from the main switch, safety switches and regulator **L** terminal flows to controller.

Controller receives current as data, processes the data, and sends out current computing results to starter motor, key stop solenoid relay, and key stop solenoid.

OPC controller (13) controls engine starting and engine stopping.

A current flows from battery to controller.

A current from switches such as PTO switch 1 (2), seat tilt switch (3), PTO switch 2 (4), seat switch (5) and HST pedal switch (6), flows to the controller.

A current from regulator **L** terminal (7) flows to the controller.

After starting the engine, the controller (13) supplies current to starter motor **S** terminal or key stop solenoid relay (10).

Controller (13) receives data, processes the data, and sends out the computing results.

Controller (13) receives data from safety switches, processes the data inside the controller itself, and sends out the computing results to starter motor (9) for engine starting, and key stop solenoid relay (10) for engine stopping.

Controller (13) is configured with a delay timer in the controller unit to hold fuel cut signal from the controller unit to key stop solenoid (11) for about 1 second.

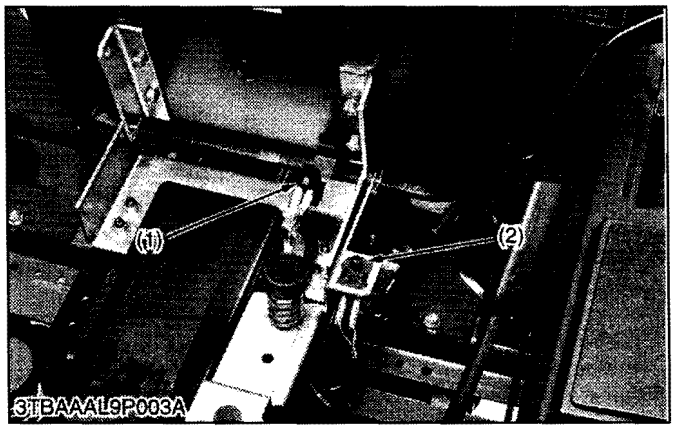
(1) Main Switch
(2) PTO Switch 1
(3) Seat Tilt Switch
(4) PTO Switch 2
(5) Seat Switch
(6) HST Pedal Switch
(7) Regulator **L** Terminal
(8) Body Earth
(9) Starter Motor
(10) Key Stop Solenoid Relay
(11) Key Stop Solenoid
(12) Battery
(13) OPC Controller
(14) Steering Post

a to l :Controller Terminal
ST : Main Switch ST Terminal
G : Main Switch G Terminal
A : Main Switch AC Terminal
B : Starter Motor B Terminal
S : Starter Motor S Terminal
→ : Current Flow

W1013855

[3] SAFETY SWITCH AND ENGINE CONDITION

(1) Related Switches

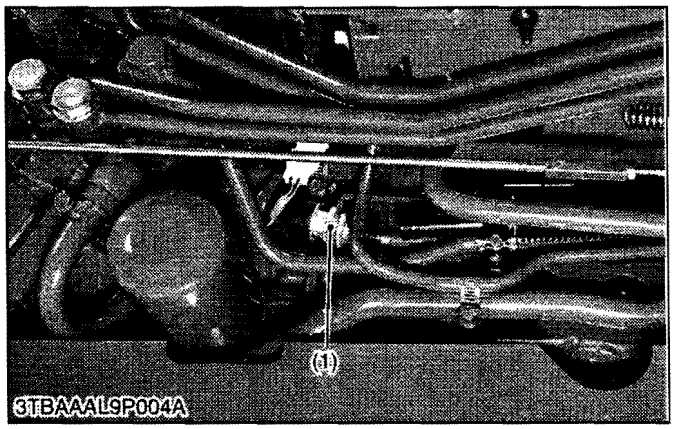


■ Seat Switch and Seat Tilt Switch

These switches are located under the seat. When sitting on the seat, the seat switch (2) is pushed in and electrical circuit is closed. When the seat is vacant, this switch is not pushed and electric circuit is opened. Other seat tilt switch (1) is to detect tilting the seat. When tilting the seat forward as shown in the figure, the seat tilt switch (1) is pushed in and electrical circuit is closed.

(1) Seat Tilt Switch (2) Seat Switch

W1014909

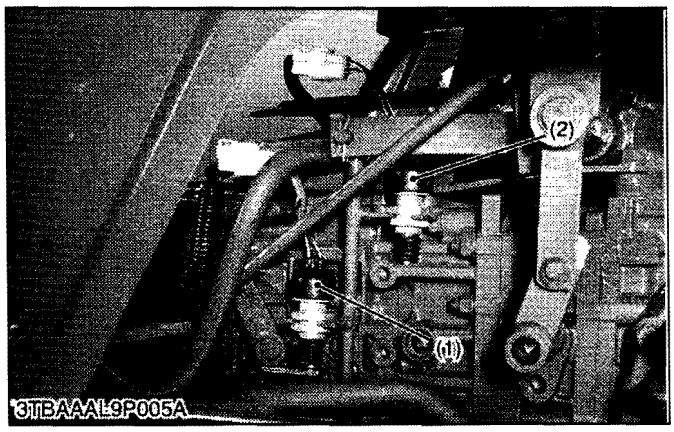


■ HST Pedal Switch

When the HST pedal is in neutral, this switch is pushed in and electric circuit is closed.

(1) HST Pedal Switch

W1015091



■ PTO Switch 1 and PTO Switch 2

These switches are located near the PTO gear shift lever. When the PTO gear shift lever is in neutral, the rear PTO switch 1 (1) is pushed in and electric circuit is closed.

On the other hand, the PTO switch 2 (2) is to detect the PTO gear shift lever in rear PTO speed position. When the PTO gear shift lever is shifted to rear PTO speed position, this switch is pushed in and electric circuit is closed.

(1) PTO Switch 1 (2) PTO Switch 2

W1015181

(2) Engine Starting Conditions

When the following conditions become complete, electric current (12V) reaches starter **S** terminal through operator presence controller from main switch **50** terminal, and the engine can be started.

	PTO Switch (Neutral : ON) (Engaged : OFF)	**HST Pedal Switch** (Neutral : ON) (Others : OFF)
Condition	ON	ON

W1015447

(3) Automatic Engine Stop

Engine can be shut off under the following conditions since these conditions cause key stop relay to operate and it controls fuel cut solenoid.

Condition	**Seat Switch** (Occupied : ON) (Vacant : OFF)	**HST Pedal Switch** (Neutral : ON) (Others : OFF)	**PTO Switch 1** (Neutral : ON) (Engage : OFF)	**PTO Switch 2** (Others : OFF) (Rear PTO Engage : ON)	**Seat Tilt Switch** (Tilted : ON) (Normal : OFF)
1	OFF	OFF	ON / OFF	ON / OFF	ON / OFF
2	OFF	ON / OFF	OFF	OFF	ON / OFF
3	OFF	ON / OFF	OFF	ON	OFF

■ **NOTE**

- **When the mid PTO is not engaged and the seat is tilted, the engine does not stop even if rear PTO is engaged.**

W1015551

The Correct Automatic Engine Stop Condition

[INCORRECT] Page 9-M7

(3) Automatic Engine Stop

Engine can be shut off under the following conditions since these conditions cause key stop relay to operate and it controls fuel cut solenoid.

Condition	**Seat Switch** (Occupied : ON) (Vacant : OFF)	**Main Shift Switch or HST Pedal Switch** (Neutral : ON) (Others : OFF)	**PTO Switch 1** (Neutral : ON) (Engage : OFF)	**PTO Switch 2** (Others : ON) (Rear PTO Engage : OFF)	**Seat Tilt Switch** (Tilted : ON) (Normal : OFF)
1	OFF	OFF	ON / OFF	ON / OFF	ON / OFF
2	OFF	ON	OFF	ON / OFF	ON / OFF
3	OFF	ON	OFF	OFF	OFF

■ **NOTE**

- **When the mid PTO is not engaged and the seat is tilted, the engine does not stop even if rear PTO is engaged.**

[CORRECT]

(3) Automatic Engine Stop

Since the key stop relay controlled the engine stop solenoid as show in the table below, the engine should be shut off.

Condition	**Seat Switch** (Occupied : ON) (Vacant : OFF)	**Main Shift Switch or HST Pedal Switch** (Neutral : ON) (Others : OFF)	**PTO Switch 1** (Neutral : ON) (Engage : OFF)	**PTO Switch 2** (Others : OFF) (Rear PTO Engage : ON)	**Seat Tilt Switch** (Tilted : ON) (Normal : OFF)
1	OFF	OFF	ON / OFF	ON / OFF	ON / OFF
2	OFF	ON / OFF	OFF	OFF	ON / OFF
3	OFF	ON / OFF	OFF	ON	OFF

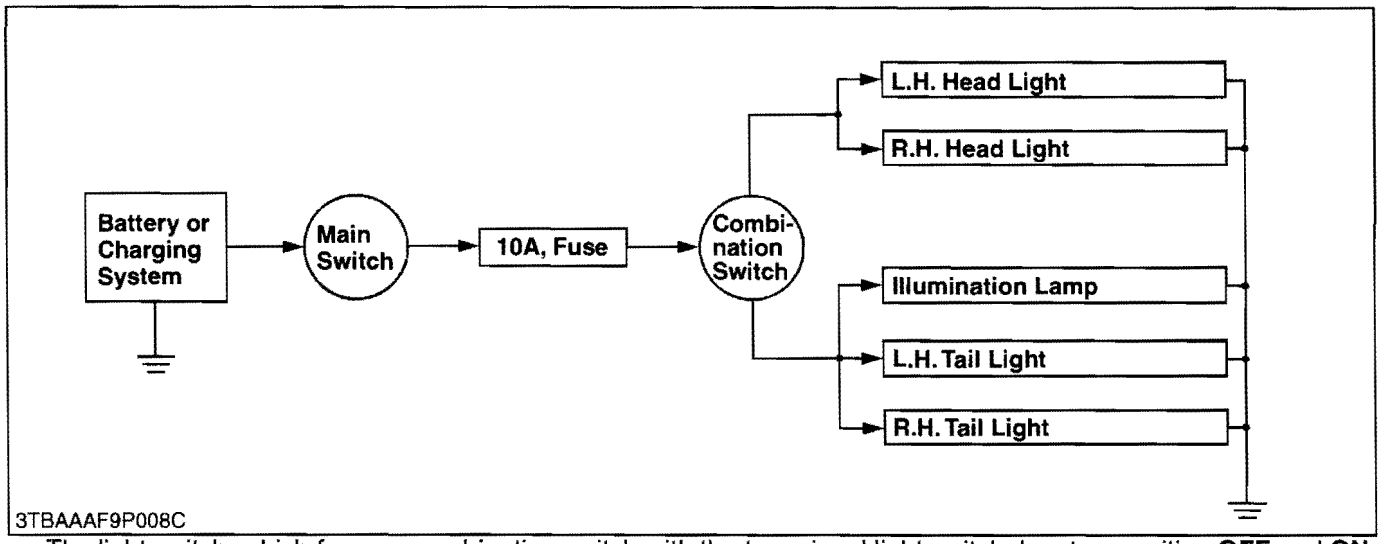
■ **NOTE**

- **When the mid-PTO is not engaged and the seat is tilted, the engine does not stop while the rear PTO is engaging.**

3. LIGHTING SYSTEM

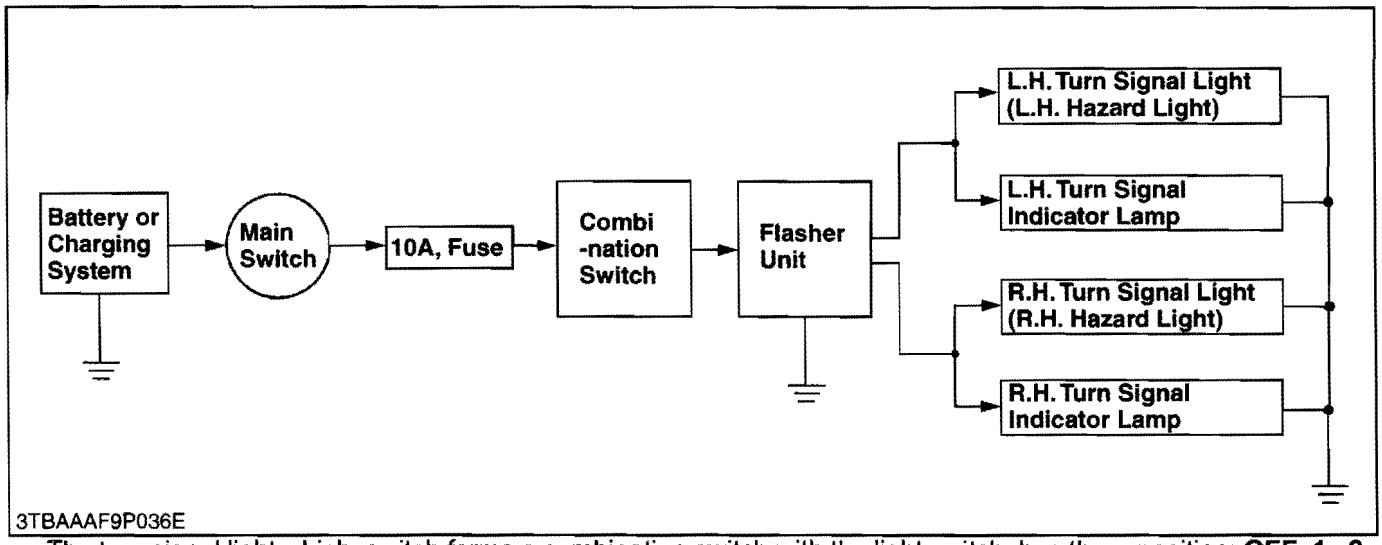
The lighting system consists of combination switch (light switch and hazard switch), head lights, tail lights, hazard lights, etc..

[1] HEAD LIGHT



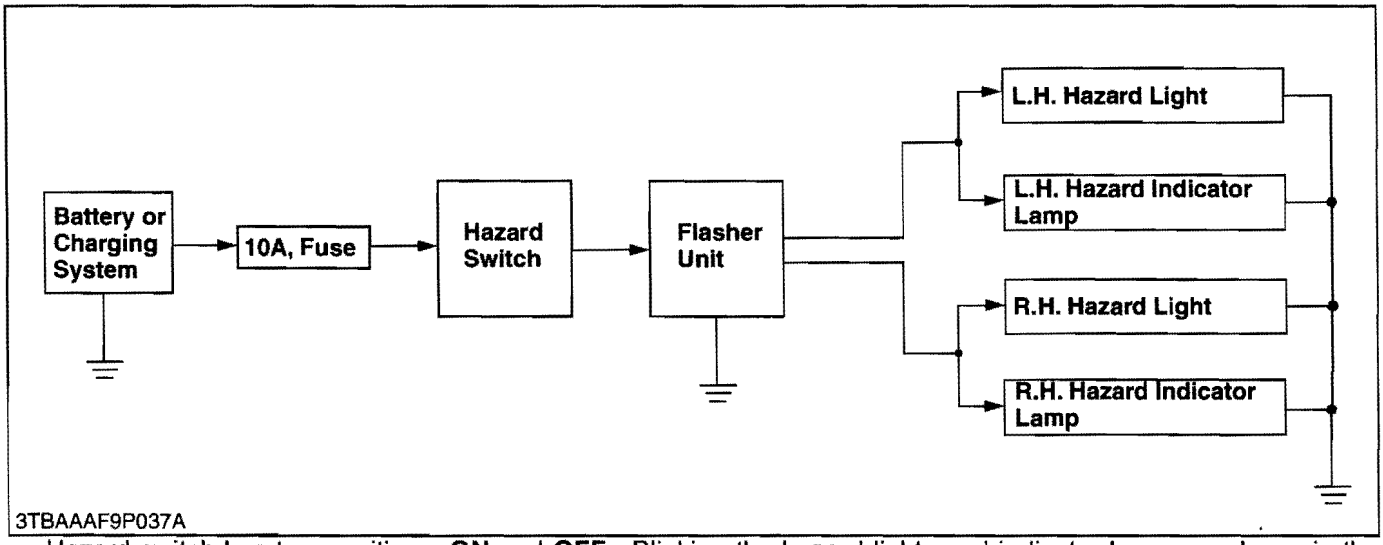
The light switch, which forms a combination switch with the turn signal light switch, has two position **OFF** and **ON**. Current passes through the light circuit as shown in the figure above.

[2] TURN SIGNAL LIGHT



The turn signal light which, switch forms a combination switch with the light switch, has three position; **OFF**, **1.**, **2.**. When using turn signal light switch, blinks only one side light and other one stays on. The operation of the turn signal light switch is given to priority when the hazard switch and the turn signal light switch are turned on at the same time.

[3] HAZARD LIGHT

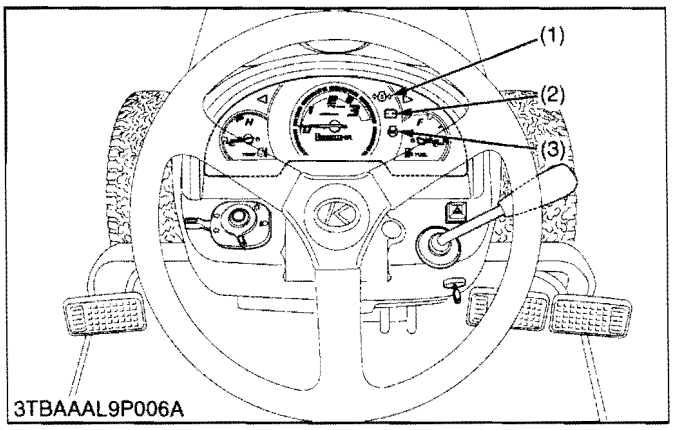


Hazard switch has two positions; **ON** and **OFF**. Blinking the hazard lights and indicator lamps as shown in the figure above. The hazard light is operative when the key switch is in either the **ON** or **OFF** positions.

4. EASY CHECKER

To check the conditions of tractor easily before and during operation, easy checker combination of lamps on the easy checker board is provided.

[1] INDICATION ITEMS



(1) Oil Pressure Lamp

When the engine oil pressure is low, this lamp illuminates.

(2) Charge Lamp

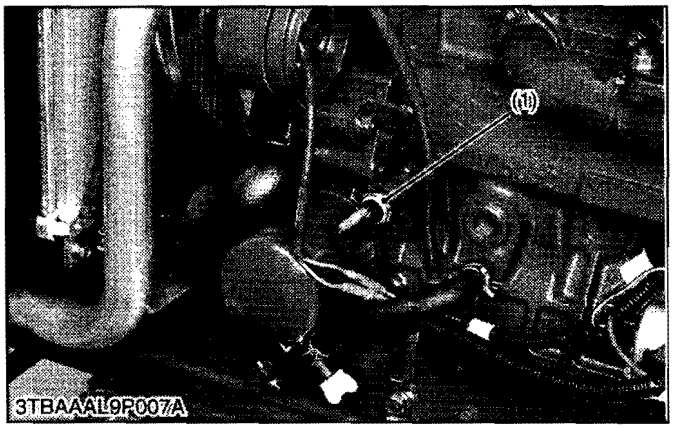
When the charging system is not functioning properly, this lamp illuminates.

(3) Pre-heat Indicator Lamp

When the key switch is in the **"Pre-heat"** position, the pre-heat indicator lamp illuminates.

W1015795

[2] ENGINE OIL PRESSURE ALARM



When the engine oil pressure has dropped, the engine oil pressure switch is activated to let the current flow from the main switch and to light up the lamp.

(1) Oil Pressure Switch

W1015898

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	Battery discharged or defective	Recharge or replace	9-S8
	Battery positive cable disconnected or improperly connected	Repair or replace	9-S7
	Battery negative cable disconnected or improperly connected	Repair or replace	9-S7
	Slow blow fuse blown	Replace	G-35
Fuse Blown Frequently	Short-circuited	Repair or replace	–

W1014322

BATTERY

Battery Discharges Too Quickly	Battery defective	Recharge or replace	9-S8
	Dynamo defective	Repair or replace	–
	Regulator defective	Replace	9-S18
	Wiring harness disconnected or improperly connected (between battery positive terminal and regulator **B** terminal)	Repair or replace	–
	Cooling fan belt slipping	Adjust tension	G-26

W1013580

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	Battery discharged or defective	Recharge or replace	9-S8
	Slow blow fuse blown	Replace	G-35
	Safety switch improperly adjusted or defective	Repair or replace	9-S13
	Wiring harness disconnected or improperly connected (between main switch **50** terminal and operator presence controller, between main switch **50** terminal and starter relay, between safety switches and operator presence controller, between safety switches and starter relay, between battery positive terminal and starter motor)	Repair or replace	–
	Operator presence controller defective	Replace	9-S18
	Key stop solenoid relay defective	Replace	9-S12
	Starter motor defective	Repair or replace	9-S26
	Main switch defective	Replace	9-S10
Pre-heat indicator Lamp Does Not Light When Main Switch Is in Pre-heat Position	Battery discharged or defective	Recharge or replace	9-S8
	Slow blow fuse blown	Replace	G-35
	Wiring harness disconnected or improperly connected (between main switch **19** terminal and pre-heat indicator, between pre-heat indicator and glow plugs)	Repair or replace	–
	Main switch defective	Replace	9-S10
	Pre-heat indicator defective	Replace	9-S24

W1011159

AUTOMATIC ENGINE STOP

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Stop When Main Switch Is Turned OFF	Solenoid fuse blown	Replace	G-35
	Key stop solenoid replay defective	Replace	9-S12
	Key stop solenoid defective	Replace	–
	Operator presence controller defective	Replace	9-S18
	Wiring harness disconnected or improperly connected (between operator presence controller and key stop solenoid relay, between key stop solenoid relay and battery positive terminal)	Repair or replace	–
Engine Does Not Stop When Automatic Engine Stop Conditions Become Complete	Solenoid fuse blown	Replace	G-35
	Key stop solenoid defective	Replace	–
	Seat switch or seat tilt switch defective	Adjust or replace	9-S13
	HST safety switch defective	Adjust or replace	9-S16
	Safety switch (PTO switch 1 or PTO switch 2) defective	Adjust or replace	9-S14, 15
	Operator presence controller defective	Replace	9-S18
	Wiring harness disconnected or improperly connected (between operator presence controller and key stop relay, between key stop relay and engine stop solenoid, between key stop relay and battery positive terminal)	Repair or replace	–

W1011236

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light when Main Switch Is Turned ON	Fuse blown (10A)	Replace	G-35
	Wiring harness disconnected or improperly connected (between main switch **AC** terminal and panel board, between panel board and dynamo)	Repair or replace	–
	Dynamo defective	Repair or replace	–
	Regulator defective	Replace	9-S18
Charging Lamp Does Not Go Off When Engine Is Running	Wiring harness disconnected or improperly connected (between main switch **30** terminal and alternator, between panel board and dynamo)	Repair or replace	–
	Dynamo defective	Repair or replace	–
	Regulator defective	Replace	9-S18

W1011313

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head light Does Not Light	Fuse blown (10 A)	Replace	G-35
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected (between main switch **AC** terminal and combination switch **B1** terminal, between combination switch **1** terminal and headlight	Repair or replace	–
Tail Light Does Not Light	Fuse blown (10 A)	Replace	G-35
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected (between main switch **AC** terminal and combination switch **B1** terminal, between combination switch **T** terminal and tail light)	Repair or replace	–
Illumination Light Does Not Light	Fuse blown (10 A)	Replace	G-35
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected (between main switch **AC** terminal and combination switch **B1** terminal, between combination switch **T** terminal and panel board)	Repair or replace	–
Hazard Light Does Not Light	Fuse blown (10 A)	Replace	G-35
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Flasher unit defective	Replace	9-S22
	Hazard switch defective	Replace	9-S21

W1023742

LIGHTING SYSTEM (Continue)

Symptom	Probable Cause	Solution	Reference Page
Hazard Indicator Lamp Does Not Light	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Replace	–
Hazard Light Does Not Flicker	Flasher unit defective	Repair or replace	9-S22
Turn Signal Light Does Not Light	Fuse blown (10 A)	Replace	G-35
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Flasher unit defective	Replace	9-S22
	Combination switch defective	Replace	9-S19
Turn Signal Light Indicator Lamp Does Not Light	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected (between combination switch **R** or **L** terminal and panel board)	Repair or replace	–
Turn Signal Light Does Not Flicker	Flasher unit defective	Replace	9-S22
	Combination switch defective	Replace	9-S19

W1014322

EASY CHECKER

Symptom	Probable Cause	Solution	Reference Page
Oil Pressure Lamp Lights Up When Engine Is Running	Engine oil pressure too low	Repair engine	–
	Engine oil insufficient	Replenish	G-16
	Oil pressure switch defective	Replace	9-S23
	Short circuit between oil pressure switch lead and chassis	Repair	–
	Circuit in panel board defective	Replace	9-S23
Oil Pressure Lamp Does Not Light When Main Switch Is Turned On and Engine Is Not Running	Bulb blown	Replace	G-35
	Oil pressure switch defective	Replace	9-S23
	Wiring harness disconnected or improperly connected (between panel board and oil pressure switch)	Repair or replace	–
	Circuit in panel board defective	Replace	9-S23

W1011542

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	Fuel gauge defective	Repair	9-S25
	Fuel level sensor defective	Replace	–
	Wiring harness disconnected or improperly connected (between panel board and fuel level sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	9-S23
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge defective	Replace	9-S25
	Coolant temperature sensor defective	Replace	–
	Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	9-S23

W1011619

2. SERVICING SPECIFICATIONS

STARTER

Item		Factory Specification	Allowable Limit
Commutator	O.D.	28.0 mm 1.10 in.	27.0 mm 1.06 in.
	Difference of O.D.'s	Less than 0.02 mm 0.0008 in.	0.05 mm 0.002 in.
Mica	Undercut	0.60 mm 0.024 in.	0.20 mm 0.0079 in.
Brush	Length	14.0 mm 0.551 in.	9.0 mm 0.35 in.

W1013874

GLOW PLUG

Glow Plug	Resistance	Approx. 0.9 Ω	–

W1013874

3. CHECKING, DISASSEMBLING AND SERVICING

⚠ CAUTION

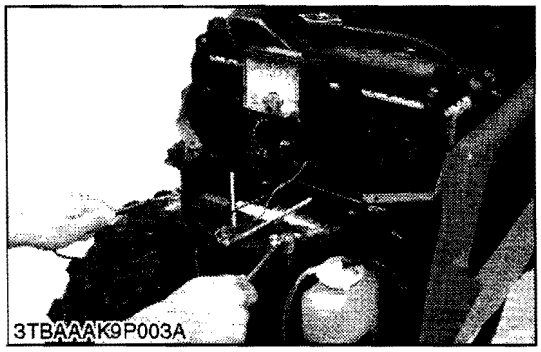
- **To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Never remove the battery cap while the engine is running.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**

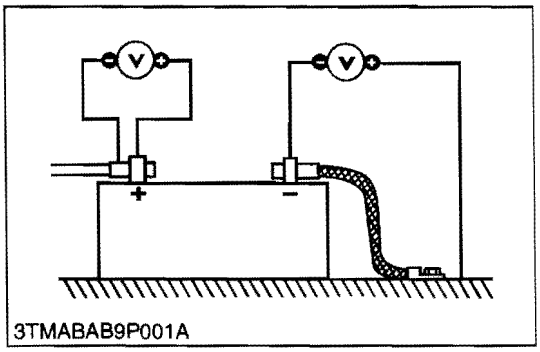
■ IMPORTANT

- **If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to regulator may result.**

[1] CHECKING AND ADJUSTING

(1) Battery





Battery Voltage

1. Stop the engine and turn the main switch off.
2. Connect the COM (−) lead of the voltmeter to the battery's negative terminal post and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Factory spec.	More than 12 V

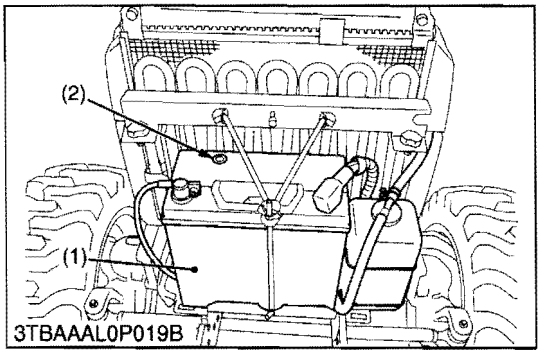
W1012124

Battery Terminal Connection

1. Turn the main switch on, and turn on the head light.
2. Measure the voltage with a voltmeter across the battery's positive terminal post and the cable terminal, and the voltage across the battery's negative terminal post and the chassis.
3. If the measurement exceeds the factory specification, clean the battery terminal posts and cable clamps, and tighten them firmly.

Potential difference	Factory spec.	Less than 0.1 V

W1012151



Battery Condition Indicator

1. Check the battery condition by reading the indicator (2).

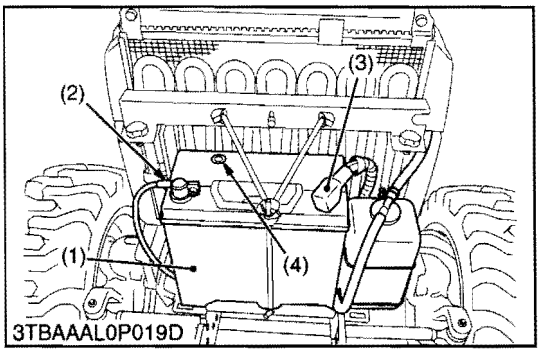
State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery
White	Needs changing battery

■ IMPORTANT

- **The factory installed battery is of non-refillable type. If the indicator turns white, do not charge the battery but replace it with new one.**

(1) Battery (2) Indicator

W1016405



Recharging

⚠ CAUTION

- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When disconnecting the cable from the battery, start with the negative terminal first.**
  When connecting the cable to the battery, start with the positive terminal first.
- **Never check battery charge by placing a metal object across the posts.**
  Use a voltmeter or hydrometer.

1. To slow charge the battery (1), connect the battery positive terminal (3) to the charge positive terminal and the negative (2) to the negative, then recharge in the standard fashion.
2. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time.
   When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
   Failure to do this will shorten the battery's service life.
3. The battery is charge if the indicator display turns green from black.
4. When exchanging an old battery for a new one, use battery of equal specification shown in table.

Table

Battery Type	Volts (V)	Capacity at 5H.R	Reserve at (min)	Cold Cranking Amps	Normal Charging Rate (A)
55B24L (S)-MF	12	36	79	433	4.5

(1) Battery (3) Positive Terminal
(2) Negative Terminal (4) Indicator

W1016725

Directions for Storage

1. When shutting down the tractor for long periods of time, remove the battery from the tractor, store the battery in a well ventilated placed where it is not exposed to direct sunlight.
2. Since the battery self-discharges by approx. 0.5 % per day even in storage, it must be once every two months in cold season.
3. When storing the battery mounted on the tractor, disconnect the ground cable from the battery's negative terminal post.

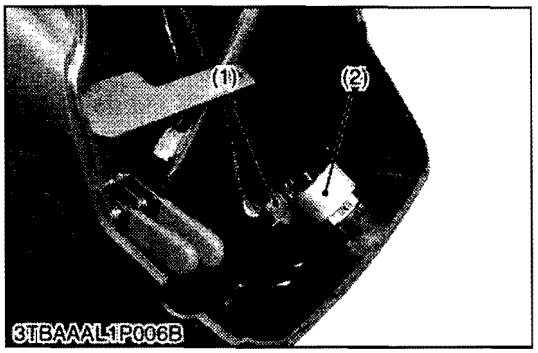
(Reference)

- Self-discharge Rate

Temperature	Self-discharge rate
30 °C (86 °F)	Approx. 1.0 % per day
20 °C (68 °F)	Approx. 0.5 % per day
10 °C (50 °F)	Approx. 0.25 % per day

W1017453

(2) Main Switch

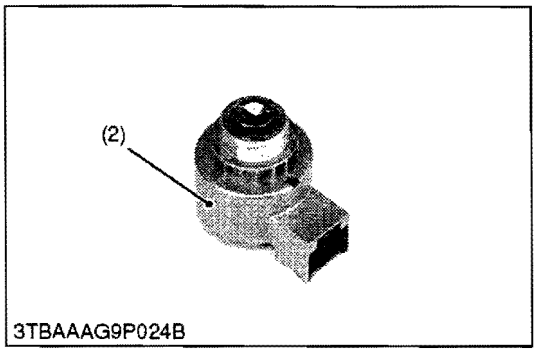


Main Switch

1. Remove the steering wheel and the meter panel.
2. Disconnect the **4P** connector (1) and remove the main switch (2).
3. Perform the following checks.

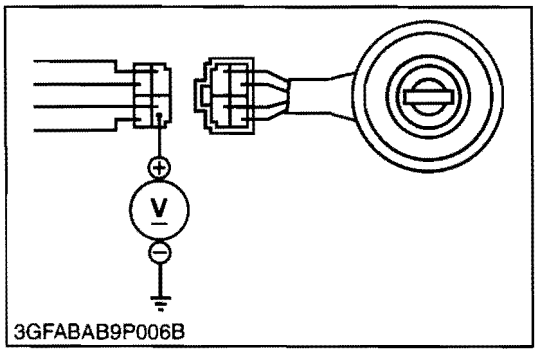
(1) **4P** Connector (2) Main Switch

W1012247



Connector Voltage

1. Measure the voltage with a voltmeter across the connector **30** terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.



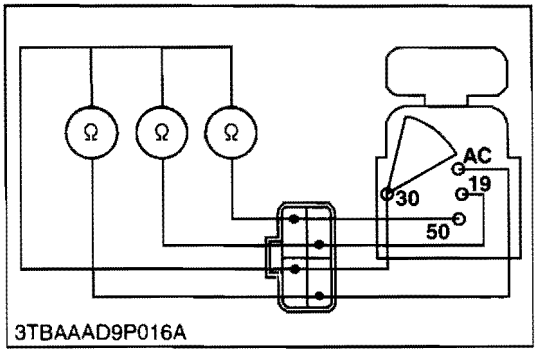
Voltage	Connector **30** terminal - Chassis	Approx. battery voltage

W1012280

Main Switch Continuity (To be continued)

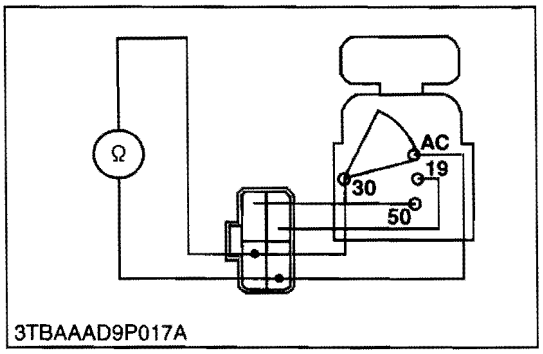
1) Main Switch Key at OFF Position

1. Set the main switch **OFF** position.
2. Measure the resistance with an ohmmeter across the **30** terminal and the **AC** terminal, **30** terminal and **50** terminal, **30** terminal and **19** terminal.
3. If infinity is not indicated, the contacts of the main switch are faulty.

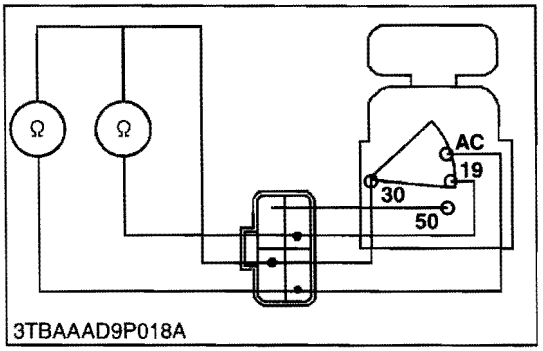


Resistance	**30** terminal - **AC** terminal	Infinity
	30 terminal - **50** terminal	
	30 terminal - **19** terminal	

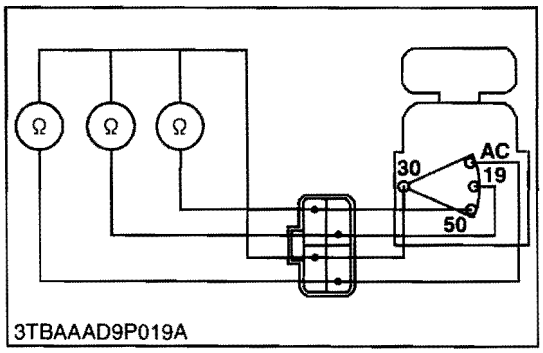
W1012312



3TBAAAD9P017A



3TBAAAD9P018A



3TBAAAD9P019A

Main Switch Continuity (Continued)

2) Main Switch Key at ON Position

1. Set the main switch **ON** position.
2. Measure the resistance with an ohmmeter across the **30** terminal and the **AC** terminal.
3. If 0 Ω is not indicated, the **30** - **AC** contact of the main switch are faulty.

Resistance	**30** terminal - **AC** terminal	0 Ω

W1012344

3) Main Switch Key at PREHEAT Position

1. Set and hold the main switch key at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the **30** terminal and the **19** terminal, and measure the resistance across the **30** terminal and the **AC** terminal.
3. If 0 Ω is not indicated, these contacts of the main switch are faulty.

Resistance	**30** terminal - **19** terminal	0 Ω
	30 terminal - **AC** terminal	

W1012376

4) Main Switch Key at START Position

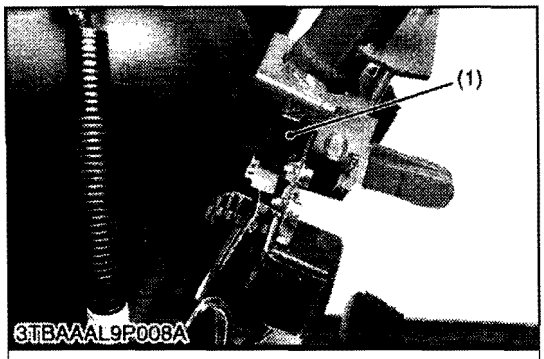
1. Set and hold the main switch key at the **START** position.
2. Measure the resistance with an ohmmeter across the **30** terminal and the **19** terminal, across the **30** terminal an the **50** terminal, and across the **30** terminal and the **AC** terminal.
3. If 0 Ω is not indicated, these contacts of the main switch are faulty.

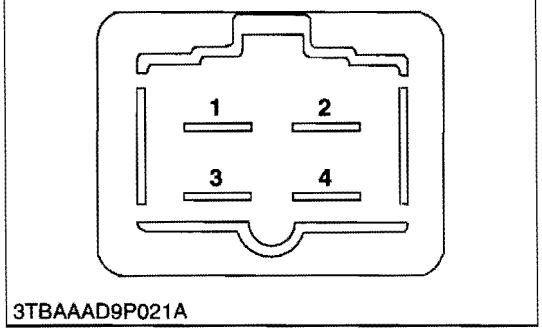
Resistance	**30** terminal - **19** terminal	0 Ω
	30 terminal - **50** terminal	
	30 terminal - **AC** terminal	

Terminal / Key position	30	AC	19	50
OFF	●			
ON	●	●		
PREHEAT	●	●	●	
START	●	●	●	●

W1012408

(3) Key Stop Solenoid Relay





Key Stop Solenoid Relay

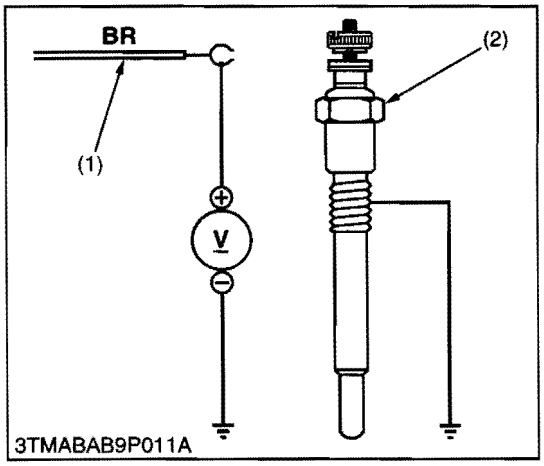
1. Remove the panel board and key stop solenoid relay (1).
2. Apply battery voltage across **2** terminal and **4** terminal, and check for continuity across **1** terminal and **3** terminal.
3. If 0 Ω is not indicated, renew the starter relay (1).

Resistance	**1** terminal - **3** terminal	Battery voltage is applied across **2** terminal and **4** terminal	0 Ω

(1) Key Stop Solenoid Relay **1 to 4 : Terminals**

W1012480

(4) Glow Plug



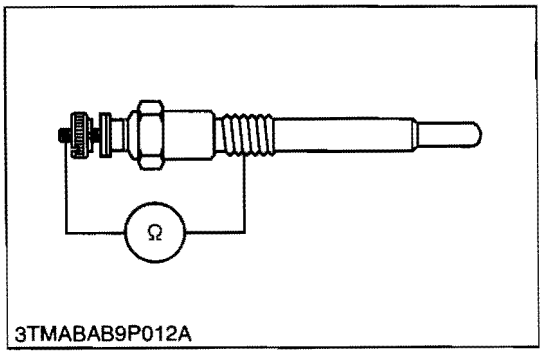
Lead Terminal Voltage

1. Disconnect the wiring lead (1) from the glow plug (2) after turning the main switch off.
2. Turn the main switch key to the **"PREHEAT"** position, and measure the voltage between the lead terminal and the chassis.
3. Turn the main switch key to the **"START"** position, and measure the voltage with a voltmeter between the lead terminal and the chassis.
4. If the voltage at either position differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage (Lead terminal - Chassis)	Main switch key at **"PREHEAT"**	Approx. battery voltage
	Main switch key at **"START"**	Approx. battery voltage

(1) Wiring Lead (2) Glow Plug

W1012513



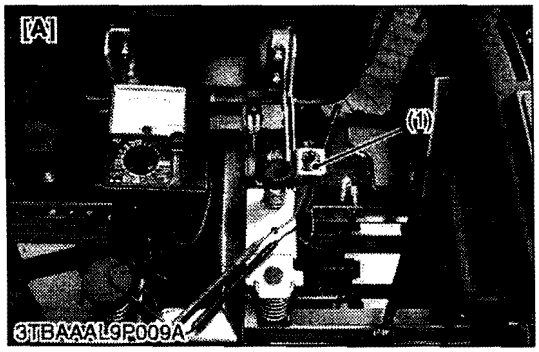
Glow Plug Continuity

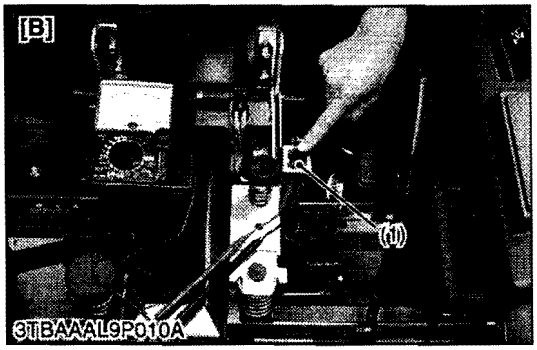
1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and chassis.
3. If 0 Ω is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, the glow plug is faulty.

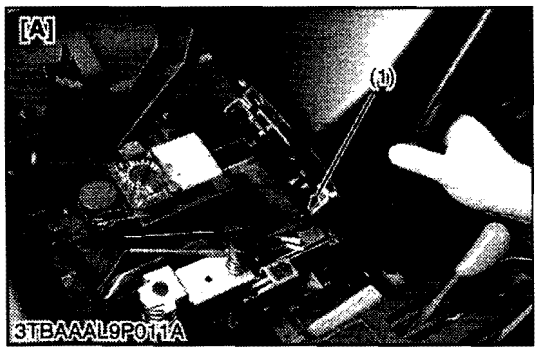
Glow plug resistance	Factory spec.	Approx. 0.9 Ω

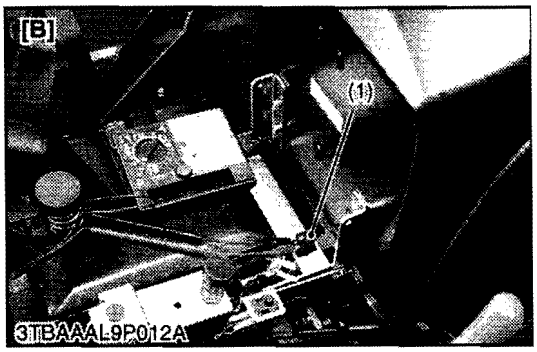
W1012546

(5) Safety Switch









Seat Switch Continuity Check

1. Disconnect the safety switch leads.
2. Connect the circuit tester leads to the safety switch terminals.

(When switch is not pushed)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(When switch is pushed)

1. Measure the resistance between terminals.
2. If the continuity is not 0 Ω, the switch is faulty, replace it.

Resistance	When seat switch is not pushed	Infinity
	When seat switch is pushed	0 Ω

(1) Seat Switch

[A] Seat switch is not pushed
[B] Seat switch is pushed

W1019701

Seat Tilt Switch Check

1. Disconnect the safety switch leads.
2. Connect the circuit tester leads to the safety switch terminals.

(When switch is not pushed)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(When switch is pushed)

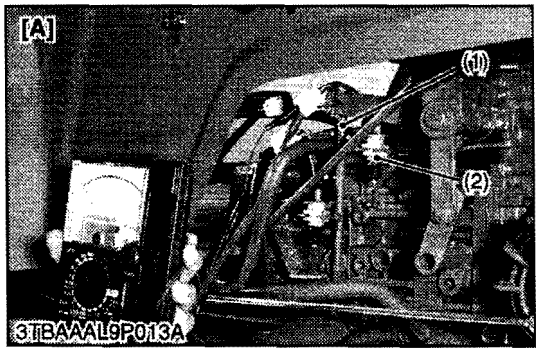
1. Measure the resistance between terminals.
2. If the continuity is not 0 Ω, the switch is faulty, replace it.

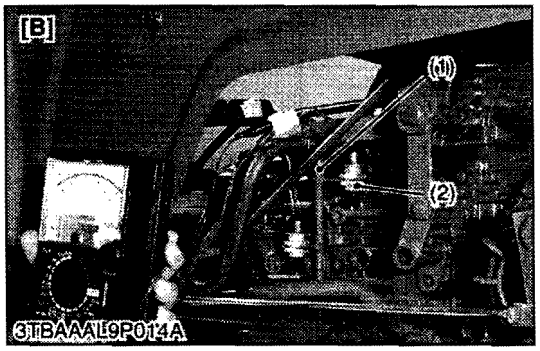
Resistance	When seat switch is not pushed	Infinity
	When seat switch is pushed	0 Ω

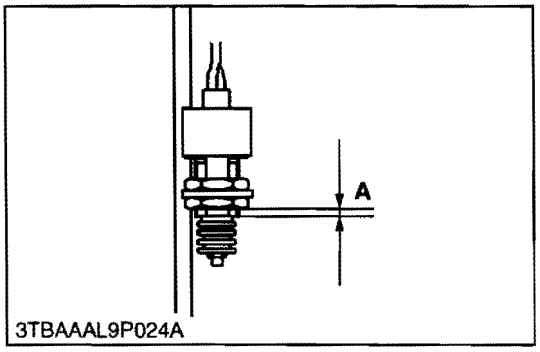
(1) Seat Tilt Switch

[A] Seat switch is not pushed
[B] Seat switch is pushed

W1020308







PTO Safety Switch 2 Check

1. Check the length **A** of the PTO safety switch 2 (2).
2. If the measurement is not out of factory specification, adjust the length **A**.
3. Disconnect the **2P** connector from the PTO safety switch 2 (2).
4. Connect the circuit tester leads to the PTO safety switch 2 terminals.

(When the rear PTO gear shift lever is in "NEUTRAL" position)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(When the rear PTO gear shift lever is in "Engage" position)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(Reference)

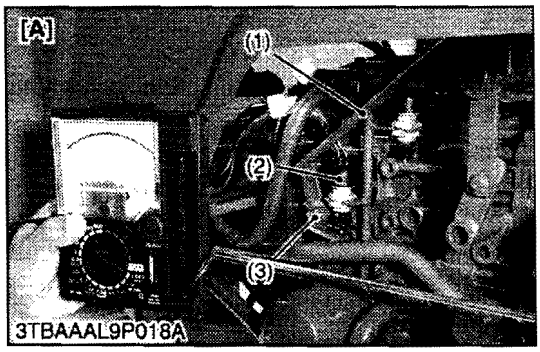
Length **A** : 3 mm (0.1 in.)

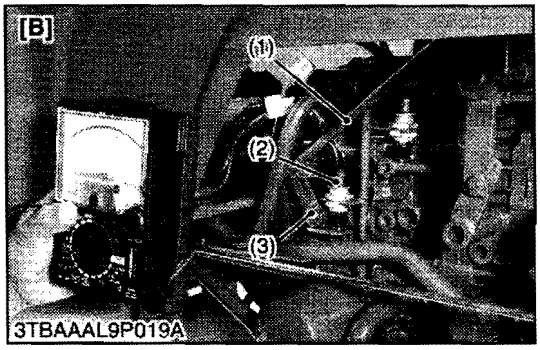
Resistance	When the rear PTO gear shift lever is in "**NEUTRAL**" position	0 Ω
	When the rear PTO gear shift lever is in "**Engage**" position	Infinity

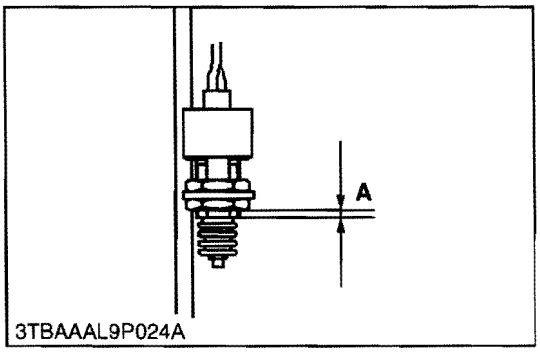
(1) Control Rod
(2) PTO Switch 2
(3) PTO Shift Arm

[A] Rear PTO Gear Shift Lever "NEUTRAL" Position
[B] Rear PTO Gear Shift Lever "Engage" Position

W1021601







PTO Safety Switch 1 Check

1. Check the length **A** of the PTO safety switch 1 (2).
2. If the measurement is not out of factory specification, adjust the length **A**.
3. Disconnect the **2P** connector from the PTO switch 1 (2).
4. Connect the circuit tester leads to the PTO switch 1 terminals.

(When the mid-PTO gear shift lever is in "NEUTRAL" position)

1. Measure the resistance between terminals.
2. If the continuity is not 0 Ω, the switch is faulty, replace it.

(When the mid-PTO gear shift lever is in "Engage" position)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(Reference)

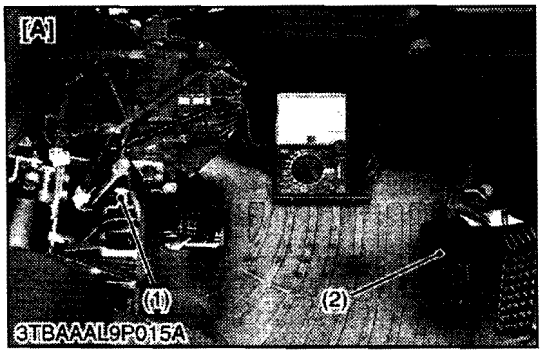
Length **A** : 3 mm (0.1 in.)

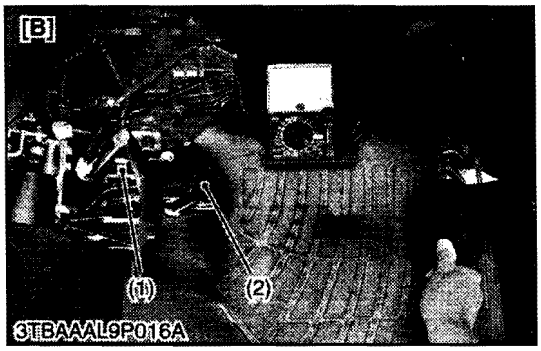
Resistance	When the PTO gear shift lever is in **"NEUTRAL"** position	0 Ω
	When the PTO gear shift lever is in **"Engage"** position	Infinity

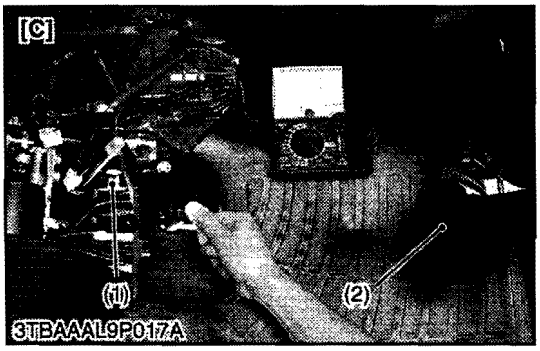
(1) Control Rod
(2) PTO Switch 1
(3) PTO Shift Arm

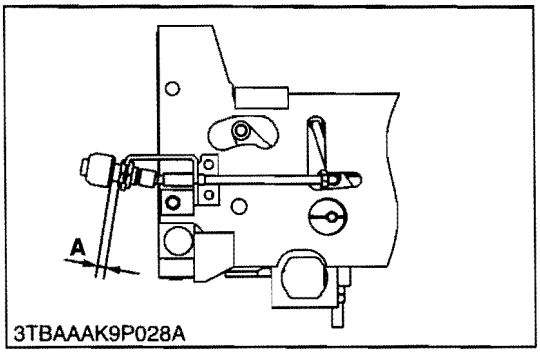
[A] Mid-PTO Gear Shift Lever "NEUTRAL" Position
[B] Mid-PTO Gear Shift Lever "Engage" Position

W1022156









HST Safety Switch Check

1. Check the length **A** of the HST safety switch (1).
2. If the measurement is not out of factory specification, adjust the length **A**.
3. Disconnect the HST safety switch leads.
4. Connect the circuit tester leads to the HST **2P** connector.

(When the HST pedal is in "NEUTRAL" position)

1. Measure the resistance between terminals.
2. If the continuity is not 0 Ω, the switch is faulty, replace it.

(When the HST pedal is in "FORWARD" position)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(When the HST pedal is in "REVERSE" position)

1. Measure the resistance between terminals.
2. If the continuity is not infinity, the switch is faulty, replace it.

(Reference)

Length **A** : 17.3 to 17.7 mm (0.682 to 0.696 in.)

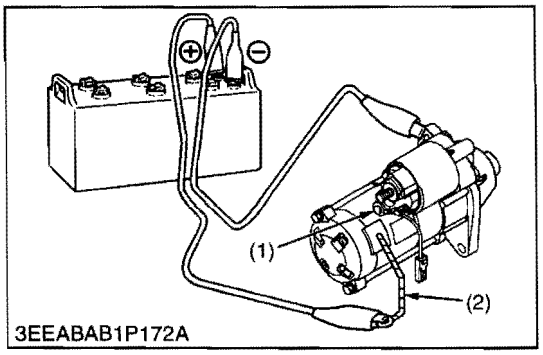
Resistance	When the HST pedal is in "**NEUTRAL**" position	0 Ω
	When the HST pedal is in "**FORWARD**" position	Infinity
	When the HST pedal is in "**REVERSE**" position	

(1) HST Safety Switch
(2) HST Pedal

[A] HST Pedal "NEUTRAL" Position
[B] HST Pedal "FORWARD" Position
[C] HST Pedal "REVERSE" Position

W1020574

(6) Starter



Motor Test

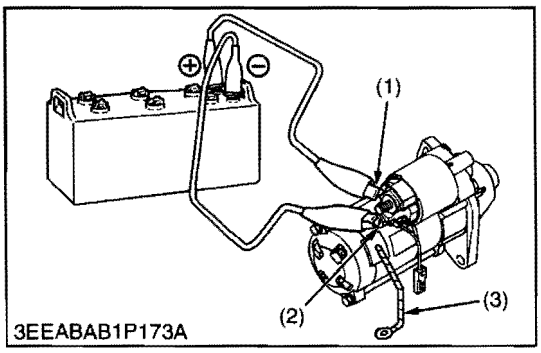
CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cord from the battery.
2. Disconnect the battery positive cord and the leads form the starter **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (2) from the starter **C** terminal (1).
5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post.
7. If the motor does not run, check the motor.

(1) **C** Terminal (2) Connecting Lead

W1012656



Magnetic Switch Test

1. Disconnect the battery negative cord from the battery.
2. Disconnect the battery positive cord and the leads from the starter **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter **C** terminal (2).
5. Connect a jumper lead from the starter **S** terminal (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter **C** terminal (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

NOTE

- **This test should be carried out for a short time, about 3 to 5 seconds.**

(1) **S** Terminal (3) Connecting Lead
(2) **C** Terminal

W1012689

(7) OPC Controller

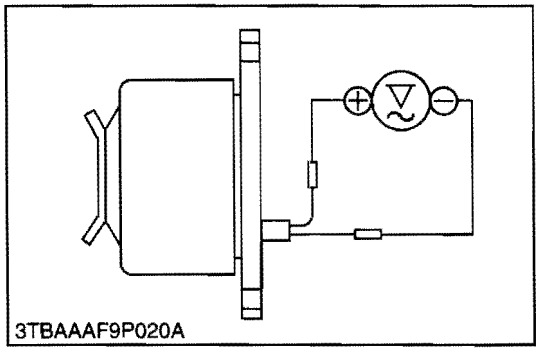
OPC Controller

1. Check the "Engine Starting Conditions" and "Automatic Engine Stop Conditions" (See page 9-M7).
2. If the tractor does not operate appropriately, check all parts according to the **"1. TROUBLESHOOTING"** section.
3. If all parts except the OPC controller (1) is not defective, replace the OPC controller (1).

(1) OPC Controller

W1012945

(8) AC Dynamo



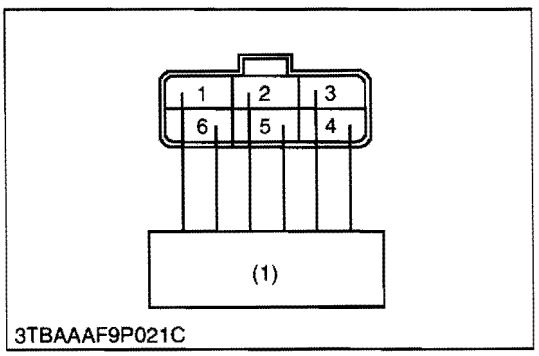
Dynamo No-load Voltage

1. Disconnect the lead wires from the dynamo.
2. Start the engine, and check the generating voltage of the dynamo.

Factory spec.	Voltage	14 to 15 V (at engine idling speed)
		36 to 39 V (at engine high speed)

W1013115

(9) Regulator



Continuity across Regulator's Terminals

1. Remove the regulator.
2. Check with a tester whether the regulator is in optimum condition or not.

■ **Check Table**

■ **NOTE**

- **Type to use a high-resistance tester as far as possible.**

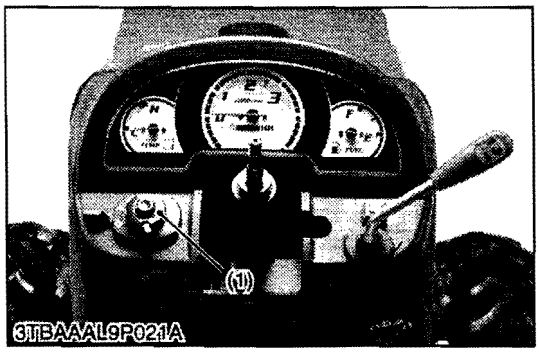
Tester (+) terminal / Tester (-) terminal		Cord colors 1	2	3	4	5	6
Cord colors	1					●	●
	2		●				
	3			●			●
	4				●		
	5	●	●	●		●	●
	6						●

(1) Regulator

1 : Sky Blue
2 : Black
3 : Sky Blue
4 : Green
5 : Yellow
6 : Red

W1017265

(10) Combination Switch

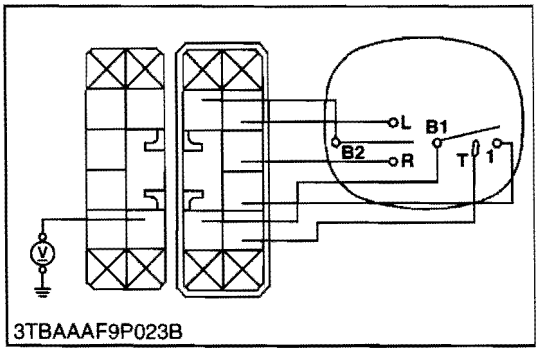


Combination Switch (To be continued)

1. Remove the steering wheel and steering boot.
2. Disconnect the combination switch connector.
3. Remove the combination switch (1) and perform the following checks **1)** to **6)**.

(1) Combination Switch

W1017739

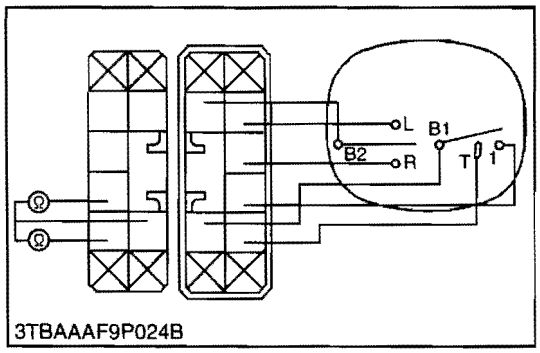


1) Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B1** terminal and chassis when the main switch is **"ON"** position.
2. If the voltage differs from the battery voltage, the wiring harness and main switch is faulty.

Voltage	Main switch at **"ON"** position	**B1** terminal - Chassis	Battery voltage

W1017861

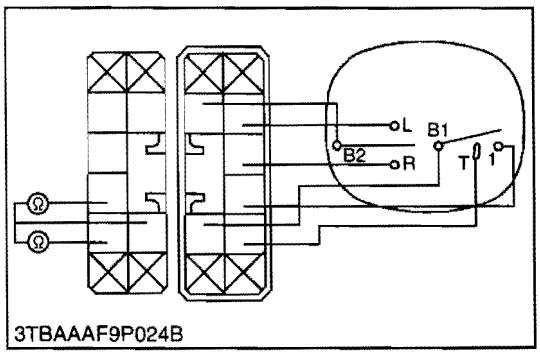


2) Head Light Switch Continuity when Setting Switch at OFF Position

1. Set the light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal, the **B1** terminal to the terminal **1**.
3. If infinity is not indicated, the head light switch is faulty.

Resistance (Switch at **OFF** position)	**B1** terminal - **T** terminal	Infinity
	B1 terminal - **1** terminal	

W1017991

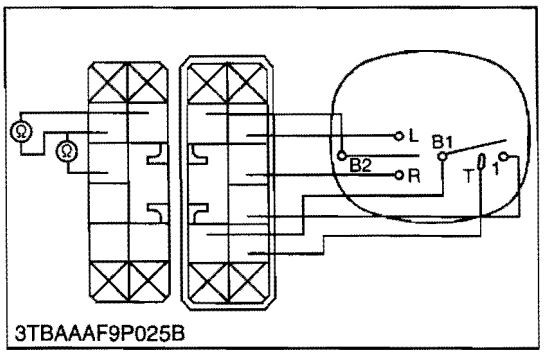


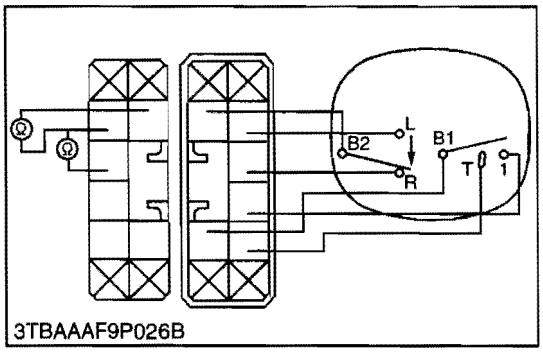
3) Head Light Switch Continuity when Setting Switch at ON Position

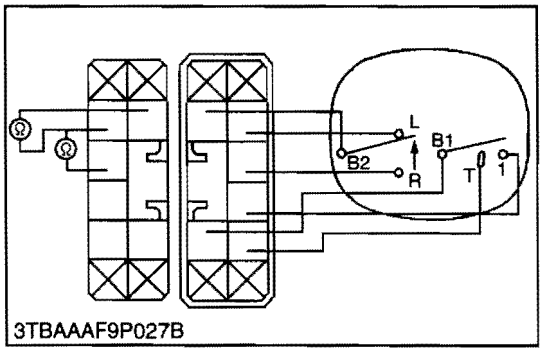
1. Set the light switch to the **ON** position.
2. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the terminal **1**.
3. If 0 Ω is not indicated, the head light switch is faulty.

Resistance (Switch at **ON** position)	**B1** terminal - **T** terminal	0 Ω
	B1 terminal - **1** terminal	

W1018137







Combination Switch (Continued)

4) Turn Signal Light Switch Continuity When Setting Switch Knob OFF Position

1. Set the turn signal light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **L** terminal, the **B2** terminal and **R** terminal.
3. If infinity is not indicated, the combination switch is faulty.

Resistance (Switch knob at **OFF** position)	**B2** terminal - **L** terminal	Infinity
	B2 terminal - **R** terminal	

W1018249

5) Turn Signal Light Switch Continuity When Setting Switch Knob at 1 Position

1. Set the turn signal light switch to the **1** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **R** terminal.
3. If 0 Ω is not indicated, the combination switch is faulty.

Resistance (Switch knob at **1** position)	**B2** terminal - **R** terminal	0 Ω
	B2 terminal - **L** terminal	Infinity

W1018418

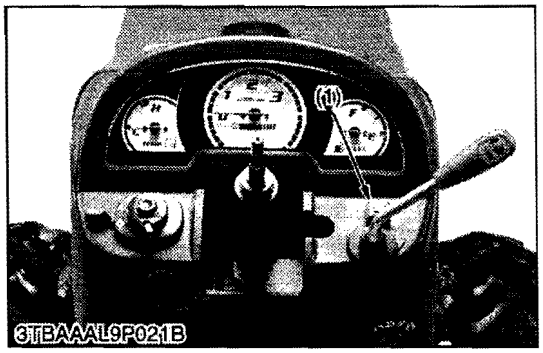
6) Turn Signal Light Switch Continuity When Setting Switch Knob at 2 Position

1. Set the turn signal light switch to the **2** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **L** terminal.
3. If 0 Ω is not indicated, the combination switch is faulty.

Resistance (Switch knob at **2** position)	**B2** terminal - **L** terminal	0 Ω
	B2 terminal - **R** terminal	Infinity

W1018530

(11) Hazard Switch

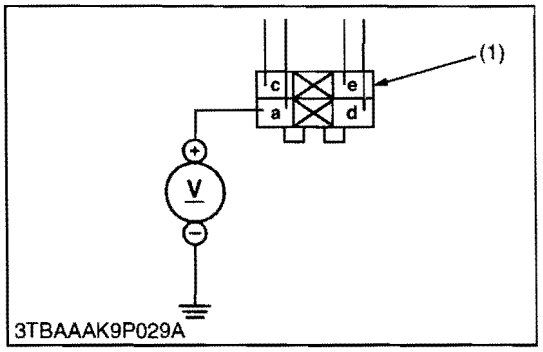


Hazard Switch

1. Remove the steering wheel and steering boot.
2. Disconnect the **4P** connector from hazard switch after disconnect the battery negative cord.
3. Remove the hazard switch.
4. Perform the following checks.

(1) Hazard Switch

W1018642



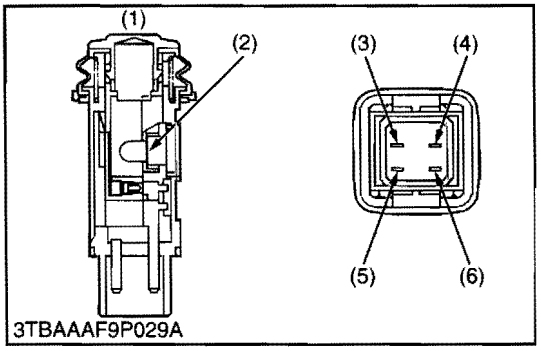
Connector Voltage

1. Connect the battery negative code, then measure the voltage with a voltmeter across the **a** terminal and chassis.
2. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	**a** terminal - Chassis	Approx. battery voltage

(1) **4P** Connector

W1018780



Hazard Switch Continuity

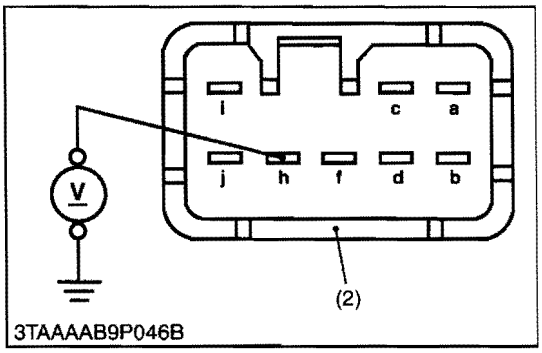
1. Measure the resistance with ohmmeter across the **a** terminal and **c** terminal, and across the **d** terminal and **e** terminal.
2. If the measurement is not following below, the hazard switch or the bulb are faulty.

Resistance (Switch at **OFF**)	**a** terminal - **c** terminal	Infinity
Resistance (Switch at **ON**)	**a** terminal - **c** terminal	0 Ω
Resistance (Bulb)	**d** terminal - **e** terminal	Approx. 13 Ω

(1) Hazard Switch
(2) Bulb
(3) **a** Terminal
(4) **d** Terminal
(5) **c** Terminal
(6) **e** Terminal

W1018982

(12) Flasher Unit



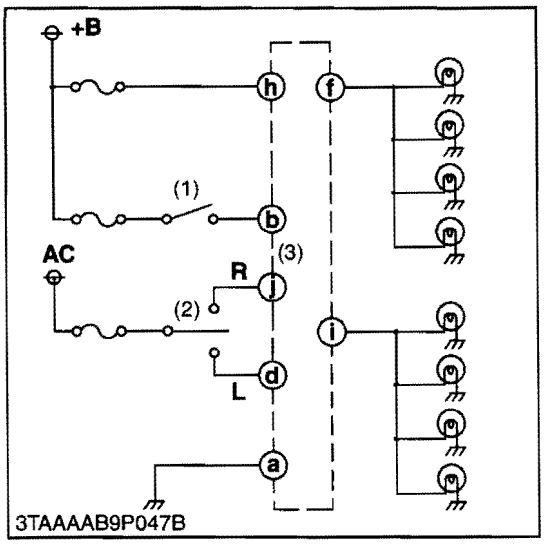
Flasher Unit Connector Voltage

1. Remove the meter panel and panel under cover.
2. Disconnect the connector (2) from the flasher unit (1).
3. Measure the voltage with a voltmeter across the **h** terminal and chassis.
4. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	h terminal - Chassis	Approx. battery voltage

(1) Flasher Unit (2) Connector

W1019206



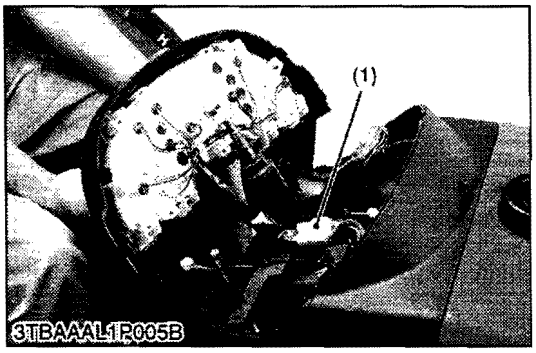
Flasher Unit Actuation Test

1. Set the hazard switch to the **ON** position, and make sure the hazard light gives 60 to 85 flashes for a minute.
2. With the main switch and the hazard switch at the **ON** positions, respectively, move the turn signal switch to the left. Make sure that the right-hand light stays on and the left-hand light gives flashes earlier (by about 20 flashes) than when the hazard lamp is activated. Then move the turn signal switch to the right and make sure the corresponding actions take place.
3. Now set the main switch to the **ON** position and move the turn signal switch alone. Make sure the same action as above result.
4. If both the hazard switch and the turn signal switch function but the above actions do not take place, replace the hazard unit with new one.

(1) Hazard Switch (3) Flasher Unit
(2) Turn Signal Switch

W1019395

(13) Easy Checker

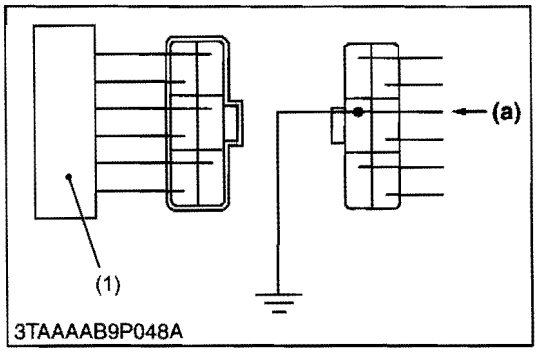


Easy Checker

1. Remove the panel board and disconnect the meter panel connector (1) from it.
2. Turn the main switch on.
3. Measure the voltage with a voltmeter across the terminal (Red / Yellow) and the earth terminal (Black).
4. If the voltage differs from the battery voltage, the wiring harness fuses and main switch should be checked.

(1) Meter Panel Connector

W1019659

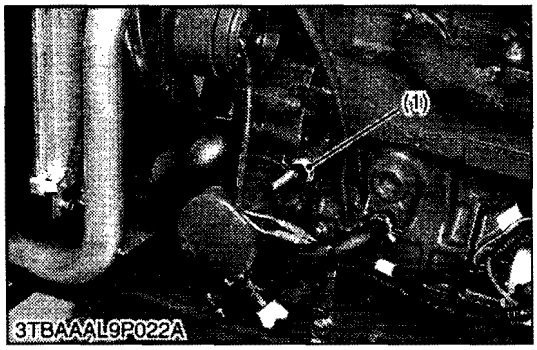


Charging Circuit (Panel Board and Wiring Harness)

1. Remove the panel board from tractor.
2. Disconnect the **6P** connector from the regulator after turning the main switch off.
3. Turn the main switch on and connect a jumper lead from the wiring harness connector terminal (Black) to the chassis.
4. If the charge lamp does not light, the panel board circuit, regulator, wiring harness, or fuse is fault.

(1) Regulator **(a) From Charge Lamp**

W1019776

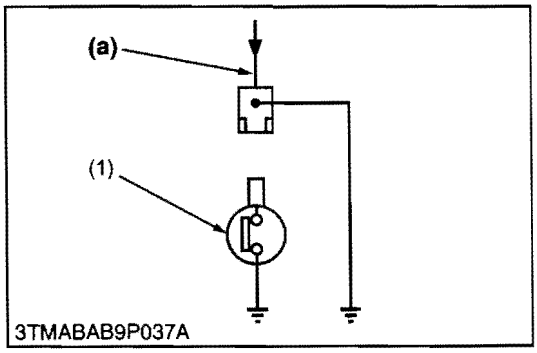


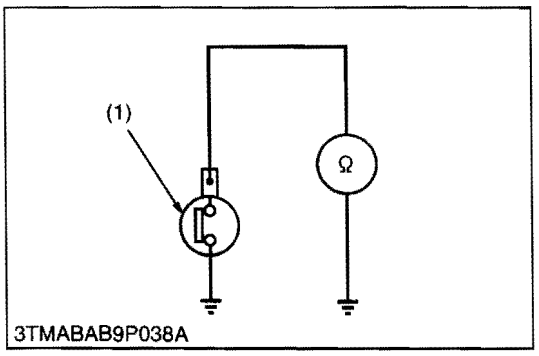
Engine Oil Pressure Switch

1. Disconnect the lead from the engine oil pressure switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the lead to the chassis.
3. If the engine oil pressure indicator lamp does not light, the panel board circuit or the wiring harness is faulty.

(1) Engine Oil Pressure Switch **(a) From Oil Pressure Lamp**

W1019936





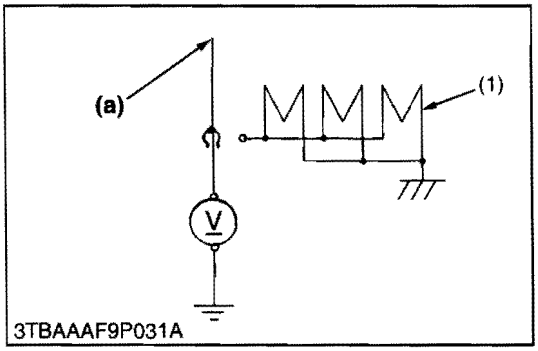
Engine Oil Pressure Switch Continuity

1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 Ω is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 4.9 kPa (0.5 kgf/cm^2, 7 psi), the switch is faulty.

Resistance (Switch terminal - Chassis)	In normal state	0 Ω
	At pressure over approx. 4.9 kPa (0.5 kgf/cm^2, 7 psi)	Infinity

(1) Engine Oil Pressure Switch

W1020161

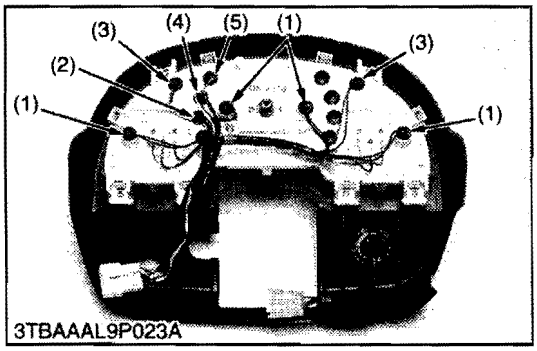


Glow Plug

1. Disconnect the lead from the glow plug.
2. Connect the tester positive cable to the glow plug lead and negative one to the chassis.
3. Measure its voltage with a voltmeter, after turning the main switch to the preheating or starting position.
4. If its voltage is not approximately the battery one, check the main switch or wiring harness.

(1) Glow Plugs
(a) From Main Switch 19 and Pre-heat Indicator Lamp

W1020345



Monitor Lamp (for Charge, Engine Oil Pressure, Pre-heat, Illumination and Hazard)

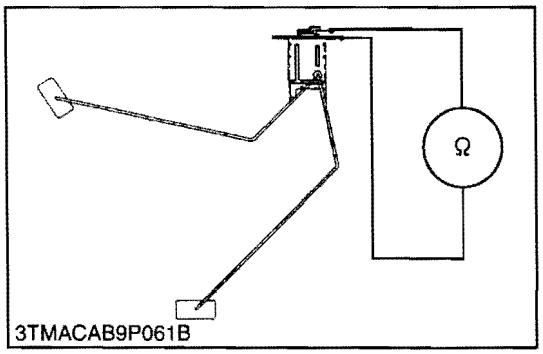
1. After removing the meter panel from tractor.
2. Remove the each lamp.
3. Measure the lamp resistance.
4. If it is infinity, replace the lamp with new.

Lamp spec.	All lamp	12 V, 1.7 W

(1) Illumination
(2) Pre-heat
(3) Hazard
(4) Charge
(5) Engine Oil Pressure

W1020523

(14) Gauges



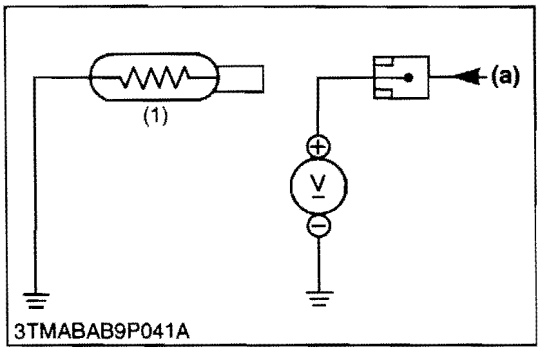
Fuel Level Sensor

1) Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the reference values are not indicated, the sensor is faulty.

Resistance (Sensor terminal - its body)	Reference value	Float at uppermost position	1 to 5 Ω
		Float at lowermost position	103 to 117 Ω

W1020761



Coolant Temperature Sensor

1) Lead Terminal Voltage

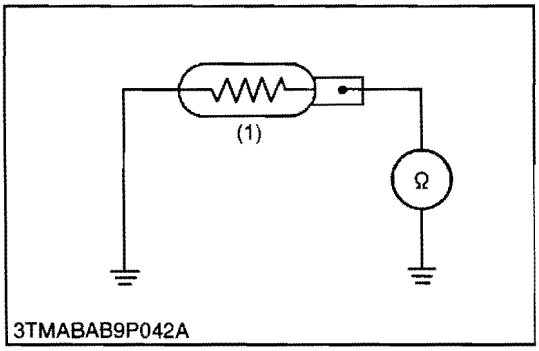
1. Disconnect the lead from the coolant temperature sensor after turning the main switch off.
2. Turn the main switch on and measure the voltage with a voltmeter across the lead terminal and the chassis. If the voltage differs from the battery voltage, the wiring harness fuse or coolant temperature gauge is faulty.

Voltage	Lead terminal - Chassis	Approx. battery voltage

2) Sensor Continuity

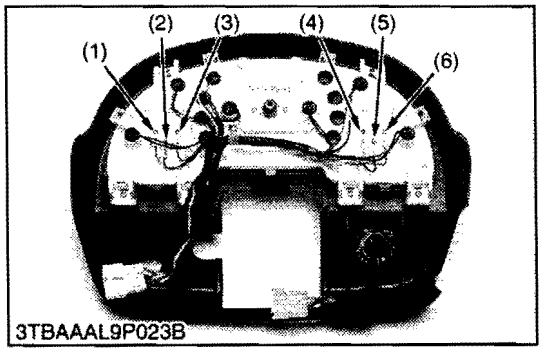
1. Measure the resistances with an ohmmeter across the sensor terminal and the chassis.
2. If the reference value is not indicated, the sensor is faulty.

Resistance (Sensor terminal - Chassis)	Reference value	Approx. 161 Ω at 120 °C (248 °F) Approx. 27.4 Ω at 100 °C (212 °F) Approx. 51.9 Ω at 80 °C (176 °F) Approx. 153.9 Ω at 50 °C (122 °F)



(1) Coolant Temperature Sensor **(a) From Temperature Gauge**

W1020911



Fuel Gauge and Coolant Temperature Gauge Continuity

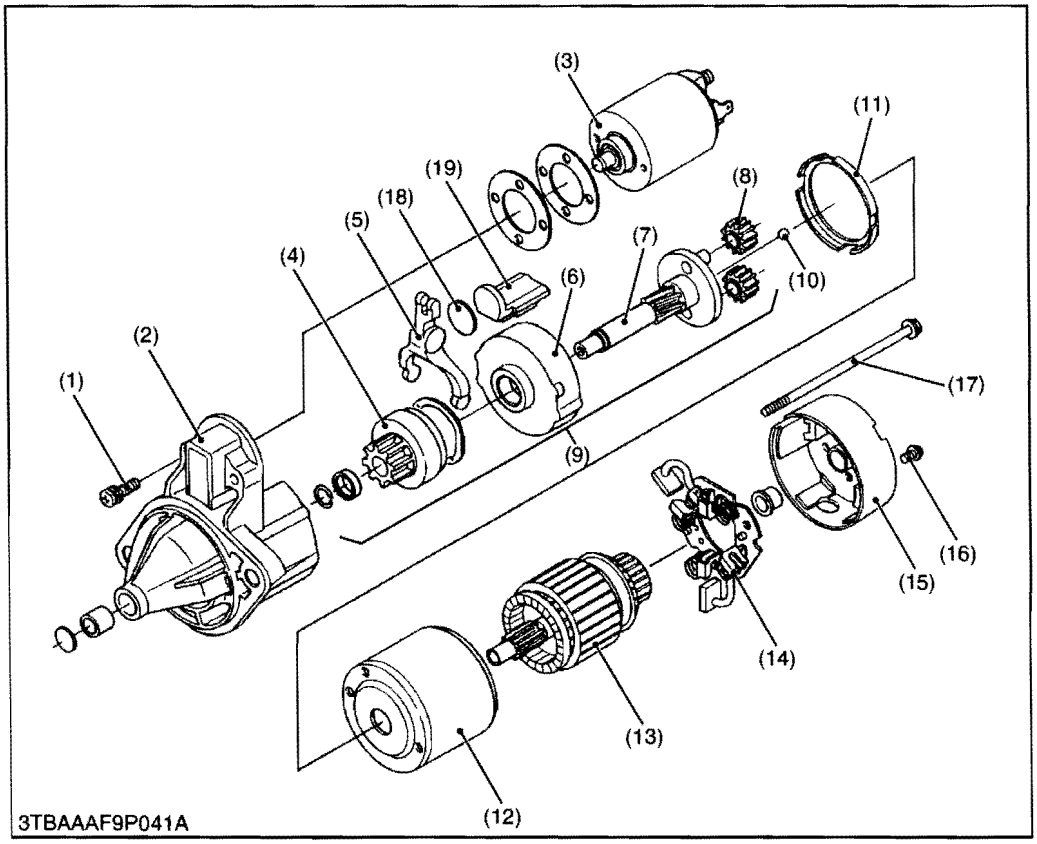
1. Remove the meter panel from the tractor.
2. Check the continuity with an ohmmeter across the **U** terminal (1) and **IGN** terminal (3) and across the **U** terminal (1) and **GND** terminal (2).
3. If infinity is indicated, the coolant temperature is faulty.
4. Check the continuity with an ohmmeter across the **U** terminal (4) and **IGN** terminal (6) and across the **U** terminal (4) and **GND** terminal (5).
5. If infinity is indicated, the fuel gauge is faulty.

(1) **U** Terminal (Fuel)
(2) **GND** Terminal (Fuel)
(3) **IGN** Terminal (Fuel)
(4) **U** Terminal (Temperature)
(5) **GND** Terminal (Temperature)
(6) **IGN** Terminal (Temperature)

W1021151

[2] DISASSEMBLING AND ASSEMBLING

(1) Starter



(1) Screw
(2) Front Bracket
(3) Magnetic Switch
(4) Overrunning Clutch
(5) Drive Lever
(6) Internal Gear
(7) Shaft
(8) Planetary Gear
(9) Shaft Assembly
(10) Ball
(11) Gasket
(12) Yoke
(13) Armature
(14) Brush Holder
(15) Rear End Frame
(16) Screw
(17) Through Bolt
(18) Plate
(19) Gasket

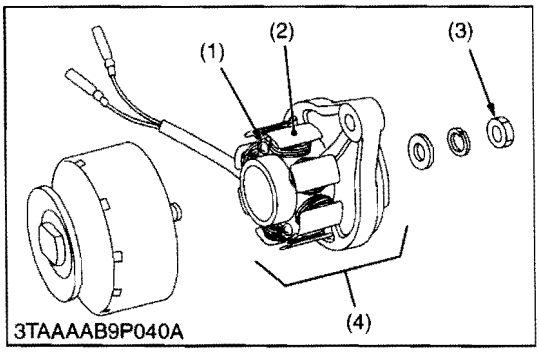
W1021763

1. Disconnect the connecting lead from the magnetic switch (3).
2. Remove the screw (1) and remove the magnet switch (3).
3. Remove the screw (16) and through bolt (17), and separate the rear end frame (15).
4. Remove the brush holder (14).
5. Draw out the armature (13) and yoke (12).
6. Remove the gasket (11), gasket (19) and plate (18).
7. Draw out the shaft assembly (9) with the drive lever (5).

■ **NOTE**

- **Do not damage the brush and commutator.**
- **Do not miss the ball (10).**

(2) AC Dynamo

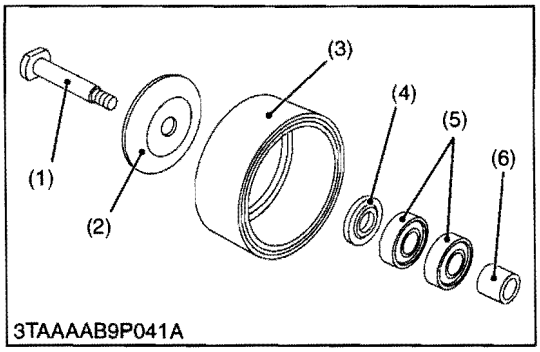


Stator

1. Remove the nut (3) and separate the stator comp. (4).
2. Unscrew the screws (1) and remove the stator (2).

(1) Screw
(2) Stator
(3) Nut
(4) Stator Comp.

W1022319



Rotor

1. Tap out the shaft (1) from the rotor (3).

(When reassembling)

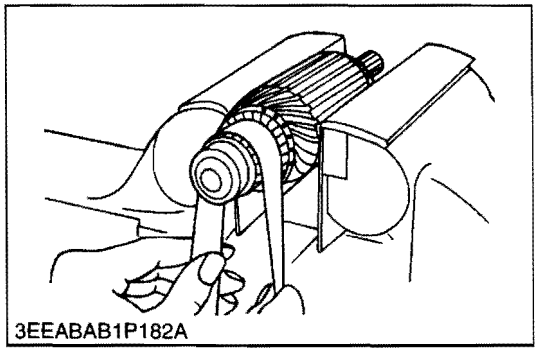
- Take care the direction of the collar (4), the flat side should face to the pulley (2) side.

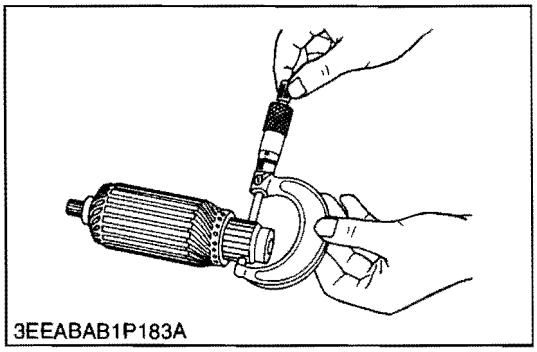
(1) Shaft
(2) Pulley
(3) Rotor
(4) Collar
(5) Bearings
(6) Collar

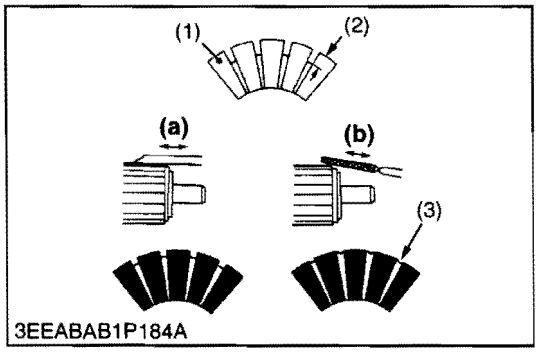
W1022532

[3] SERVICING

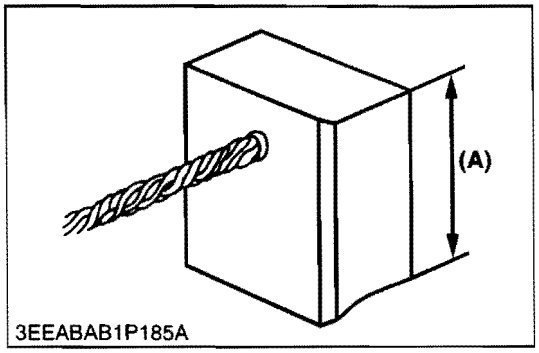
(1) Starter


3EEABAB1P182A


3EEABAB1P183A



3EEABAB1P184A



3EEABAB1P185A

Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, correct the commutator on a lathe to the factory specification.
4. Measure the mica undercut.
5. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory spec.	28.0 mm 1.10 in.
	Allowable limit	27.0 mm 1.06 in.
Difference of O.D.'s	Factory spec.	Less than 0.02 mm 0.0008 in.
	Allowable limit	0.05 mm 0.002 in.
Mica undercut	Factory spec.	0.60 mm 0.024 in.
	Allowable limit	0.20 mm 0.0079 in.

(1) Segment
(2) Undercut
(3) Mica

(a) Correct
(b) Incorrect

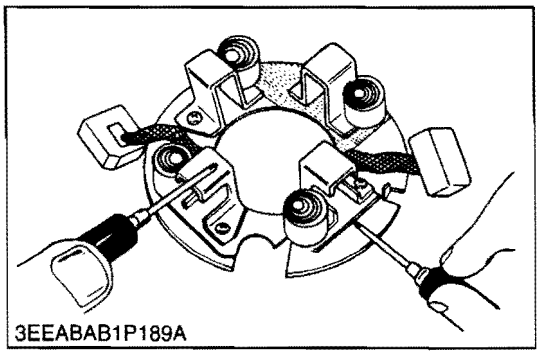
W1022744

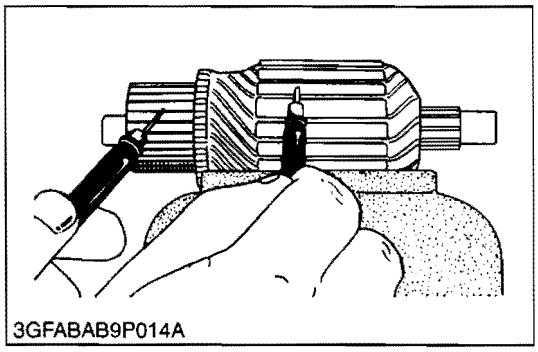
Brush Wear

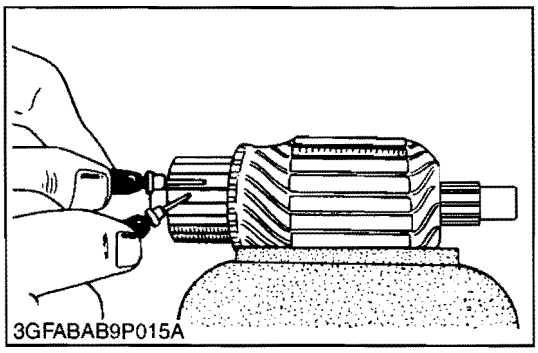
1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length **A** with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length **A**	Factory spec.	14.0 mm 0.551 in.
	Allowable limit	9.0 mm 0.35 in.

W1023058


3EEABAB1P189A


3GFABAB9P014A


3GFABAB9P015A

Brush Holder

1. Check the continuity across the brush holder and the holder support with an ohmmeter.
2. If it conducts, replace the brush holder.

Resistance	Brush holder - Holder support	Infinity

W1023199

Armature Coil

1. Check the continuity between the commutator and armature coil core with an ohmmeter.
2. If it conducts, replace the armature.
3. Check the continuity between the segments of the commutator with an ohmmeter.
4. If it does not conduct, replace the armature.

W1023321