WSM

WORKSHOP MANUAL
TRACTOR

M5040,M6040,M7040

Kubota

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of M5040, M6040 and M7040. It is divided into three parts, "General", "Mechanism" and "Servicing".

■ **General**

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

■ **Mechanism**

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

Refer to Diesel Engine / Tractor Mechanism Workshop Manual (Code No. 9Y021-01873 / 9Y021-18200)* for the one which has not been described to this workshop manual.

* The code numbers provided above are the latest numbers.
Old code numbers corresponding to those numbers are 97897-01872 and 97897-18200.

■ **Servicing**

Information on the troubleshooting, servicing specification lists, tightening torque, checking and adjusting, disassembling and assembling, and servicing which cover procedures, precautions, factory specifications and allowable limits.

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

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

Due to covering many models of this manual, information or picture being used, have not been specified as one model.

May 2006

SAFETY FIRST

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

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

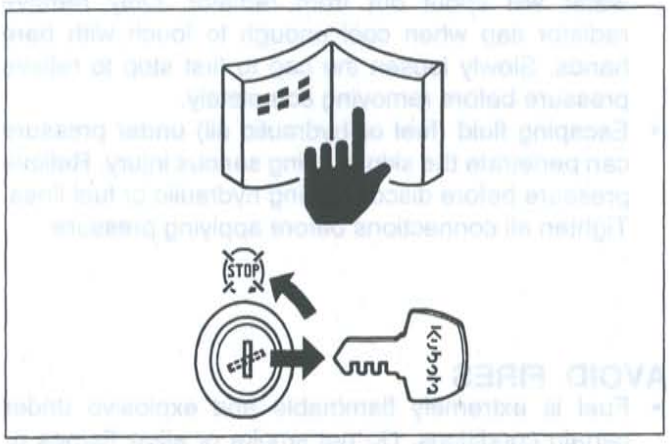
DANGER : **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

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

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

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

■ NOTE : **Gives helpful information.**

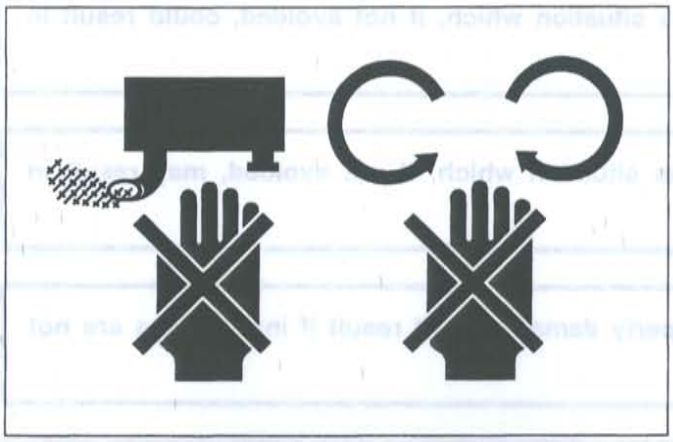


BEFORE SERVICING AND REPAIRING

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

SAFETY STARTING

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



SAFETY WORKING

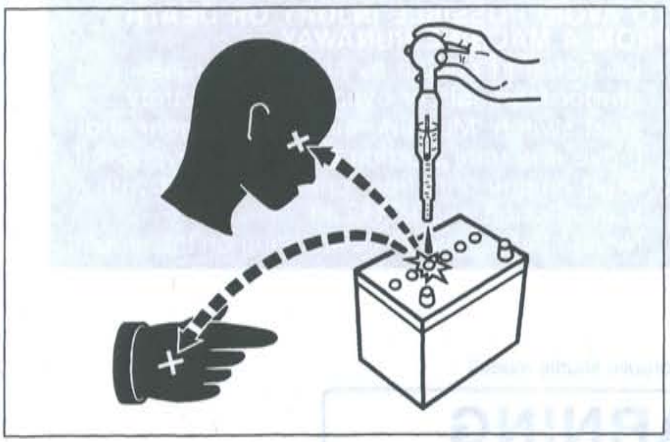
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.

AVOID FIRES

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

VENTILATE WORK AREA

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

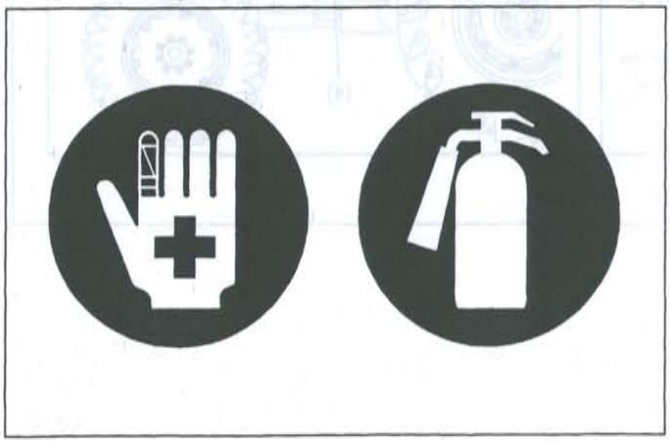


PREVENT ACID BURNS

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

DISPOSE OF FLUIDS PROPERLY

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



PREPARE FOR EMERGENCIES

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

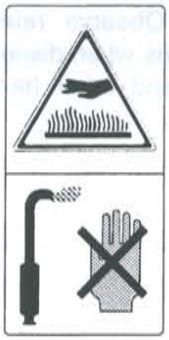
SAFETY DECALS

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

■ **ROPS Model**

(1) Part No. 6C090-4958-2
Stay clear of engine fan and fanbelt.

(2) Part No. 3N300-4958-1
Do not touch hot surface like muffler, etc.



(3) Part No. TA040-4965-2

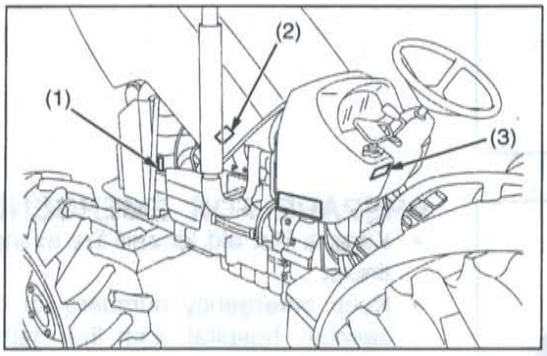
⚠ DANGER

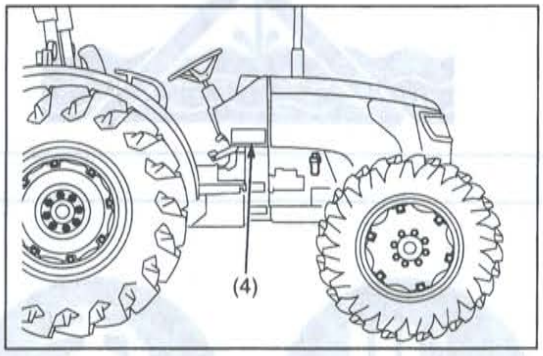
TO AVOID POSSIBLE INJURY OR DEATH FROM A MACHINE RUNAWAY.
1. Do not start engine by shorting across starter terminals or bypassing the safety start switch. Machine may start in gear and move if normal starting circuitry is bypassed.
2. Start engine only from operator's seat with transmission and PTO OFF.
Never start engine while standing on the ground.

(4) Part No. 3F240-9857-1 [Hydraulic shuttle model]

⚠ WARNING

To avoid free wheeling when shifting the shuttle lever while on a slope : Stop completely by using the brake and by depressing the clutch pedal. Start off after selecting shuttle direction by releasing the clutch pedal.





3TMACAPCP001A

(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, or 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.

(2) Part No. 3A111-9848-2

⚠ WARNING

TO AVOID INJURY OR DEATH FROM ROLL-OVER:

- Keep Roll-Over Protective Structures (ROPS) in the upright and locked position.
- Fasten SEAT BELT before operating.

THERE IS NO OPERATOR PROTECTION WHEN THE ROPS IS IN THE FOLDED POSITION.

- Check the operating area and fold the ROPS only when absolutely necessary.
- Do not wear SEAT BELT if ROPS is folded.
- Raise and lock ROPS as soon as vertical clearance allows.
- Read ROPS related instructions and warnings.

(4) Part No. TA040-4956-2

Diesel fuel only

No fire

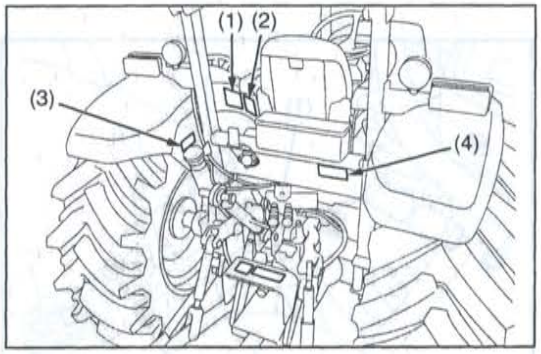
(3) Part No. 3A111-9856-3

⚠ CAUTION

TO AVOID INJURY FROM SEPARATION:

RH.
DO NOT EXTEND LIFT ROD BEYOND THE POINT WHERE THREADS ARE EXPOSED.

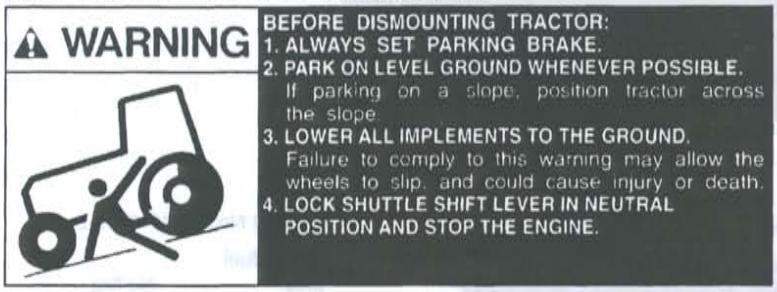
LH.
DO NOT EXTEND LIFT ROD BEYOND THE GROOVE ON THE THREADED ROD.



3TMACAPCP002A

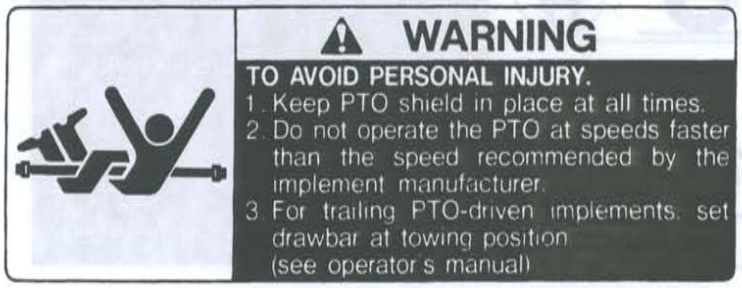
(1) Part No. 6C150-4743-1 [Hydraulic shuttle model]

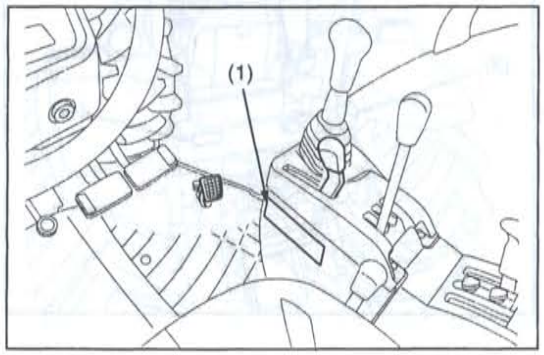
(1) Part No. TA140-4933-1 [Synchro shuttle model]

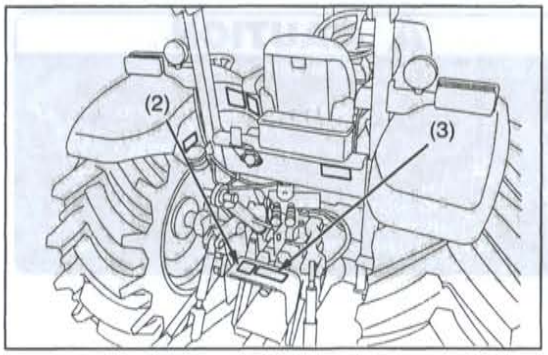


(2) Part No. TA040-4935-1

(3) Part No. TA040-4959-3



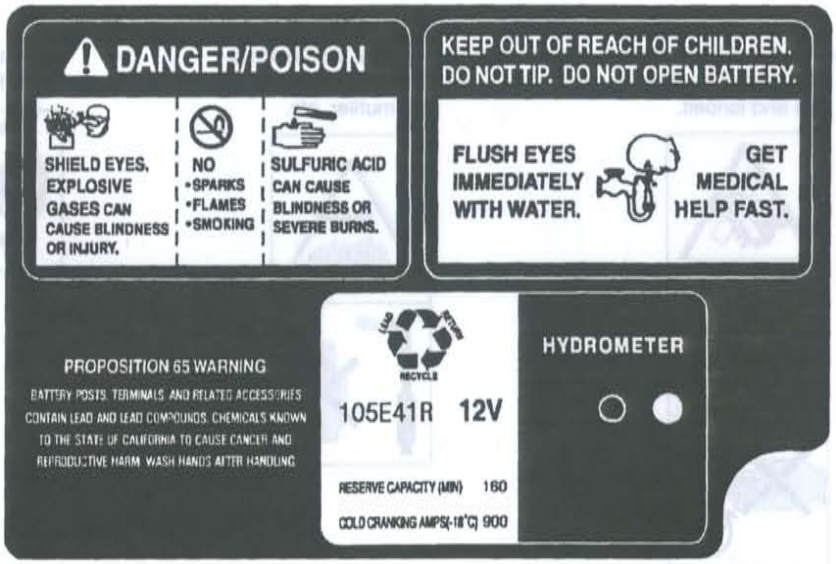




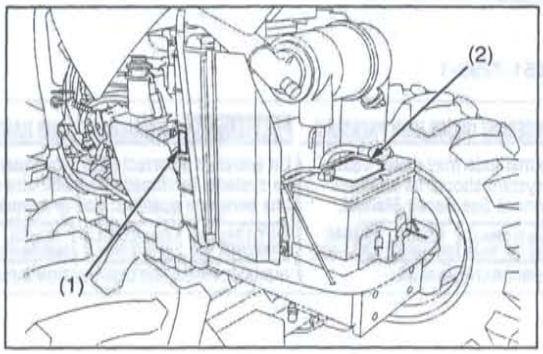
3TMACAPCP003A

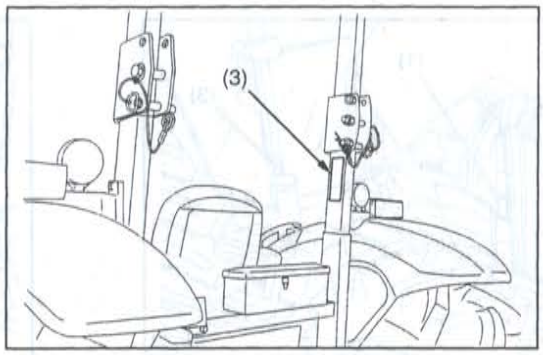
(1) Part No. 6C090-4958-2
Stay clear of engine fan and fanbelt.

(2) Part No. 3N300-9892-1



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





CARE OF DANGER, WARNING AND CAUTION LABELS

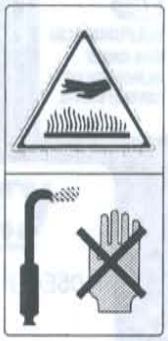
1. Keep danger, warning and caution labels clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels.
4. If a component with danger, warning or caution 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.

3TMACAPCP004A

■ CABIN Model

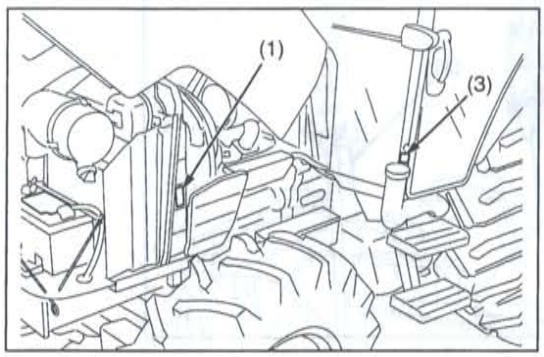
(1) Part No. 6C090-4958-2
Stay clear of engine fan and fanbelt.

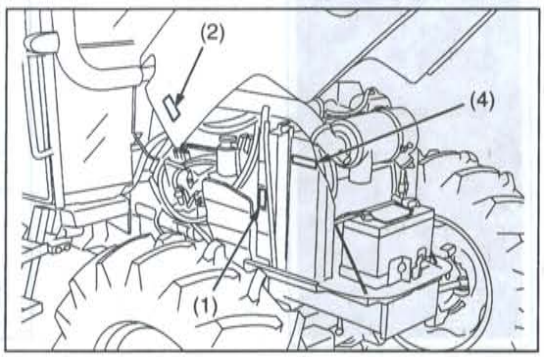
(2) Part No. 3N300-4958-1
Do not touch hot surface like muffler, etc.



(3) Part No. 6C040-4741-1
No fire

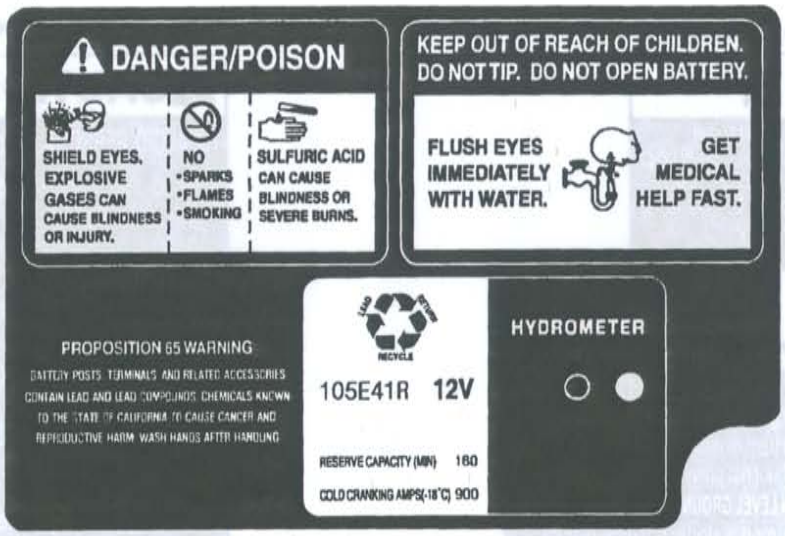
(4) Part No. 3A851-7295-1



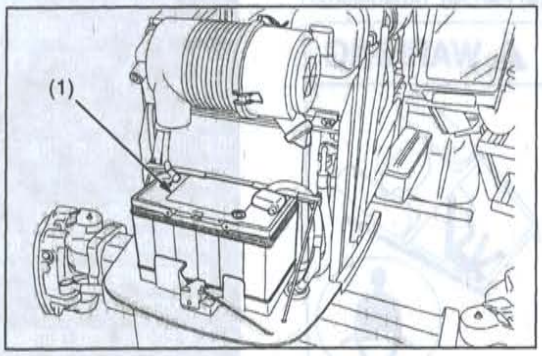


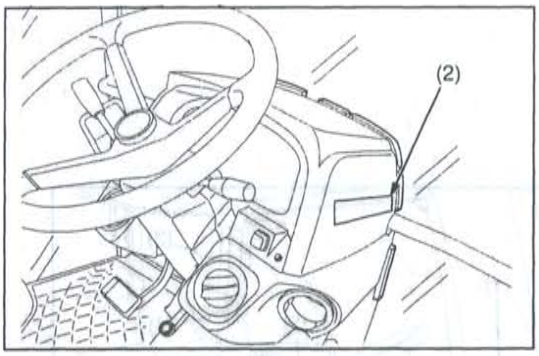
3TMACAPCP005A

(1) Part No. 3N300-9892-1



(2) Part No. TA040-4965-2





3TMACAPCP006A

(1) Part No. 3F240-9857-1 [Hydraulic shuttle model]

⚠ WARNING

To avoid free wheeling when shifting the shuttle lever while on a slope : Stop completely by using the brake and by depressing the clutch pedal. Start off after selecting shuttle direction by releasing the clutch pedal.

(2) Part No. 6C150-4743-1 [Hydraulic shuttle model]

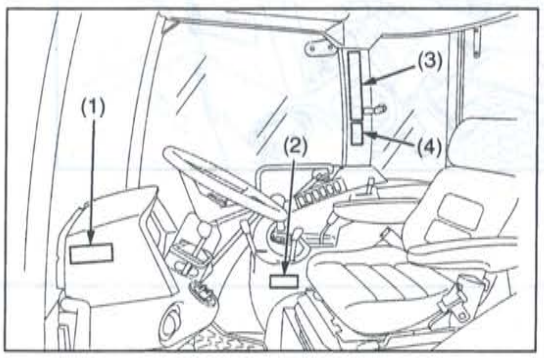
⚠ WARNING

BEFORE DISMOUNTING TRACTOR:
1. **ALWAYS SET PARKING BRAKE.**
   Leaving transmission in gear with the engine stopped will not prevent tractor from rolling.
2. **PARK ON LEVEL GROUND WHENEVER POSSIBLE.**
   If parking on a slope, position tractor across the slope.
3. **LOWER ALL IMPLEMENTS TO THE GROUND.**
4. **STOP THE ENGINE.**

(2) Part No. TA140-4933-1 [Synchro shuttle model]

⚠ WARNING

BEFORE DISMOUNTING TRACTOR:
1. ALWAYS SET PARKING BRAKE.
2. PARK ON LEVEL GROUND WHENEVER POSSIBLE.
   If parking on a slope, position tractor across the slope.
3. LOWER ALL IMPLEMENTS TO THE GROUND.
   Failure to comply to this warning may allow the wheels to slip, and could cause injury or death.
4. LOCK SHUTTLE SHIFT LEVER IN NEUTRAL POSITION AND STOP THE ENGINE.



(4) Part No. TA040-4902-1

⚠ WARNING

TO AVOID INJURY OR DEATH FROM ROLL-OVER:
Always use seat belt when driving.

(3) Part No. 3F240-9836-2

⚠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 tractor and 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 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, or 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.

3TMACAPCP007A

(1) Part No. 3A111-9856-3

⚠ CAUTION

TO AVOID INJURY FROM SEPARATION:

GROOVE

RH.
DO NOT EXTEND LIFT ROD BEYOND THE POINT WHERE THREADS ARE EXPOSED.

THREAD EXPOSURE AREA

LH.
DO NOT EXTEND LIFT ROD BEYOND THE GROOVE ON THE THREADED ROD.

(2) Part No. TA040-4935-1

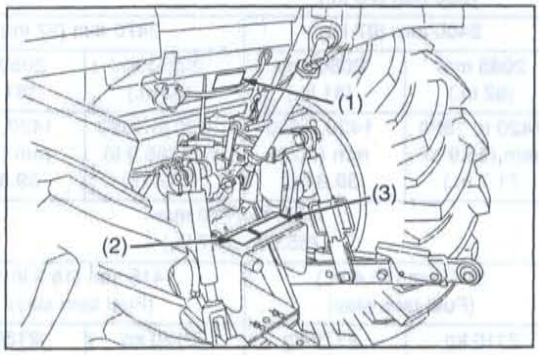
⚠ WARNING

TO AVOID PERSONAL INJURY:
1. Attach pulled or towed loads to the drawbar only.
2. Use the 3-point hitch only with equipment designed for 3-point hitch usage.

(3) Part No. TA040-4959-3

⚠ WARNING

TO AVOID PERSONAL INJURY.
1. Keep PTO shield in place at all times.
2. Do not operate the PTO at speeds faster than the speed recommended by the implement manufacturer.
3. For trailing PTO-driven implements, set drawbar at towing position. (see operator s manual)



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5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

3TMACAPCP008A

SPECIFICATIONS

[ROPS Model]

Model			M5040		M6040		M7040	
			2WD	4WD	2WD	4WD	2WD	4WD
Engine	Model		V3007-DI-E2		V3307-DI-E2		V3307-DI-E2-1	
	Type		Direct injection, liquid cooled 4 cylinder diesel					
	Number of cylinders		4					
	Total displacement		3053 cm^3 (186 cu.in.)		3331 cm^3 (203 cu.in.)			
	Bore and stroke		94 × 110 mm (3.7 × 4.3 in.)		94 × 120 mm (3.7 × 4.7 in.)			
	Rated speed		2600 min^{-1} (rpm)					
	Net power*1		37.6 kW (50.5 HP)		46.2 kW (62 HP)		50.7 kW (68 HP)	
	PTO power*1		33.6 kW (45 HP)		41.0 kW (55 HP)		46.2 kW (62 HP)	
	Maximum torque		178.5 N·m (18.2 kgf·m, 131.7 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		213 N·m (21.7 kgf·m, 157.1 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		232 N·m (23.7 kgf·m, 171.1 ft-lbs) / 1300 to 1500 min^{-1} (rpm)	
	Battery capacity		12 V, RC : 160 min, CCA : 900 A					
	Fuel		Diesel fuel No. 1 [below –10 °C (14 °F], Diesel fuel No. 2-D [above –10 °C (14 °F)]					
	Fuel tank capacity		70 L (18.5 U.S.gals., 15.4 Imp.gals.)					
	Engine oil capacity		11 L (11.6 U.S.qts., 9.7 Imp.qts.)					
	Coolant capacity		8 L (8.5 U.S.qts., 7.0 Imp.qts.)					
Dimensions	Overall length		3565 mm (140 in.)	3445 mm (136 in.)	3565 mm (140 in.)	3445 mm (136 in.)	3565 mm (140 in.)	3445 mm (136 in.)
	Overall width (min. tread)		1860 mm (73 in.)					
	Overall height		2420 mm (95 in.)		2460 mm (97 in.)		2470 mm (97 in.)	
	Wheel base		2085 mm (82 in.)	2050 mm (81 in.)	2085 mm (82 in.)	2050 mm (81 in.)	2085 mm (82 in.)	2050 mm (81 in.)
	Tread	Front	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)
		Rear	1320 to 1720 mm (52.0 to 67.7 in.)		1420 to 1720 mm (55.9 to 67.7 in.)			
	Minimum ground clearance		370 mm (14.6 in.) (Fuel tank stay)		390 mm (15.4 in.) (Fuel tank stay)		415 mm (16.3 in.) (Fuel tank stay)	
Weight			2050 kg (4519 lbs)	2120 kg (4674 lbs)	2110 kg (4652 lbs)	2170 kg (4784 lbs)	2120 kg (4674 lbs)	2180 kg (4806 lbs)
Traveling system	Standard tire size	Front	6.5-16	9.5-24	7.5-16	9.5-24	7.5-16	9.5-24
		Rear	14.9-28		16.9-28		16.9-30*2	
	Clutch		Dry, single plate / Multiple wet discs					
	Steering		Hydraulic power steering					
	Braking system		Multiple wet discs mechanical					
	Differential		Bevel gears with differential lock (rear)					

Note : *1 : Manufacture's estimate
*2 : Cast iron discs available for wheels.
*3 : At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

W10281170

Model			M5040		M6040		M7040	
			2WD	4WD	2WD	4WD	2WD	4WD
Hydraulic unit	Hydraulic control system		Position, draft (top link sensing) and mix control					
	Pump capacity		41.6 L (11.0 U.S.gals., 9.2 Imp.gals.) / min.					
	3-point hitch		SAE Category 1 and 2					
	Max. lifting force	At lift points*3	1900 kg (4189 lbs) At lower link end with links horizontal					
		24 in. behind lift points*3	1500 kg (3307 lbs)					
	Remote hydraulic control		1 standard with detent and selfcancelling (2nd and 3rd valve optinal)					
	System pressure		19.1 MPa (195 kgf/cm^2, 2770.3 psi)					
	Traction system		Swinging drawbar, adjustable in direction					
PTO	Live PTO (Indipendent)	Direction of turning	Clockwise, viewed from tractor rear					
		PTO speed	540 min^{-1} (rpm) at 2160 min^{-1} (rpm)					

Note : *1 : Manufacture's estimate
*2 : Cast iron discs available for wheels.
*3 : At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

W10309210

[CABIN Model]

Model			M5040		M6040		M7040	
			2WD	4WD	2WD	4WD	2WD	4WD
Engine	Model		V3007-DI-E2		V3307-DI-E2		V3307-DI-E2-1	
	Type		Direct injection, liquid cooled 4 cylinder diesel					
	Number of cylinders		4					
	Total displacement		3053 cm^3 (186 cu.in.)		3331 cm^3 (203 cu.in.)			
	Bore and stroke		94 × 110 mm (3.7 × 4.3 in.)		94 × 120 mm (3.7 × 4.7 in.)			
	Rated speed		2600 min^{-1} (rpm)					
	Net power*1		37.6 kW (50.5 HP)		46.2 kW (62 HP)		50.7 kW (68 HP)	
	PTO power*1		33.6 kW (45 HP)		41.0 kW (55 HP)		46.2 kW (62 HP)	
	Maximum torque		178.5 N·m (18.2 kgf·m, 131.7 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		213 N·m (21.7 kgf·m, 157.1 ft-lbs) / 1300 to 1500 min^{-1} (rpm)		232 N·m (23.7 kgf·m, 171.1 ft-lbs) / 1300 to 1500 min^{-1} (rpm)	
	Battery capacity		12 V, RC : 160 min, CCA : 900 A					
	Fuel		Diesel fuel No. 1 [below −10 °C (14 °F], Diesel fuel No. 2-D [above −10 °C (14 °F)]					
	Fuel tank capacity		90 L (23.8 U.S.gals., 19.8 Imp.gals.)					
	Engine oil capacity		11 L (11.6 U.S.qts., 9.7 Imp.qts.)					
	Coolant capacity		8 L (8.5 U.S.qts., 7.0 Imp.qts.)					
Dimensions	Overall length		3625 mm (142.7 in.)	3505 mm (138 in.)	3625 mm (142.7 in.)	3505 mm (138 in.)	3625 mm (142.7 in.)	3505 mm (138 in.)
	Overall width (min. tread)		1860 mm (73 in.)					
	Overall height		2515 mm (99 in.)		2555 mm (100.6 in.)		2565 mm (97 in.)	
	Wheel base		2145 mm (84.4 in.)	2110 mm (83.1 in.)	2145 mm (84.4 in.)	2110 mm (83.1 in.)	2145 mm (84.4 in.)	2110 mm (83.1 in.)
	Tread	Front	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)	1420 to 1820 mm (55.9 to 71.7 in.)	1420, 1520 mm (55.9, 59.8 in.)
		Rear	1320 to 1720 mm (52.0 to 67.7 in.)		1420 to 1720 mm (55.9 to 67.7 in.)			
	Minimum ground clearance		410 mm (16.1 in.) (Fuel tank stay)		430 mm (16.9 in.) (Fuel tank stay)		440 mm (17.3 in.) (Fuel tank stay)	
Weight			2310 kg (5093 lbs)	2380 kg (5247 lbs)	2370 kg (5225 lbs)	2430 kg (5357 lbs)	2380 kg (5247 lbs)	2440 kg (5379 lbs)
Traveling system	Standard tire size	Front	6.5-16	9.5-24	7.5-16	9.5-24	7.5-16	9.5-24
		Rear	14.9-28		16.9-28		16.9-30*2	
	Clutch		Dry, single plate / Multiple wet discs					
	Steering		Hydraulic power steering					
	Braking system		Multiple wet discs mechanical					
	Differential		Bevel gears with differential lock (rear)					

Note : *1 : Manufacture's estimate
*2 : Cast iron discs available for wheels.
*3 : At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

W10281170

Model			M5040		M6040		M7040	
			2WD	4WD	2WD	4WD	2WD	4WD
Hydraulic unit	Hydraulic control system		Position, draft (top link sensing) and mix control					
	Pump capacity		41.6 L (11.0 U.S.gals., 9.2 Imp.gals.) / min.					
	3-point hitch		SAE Category 1 and 2					
	Max. lifting force	At lift points*3	1900 kg (4189 lbs) At lower link end with links horizontal					
		24 in. behind lift points*3	1500 kg (3307 lbs)					
	Remote hydraulic control		1 standard with detent and selfcancelling (2nd and 3rd valve optinal)					
	System pressure		19.1 MPa (195 kgf/cm^2, 2770.3 psi)					
	Traction system		Swinging drawbar, adjustable in direction					
PTO	Live PTO (Indipendent)	Direction of turning	Clockwise, viewed from tractor rear					
		PTO speed	540 min^{-1} (rpm) at 2160 min^{-1} (rpm)					

Note : *1 : Manufacture's estimate
*2 : Cast iron discs available for wheels.
*3 : At lower link and with links horizontal.
The company reserves the right to change the specifications without notice.

W10331560

TRAVELING SPEEDS

(At rated engine rpm)

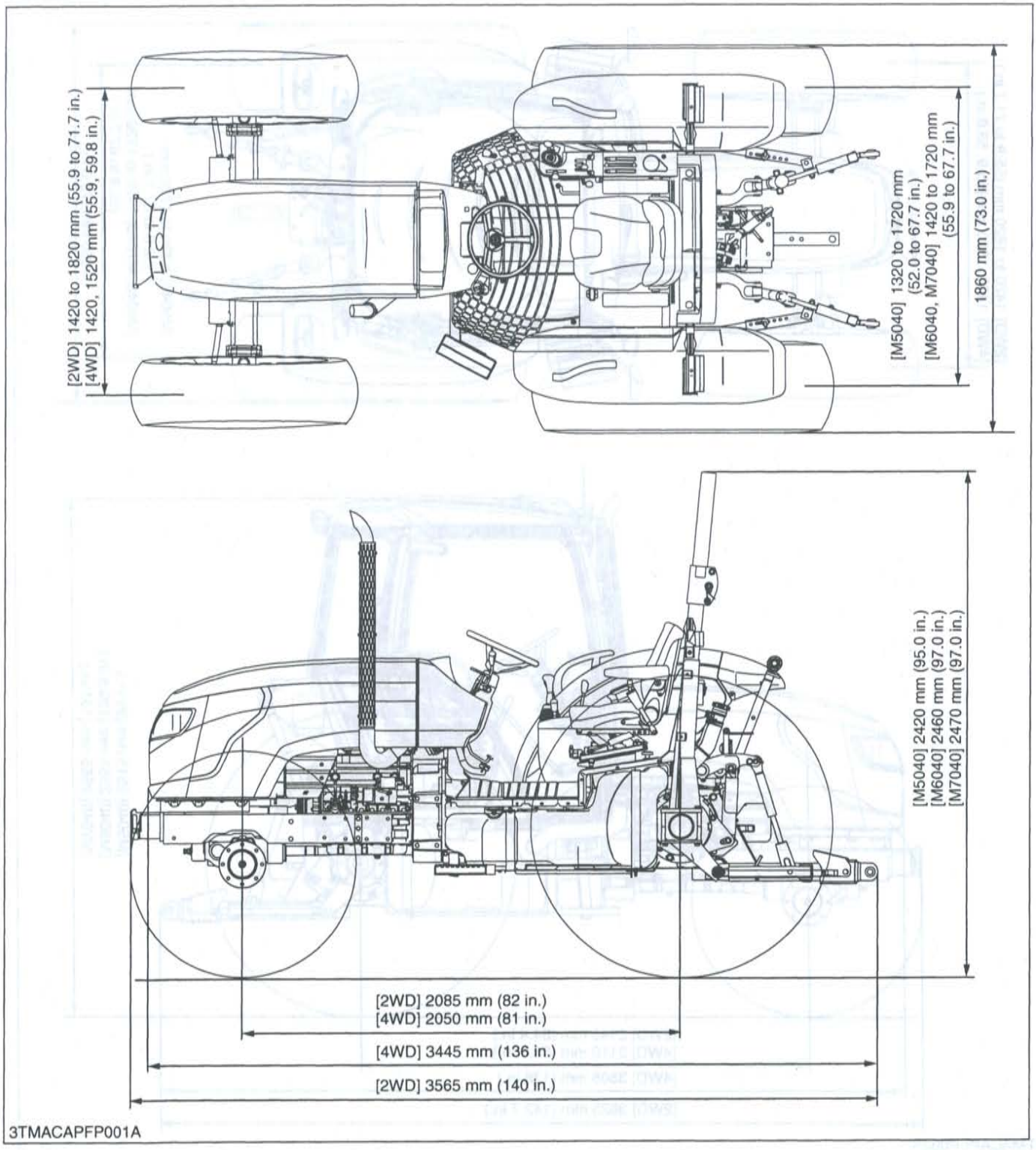
Model			M5040, M6040		M7040
Tire size (Rear)			14.9-28	16.9-28	16.9-30
Shuttle shift lever	Range gear shift lever	Main gear shift lever	km/h (mph)		
Forward	CREEP (option)	1	0.33 (0.20)	0.34 (0.21)	0.35 (0.22)
		2	0.46 (0.29)	0.48 (0.30)	0.50 (0.31)
		3	0.62 (0.39)	0.64 (0.40)	0.67 (0.42)
		4	1.0 (0.63)	1.0 (0.65)	1.1 (0.68)
	L	1	2.3 (1.4)	2.4 (1.5)	2.5 (1.5)
		2	3.3 (2.0)	3.4 (2.1)	3.5 (2.2)
		3	4.4 (2.7)	4.5 (2.8)	4.7 (2.9)
		4	7.1 (4.4)	7.4 (4.6)	7.7 (4.8)
	H	1	8.9 (5.6)	9.3 (5.8)	9.6 (6.0)
		2	12.7 (7.9)	13.1 (8.2)	13.6 (8.5)
		3	17.0 (10.5)	17.6 (10.9)	18.2 (11.3)
		4	27.6 (17.1)	28.6 (17.8)	29.7 (18.5)
Reverse	CREEP (option)	1	0.33 (0.21)	0.34 (0.21)	0.35 (0.22)
		2	0.47 (0.29)	0.49 (0.30)	0.51 (0.31)
		3	0.63 (0.39)	0.65 (0.41)	0.68 (0.42)
		4	1.0 (0.64)	1.1 (0.66)	1.1 (0.69)
	L	1	2.3 (1.5)	2.4 (1.5)	2.5 (1.6)
		2	3.3 (2.1)	3.4 (2.1)	3.6 (2.2)
		3	4.4 (2.8)	4.6 (2.9)	4.8 (3.0)
		4	7.2 (4.5)	7.5 (4.6)	7.8 (4.8)
	H	1	9.1 (5.6)	9.4 (5.8)	9.7 (6.1)
		2	12.8 (8.0)	13.3 (8.3)	13.8 (8.6)
		3	17.2 (10.7)	17.8 (11.1)	18.5 (11.5)
		4	28.0 (17.4)	29.0 (18.0)	30.1 (18.7)

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

W1035065

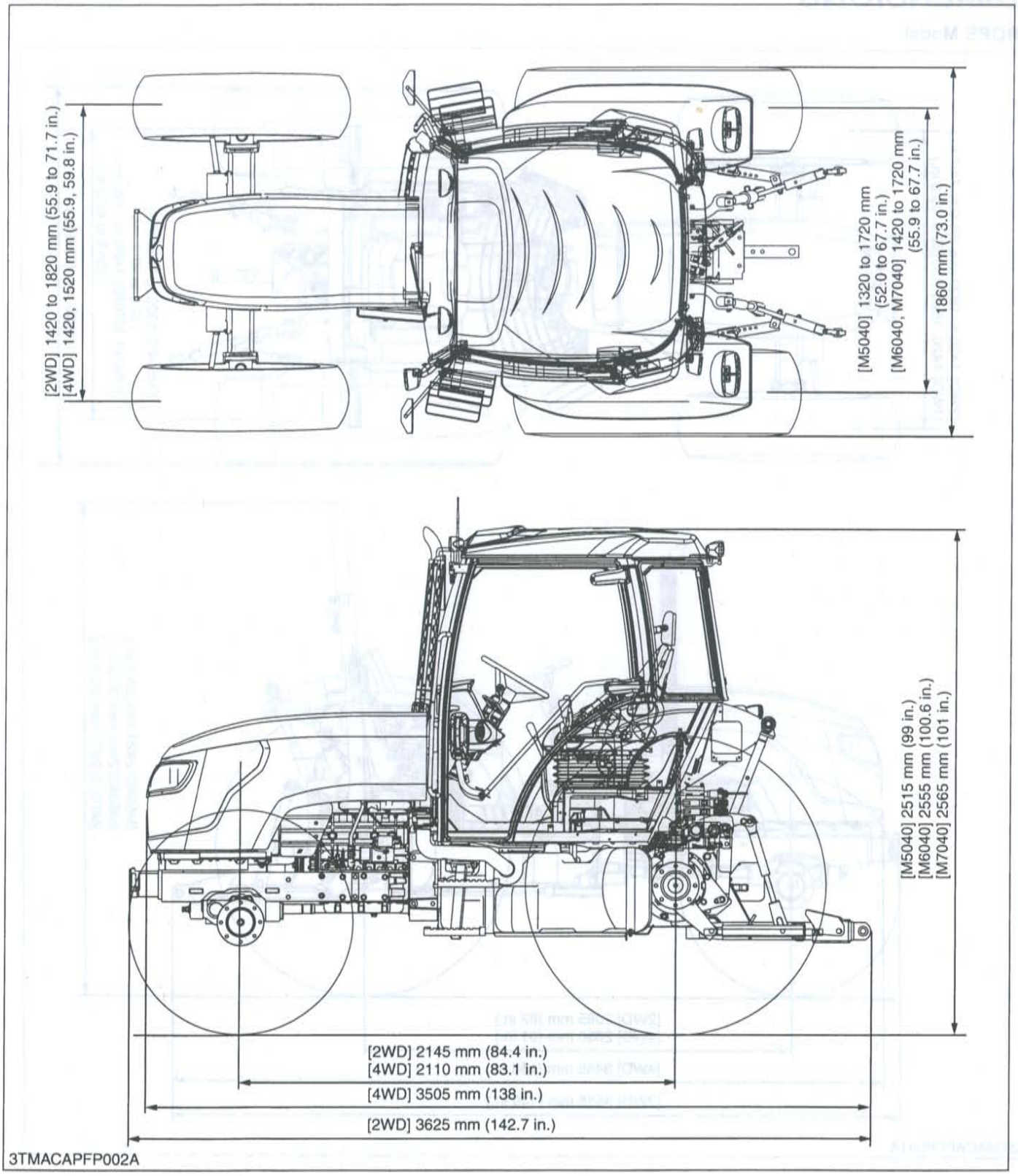
DIMENSIONS

ROPS Model



3TMACAPFP001A

CABIN Model



3TMACAPFP002A

G GENERAL

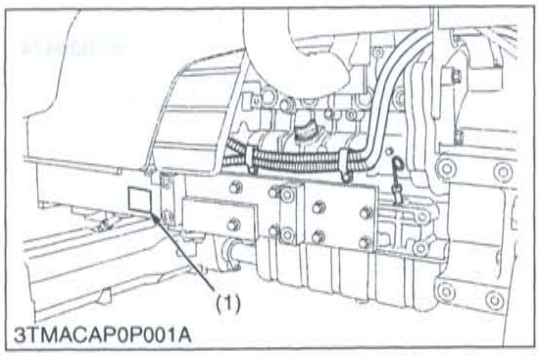
GENERAL

CONTENTS

1. TRACTOR IDENTIFICATION

[1] MODEL NAME AND SERIAL NUMBERS

(1) ROPS Model



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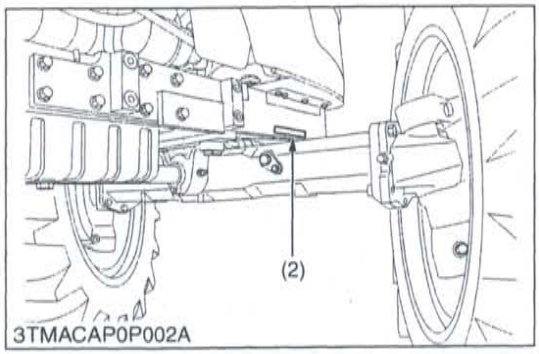

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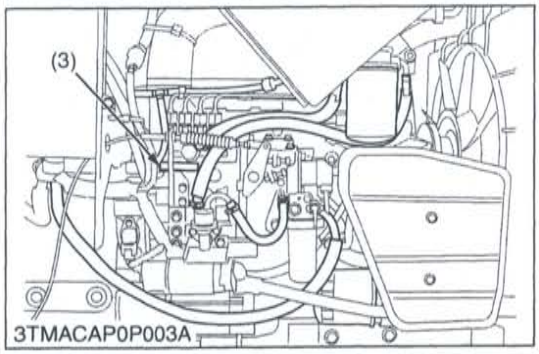

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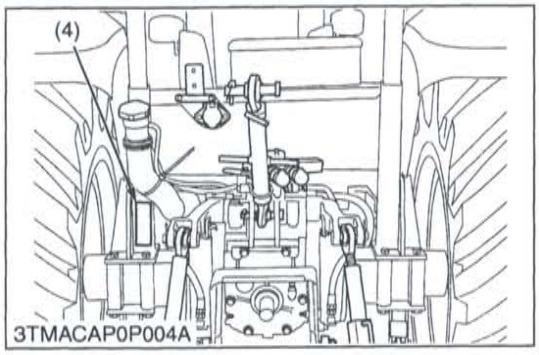


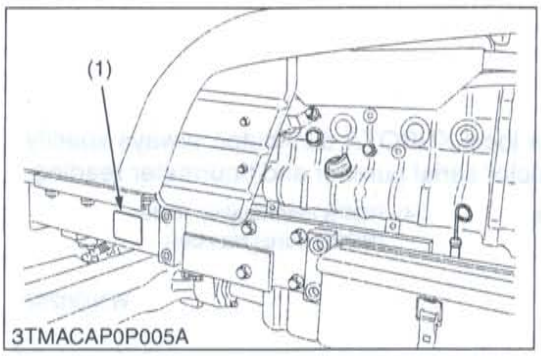
3TMACAP0P004A

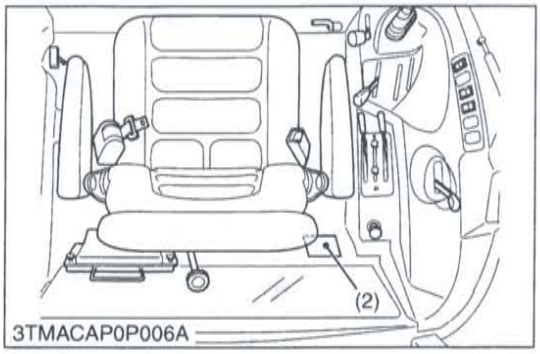
When contacting your local KUBOTA distributor, always specify engine serial number, tractor serial number and hourmeter reading.

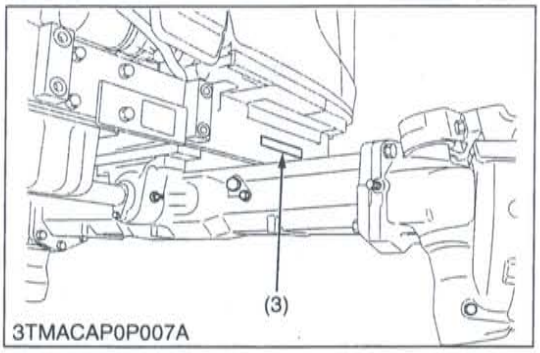
(1) Tractor Identification Plate
(2) Tractor Serial Number
(3) Engine Serial Number
(4) ROPS Identification Plate (ROPS Serial Number)

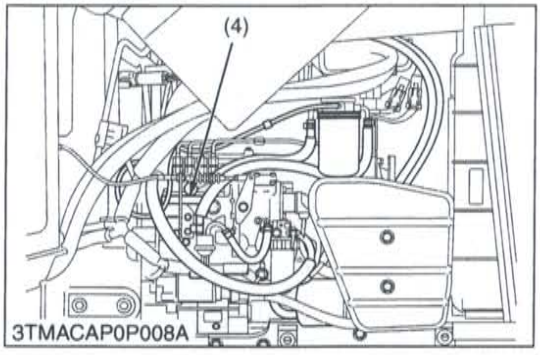
W1030262

(2) CABIN Model





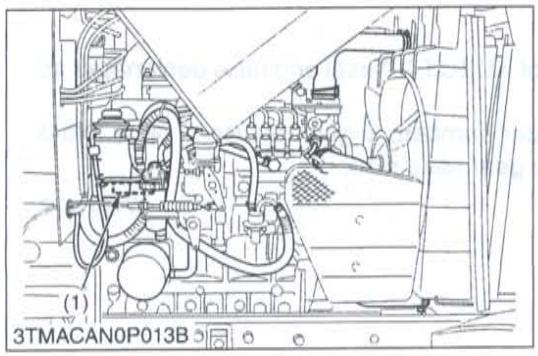




When contacting your local KUBOTA distributor, always specify engine serial number, tractor serial number and hourmeter reading.

(1) Tractor Identification Plate
(2) CABIN Identification Plate (CABIN Serial Number)
(3) Tractor Serial Number
(4) Engine Serial Number

W1030474



Engine Serial Number

The engine serial number is an identified number for the engine. It is marked after the engine model number.

It indicates month and year of manufacture as follows.

- **Year of manufacture**

Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

- **Month of manufacture**

Month	Engine Serial Number	
	0001 ~ 9999	10000 ~
January	A0001 ~ A9999	B0001 ~
February	C0001 ~ C9999	D0001 ~
March	E0001 ~ E9999	F0001 ~
April	G0001 ~ G9999	H0001 ~
May	J0001 ~ J9999	K0001 ~
June	L0001 ~ L9999	M0001 ~
July	N0001 ~ N9999	P0001 ~
August	Q0001 ~ Q9999	R0001 ~
September	S0001 ~ S9999	T0001 ~
October	U0001 ~ U9999	V0001 ~
November	W0001 ~ W9999	X0001 ~
December	Y0001 ~ Y9999	Z0001 ~

e.g. V3007-6A0001

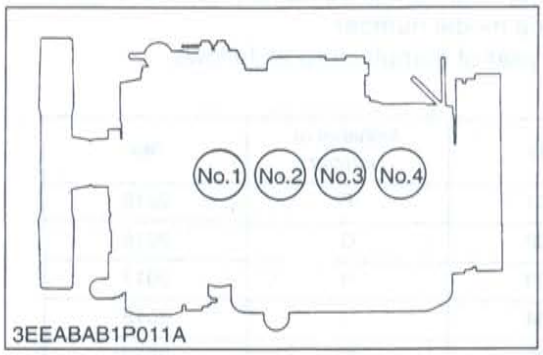
"6" indicates 2006 and "A" indicates January.

So, 6A indicates that the engine was manufactured on January, 2006.

(1) Engine Model and Serial Number

W1010477

[2] CYLINDER NUMBER



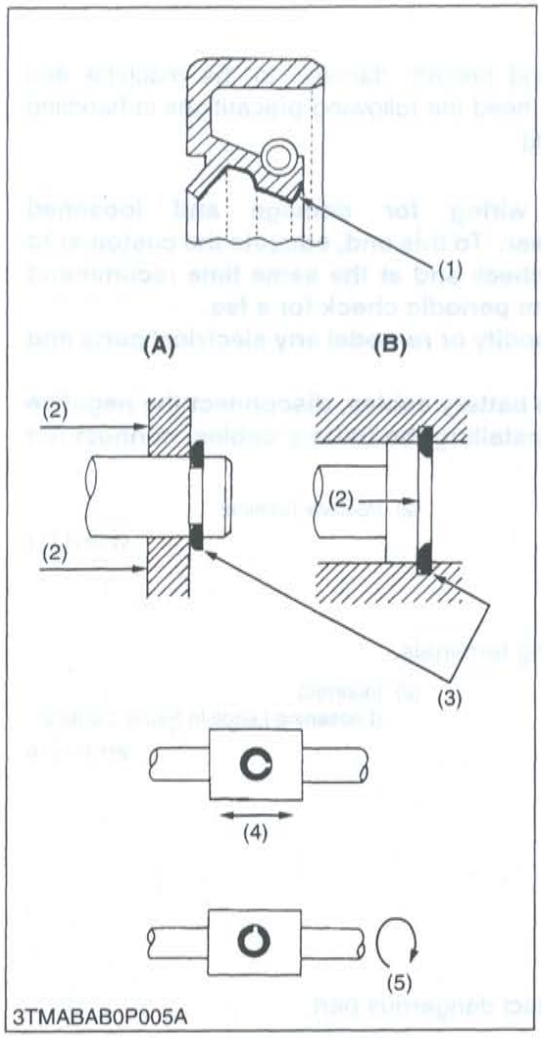
3EEABAB1P011A

The cylinder numbers of KUBOTA diesel engine is 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



3TMABAB0P005A

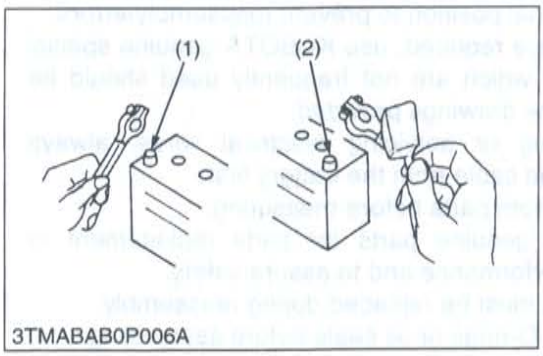
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently 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

W1010904

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.

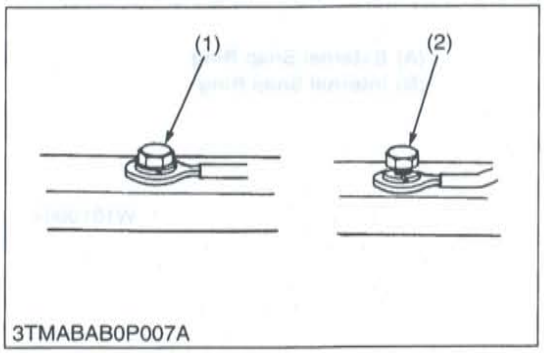
■ **IMPORTANT**

- **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

W1011114

[1] WIRING

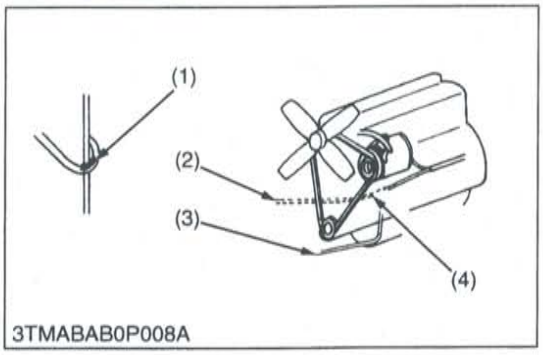


3TMABAB0P007A

- Securely tighten wiring terminals.

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

W1011216

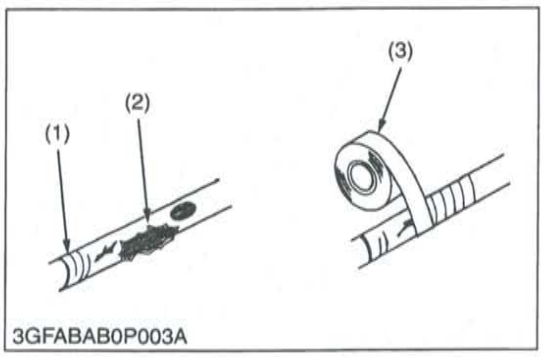


3TMABAB0P008A

- Do not let wiring contact dangerous part.

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

W1011313

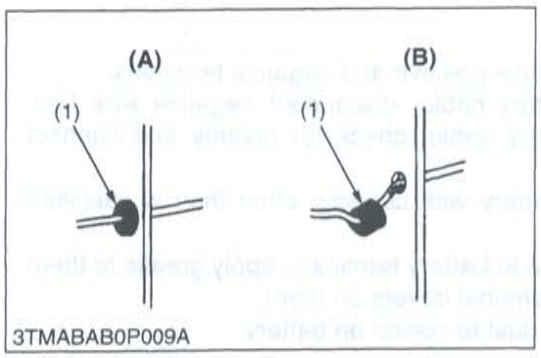


3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

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

W1012292

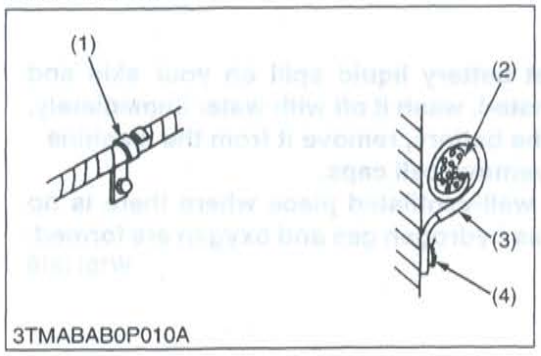


3TMABAB0P009A

- Securely insert grommet.

(1) Grommet
(A) Correct
(B) Incorrect

W1011388

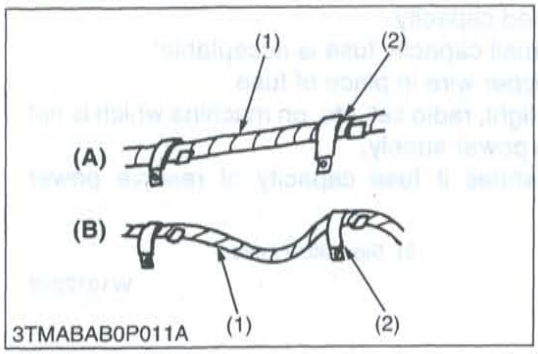


3TMABAB0P010A

- Securely clamp, being careful not to damage wiring.

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

W1011458

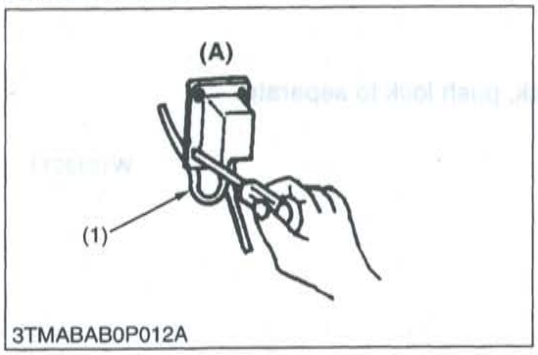


3TMABAB0P011A

- 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

W1011587

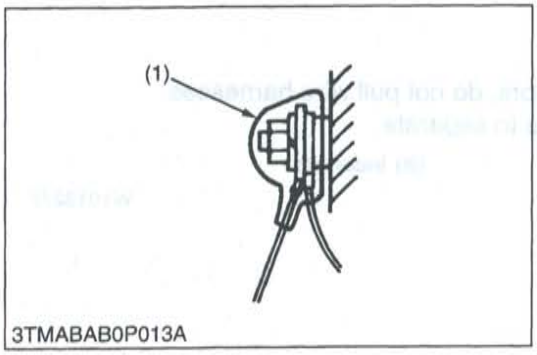


3TMABAB0P012A

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

(1) Wiring
(A) Incorrect

W1011670



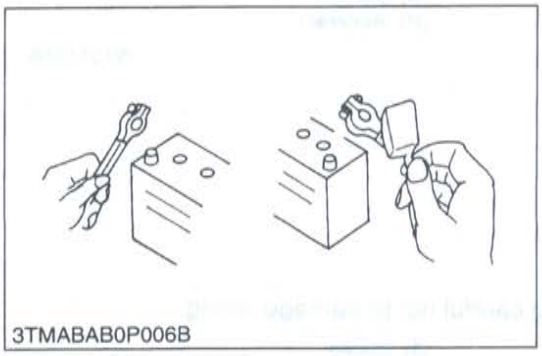
3TMABAB0P013A

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

(1) Cover
• Securely Install Cover

W1011735

[2] BATTERY


3TMABAB0P006B

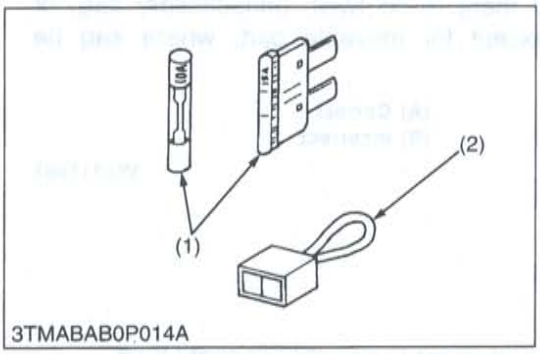
- Take care not to confuse positive and negative terminals.
- When removing battery cable, disconnect negative wire first. When installing battery cable, check for polarity and connect positive wire first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting cable to battery terminals, apply 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.**

W1011816

[3] FUSE



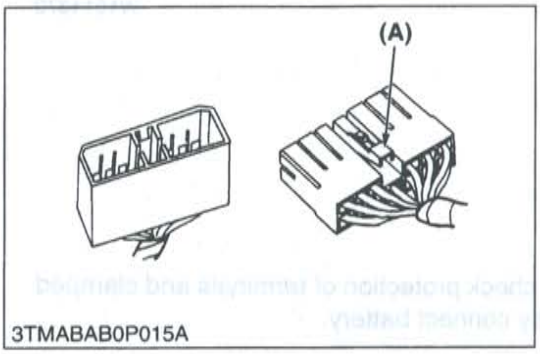
3TMABAB0P014A

- 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

W1012092

[4] CONNECTOR

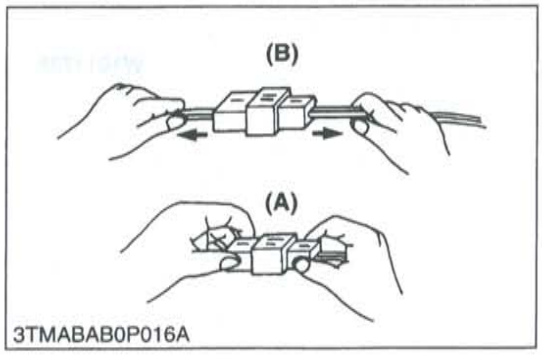


3TMABAB0P015A

- For connector with lock, push lock to separate.

(A) Push

W1012211

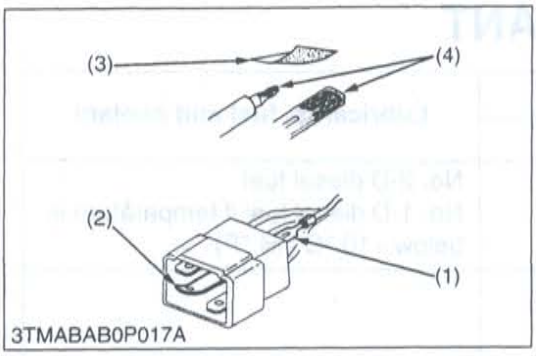


3TMABAB0P016A

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

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

W1012272

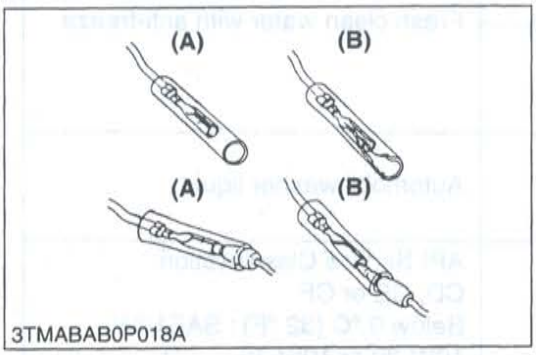


3TMABAB0P017A

- 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

W1012346

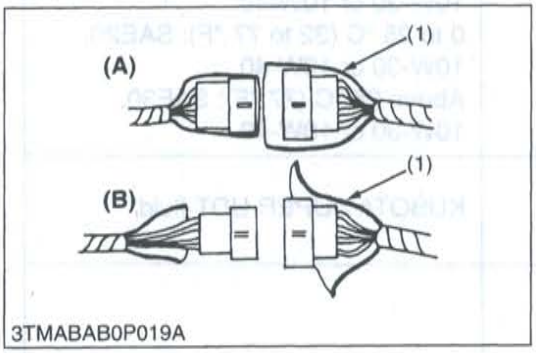


3TMABAB0P018A

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

(A) Correct
(B) Incorrect

W1012430



3TMABAB0P019A

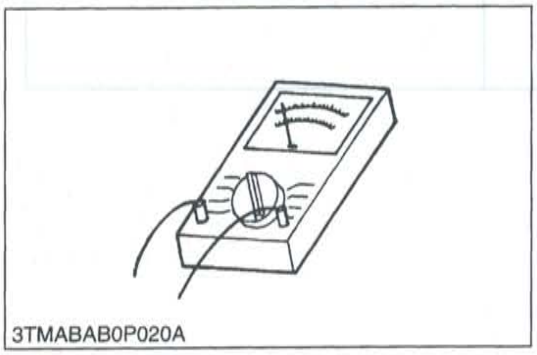
- Make certain plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct
(B) Incorrect

W1012519

[5] HANDLING OF CIRCUIT TESTER


3TMABAB0P020A

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

W1012684

4. LUBRICANTS, FUEL AND COOLANT

	Place	Capacity		Lubricants, fuel and coolant
		ROPS	CABIN	
1	Fuel tank	70 L 18.5 U.S.gals. 15.4 Imp.gals.	90 L 23.8 U.S.gals. 19.8 Imp.gals.	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below –10 °C (14 °F)
2	Coolant	8.0 L 8.5 U.S.qts. 7.0 Imp.qts.		Fresh clean water with anti-freeze
	Recovery tank	1.0 L 1.1 U.S.qts. 0.9 Imp.qts.		
3	Washer liquid	–	1.3 L 1.4 U.S.qts. 1.1 Imp.qts.	Automobil washer liquid
4	Engine crankcase (with filter)	11 L 11.6 U.S.qts. 9.7 Imp.qts.		API Service Classification CD, CE or CF Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40
5	Transmission case	56 L 59.2 U.S.qts. 49.3 Imp.qts.		KUBOTA SUPER UDT fluid*
6	Front differential case oil [4WD model]	5.5 L 5.8 U.S.qts. 4.8 Imp.qts.		KUBOTA SUPER UDT fluid or SAE80, SAE90 gear oil
7	Front axle gear case oil (one side) [4WD model]	3.5 L 3.7 U.S.qts. 3.1 Imp.qts.		

* KUBOTA original transmission hydraulic fluid.

Greasing				
	Place	No. of greasing points	Capacity	Type of grease
8	Front wheel hub [2WD model]	2	Until grease overflows	Multipurpose NLGI-2 or NLGI-1 (GC-LB) grease
	Knuckle shaft [2WD model]	2		
	Front axle gear case support [4WD model]	2		
	Front axle support	2		
	Top link	1		
	Top link bracket	2		
	Lift rod	2		
	Hydraulic lift cylinder pin	4		
	Steering joint shaft [CABIN model]	1		
	Battery terminal	2	Moderate amount	Multipurpose type grease or petroleum jelly

■ **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 temperature as shown above.**
  Do not mix different brands together.
- **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-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.**
- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

Fuel / Lubricating oil class	Low sulfur (0.5 % ≥)	High sulfur	Remarks
CF	○	○	TBN ≥ 10
CF-4	○	X	
CG-4	○	X	

○ : Recommendable X : Not recommendable

- **Transmission Oil : The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and complete lubrication of the transmission, it is important that a multi-grade transmission fluid be used in this system. We recommend the use of KUBOTA SUPER UDT fluid for optimum protection and performance.**
  Do not mix different brands together.
- **Indicated capacity of water and oil are manufacture's estimate.**

5. TIGHTENING TORQUES

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

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Indication on top of bolt	⬡ ④ No-grade or 4T						⑦ 7T						⑨ 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Diameter \ Unit	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6 (6 mm, 0.24 in.)	7.84 to 9.31	0.80 to 0.95	5.79 to 6.87	7.84 to 8.83	0.80 to 0.90	5.79 to 6.51	9.81 to 11.2	1.00 to 1.15	7.24 to 8.32	7.84 to 8.83	0.80 to 0.90	5.79 to 6.51	12.3 to 14.2	1.25 to 1.45	9.05 to 10.5
M8 (8 mm, 0.31 in.)	17.7 to 20.5	1.8 to 2.1	13.0 to 15.2	16.7 to 19.6	1.7 to 2.0	12.3 to 14.5	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
M10 (10 mm, 0.39 in.)	39.2 to 45.0	4.0 to 4.6	29.0 to 33.2	31.4 to 34.3	3.2 to 3.5	23.1 to 25.3	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
M12 (12 mm, 0.47 in.)	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	–	–	–	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	103 to 117	10.5 to 12.0	76.0 to 86.8
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	–	–	–	196 to 225	20.0 to 23.0	145 to 166	–	–	–	260 to 303	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	245 to 284	25.0 to 29.0	181 to 210	–	–	–	275 to 318	28.0 to 32.5	203 to 235	–	–	–	343 to 401	35.0 to 41.0	254 to 297
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	–	–	–	490 to 568	50.0 to 58.0	362 to 420

W1034542

[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Diameter \ Unit	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
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
M14 (14 mm, 0.55 in.)	62 to 73.5	6.3 to 7.5	45.6 to 54	–	–	–
M16 (16 mm, 0.63 in.)	98.1 to 112.8	10.0 to 11.5	72.3 to 83.2	–	–	–
M18 (18 mm, 0.71 in.)	172 to 201.1	17.5 to 20.5	126.5 to 148.2	–	–	–

W1048139

[3] HYDRAULIC FITTINGS

■ Hydraulic Hose Fittings

Hose size	Thread size	Tightening torque		
		N·m	kgf·m	ft-lbs
02	1/8	13.7 to 15.7	1.4 to 1.6	10.1 to 11.6
03	1/4	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
04				
05	3/8	45.1 to 53.0	4.6 to 5.4	33.3 to 39.0
06				

W1014711

■ Hydraulic Pipe Cap Nuts

Pipe size	Tightening torque		
	N·m	kgf·m	ft-lbs
ϕ4 × t1.0	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7
ϕ6 × t1.0	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
ϕ8 × t1.0	29.4 to 39.2	3.0 to 4.0	21.7 to 28.9
ϕ10 × t1.0	39.2 to 49.0	4.0 to 5.0	28.9 to 36.1
ϕ12 × t1.5	49.0 to 68.6	5.0 to 7.0	36.1 to 50.6
ϕ15 × t1.6	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
ϕ18 × t1.6	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8

W1014848

■ Adaptors, Elbows and Nipples

Items	Thread size	Tightening torque		
		N·m	kgf·m	ft-lbs
POA-PF (Nipple with O-ring)	PF 1/8	44.1 to 53.9	4.5 to 5.5	32.5 to 39.8
	PF 1/4	73.5 to 83.4	7.5 to 8.5	54.2 to 61.5
	PF 3/8	93.2 to 103.0	9.5 to 10.5	68.7 to 75.9
	PF 1/2	112.8 to 122.6	11.5 to 12.5	83.2 to 90.4
POB-PF (Elbow with O-ring and no nut)	PF 1/8	22.6 to 26.5	2.3 to 2.7	16.6 to 19.5
	PF 1/4	35.3 to 43.1	3.6 to 4.4	26.0 to 31.8
	PF 3/8	53.9 to 63.7	5.5 to 6.5	39.8 to 47.0
	PF 1/2	73.5 to 83.4	7.5 to 8.5	54.2 to 61.5
Adaptor (NPT)	PF 1/8	9.8 to 14.7	1.0 to 1.5	7.2 to 10.8
	PF 1/4	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
	PF 3/8	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
	PF 1/2	68.6 to 88.3	7.0 to 9.0	50.6 to 65.1

W1015484

6. MAINTENANCE

No.	Item			Indication on hour meter														Inter-val	Impor-tant		Refe-rence page
				50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Engine start system		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-21
2	Wheel bolt torque		Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-22
3	Battery condition		Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*4		G-22
4	Greasing		–		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-25
5	Fan/Air-conditioner belt		Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-24
6	Alternator belt		Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-24
7	Brake pedal		Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-24
8	Clutch pedal [Synchro shuttle model]		Adjust	★	☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-18
9	Air cleaner element [Double type]	Primary element	Clean		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*1		G-23
			Replace															every 1 year	*2	@	G-23
		Secondary element	Replace															every 1 year			G-23
10	Fuel line		Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		@	G-24
			Replace															every 2 years			G-24
11	Toe-in		Adjust				☆				☆				☆			every 200 Hr			G-28
12	Fuel tank water		Drain				☆				☆				☆			every 200 Hr			G-28
13	Power steering oil line		Check				☆				☆				☆			every 200 Hr			G-27
			Replace															every 2 years			G-27
14	Radiator hose and clamp		Check				☆				☆				☆			every 200 Hr			G-27
			Replace															every 2 years			G-27
15	Intake air line		Check				☆				☆				☆			every 200 Hr		@	G-27
			Replace															every 2 years	*3		G-27
16	Engine oil		Change	★					☆						☆			every 300 Hr			G-18
17	Hydraulic oil filter		Replace	★					☆						☆			every 300 Hr			G-19
18	Greasing (2WD front wheel hub)		–								☆							every 400 Hr			G-30

W1035769

No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
19	Water separator	Clean								☆							every 400 Hr			G-30
20	Fuel filter	Replace								☆							every 400 Hr		@	G-30
21	Engine oil filter	Replace	★											☆			every 600 Hr			G-19
22	Transmission fluid	Change	★											☆			every 600 Hr			G-20
23	Front differential case oil	Change	★											☆			every 600 Hr			G-20
24	Front axle case oil	Change	★											☆			every 600 Hr			G-20
25	Front axle pivot	Adjust												☆			every 600 Hr		@	G-31
26	Engine valve clearance	Adjust															every 800 Hr			G-31
27	Fuel injection nozzle injection pressure	Check															every 1500 Hr		@	G-31
28	Injection pump	Check															every 3000 Hr		@	G-32
29	Cooling system	Flush															every 2 years			G-33
30	Coolant	Change															every 2 years			G-33
31	Clutch housing water	Drain															Service as required			G-36
32	Fuse	Replace																		G-37
33	Light bulb	Replace																		G-39

W1028983

No.	Item		Service Interval													Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Fan/Air conditioner drive belt	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-24
2	Inner air filter	Clean				☆				☆				☆			every 200 Hr			G-28
3	Fresh air filter	Clean				☆				☆				☆			every 200 Hr			G-29
4	Air conditioner condenser	Clean				☆				☆				☆			every 200 Hr			G-29
5	Air conditioner pipes and hoses	Check															every 1 year			G-32
6	Cabin isolation cushion	Check															every 1 year			G-32
7	Washer liquid	Add															Service as required			G-40
8	Refrigerant (gas)	Check																		G-40

■ 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 battery condition by reading the indicator annually.**
- **The items listed above (@ marked) are registered as emisson related critical parts by KUBOTA in U.S.EPA nonroad 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.

W1025390

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 leak.
3. Check the engine oil level.
4. Check the transmission fluid level.
5. Check the coolant level.
6. Check the condition of ROPS attaching hardware. (ROPS model).
7. Check the washer liquid level. (CABIN model)
8. Check the water separator.
9. Check air cleaner evacuator valve.
10. Check and clean the radiator screen, grill and oil cooler.
11. Check and clean the radiator screen, grill, oil cooler and condenser (CABIN model).
12. Check and clean the air conditioner condenser screen. (CABIN model)
13. Check the nuts of tires are tight.
14. Check the number plate or SMV emblem for damage and replace as necessary if equipped.
15. Care of danger, warning and caution labels.
16. Clean around the exhaust manifold and the muffler of the engine.

- While sitting in the operator's seat.

1. Check the throttle pedal, brake pedal and clutch pedal.
2. Check the throttle lever and shuttle lever.
3. Check the parking brake.
4. Check the steering wheel.
5. Check the seat belt.

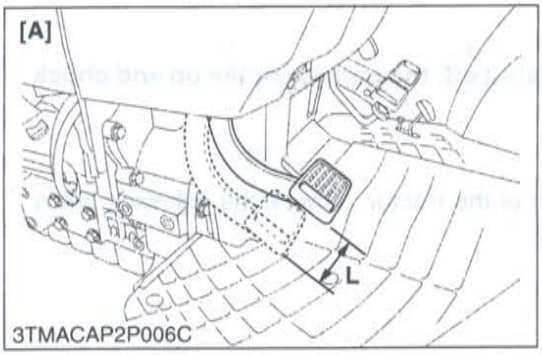
- Turning the key switch.

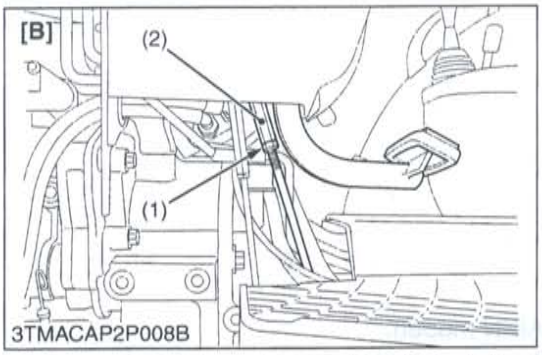
1. Check the performance of the easy checker lights.
2. Check the head lights, turn signal lights, hazard lights and other light equipment. Clean if necessary.
3. Check the performance of the meters and gauges.

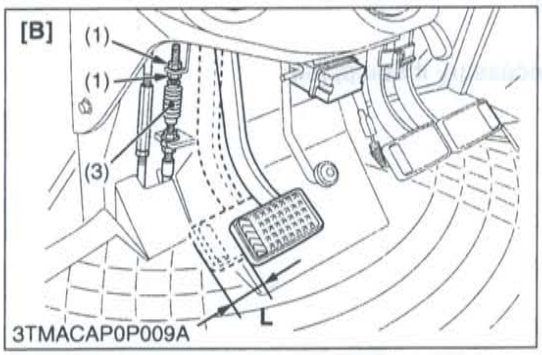
- Starting the engine.

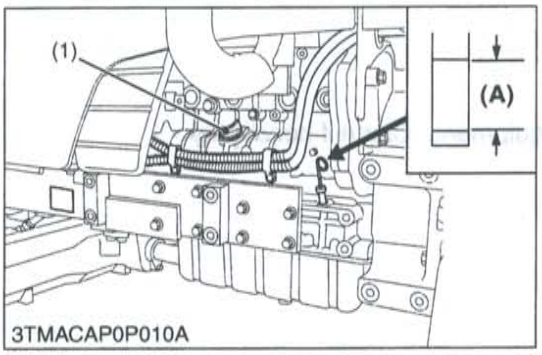
1. Check to see that the lights on the easy checker go off.
2. Check the color of the exhaust gas.
3. Check the brakes for proper operation.

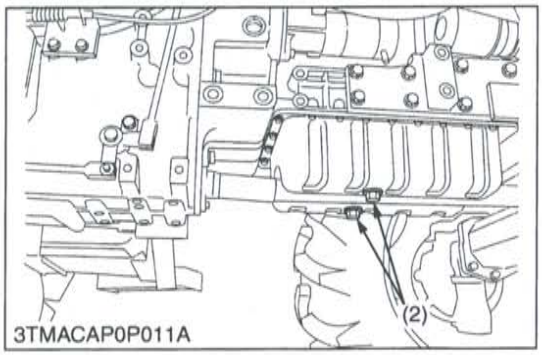
[2] CHECK POINTS OF INITIAL 50 HOURS











Adjusting Clutch Pedal (Synchro Shuttle Model)

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

Proper clutch pedal free travel (L)	Factory spec.	35 to 45 mm 1.4 to 1.8 in.

(1) Lock Nut
(2) Turnbuckle
(3) Cable

L : Free Travel
[A] ROPS Model
[B] CABIN Model

W1066699

Changing Engine Oil

CAUTION

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

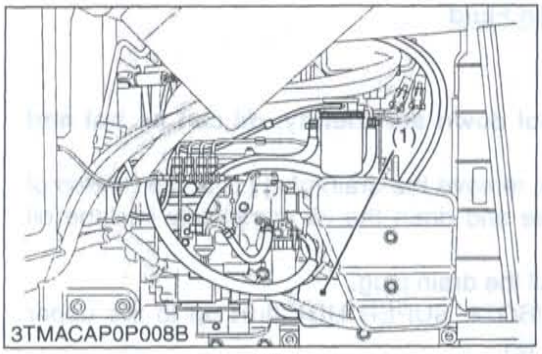
1. To drain the used oil, remove the drain plugs (2) at the bottom of the engine and drain the oil completely into the oil pan.
   All the used oil can be drained out easily when the engine is still warm.
2. After draining reinstall the drain plugs (2).
3. Fill with the new oil up to the upper notch on the dipstick.
   (Refer to "4. LUBRICANTS, FUEL AND COOLANT" in this section.)

Oil capacity with filter	11 L 11.6 U.S.qts. 9.7 Imp.qts.

(1) Oil Inlet
(2) Drain Plugs

(A) Oil level is acceptable within this range.

W1021565



Replacing Engine Oil Filter

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.**

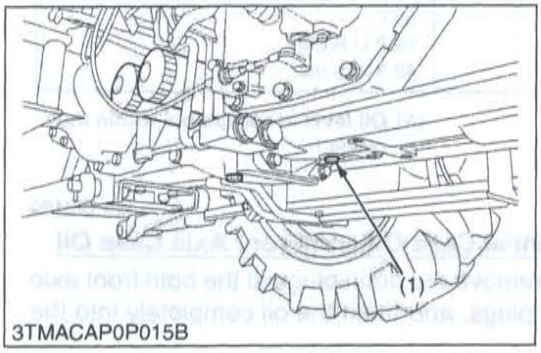
1. Remove the oil filter (1).
2. Put a film of clean engine oil on rubber seal of new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases a little. Make sure that the engine oil does not leak through the seal and be sure to check the oil level on the dipstick. Then, replenish the engine oil up to the prescribed level.

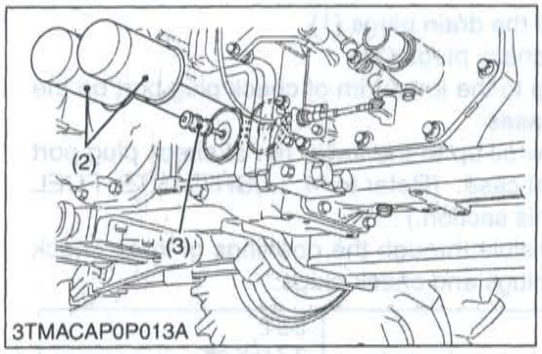
■ IMPORTANT

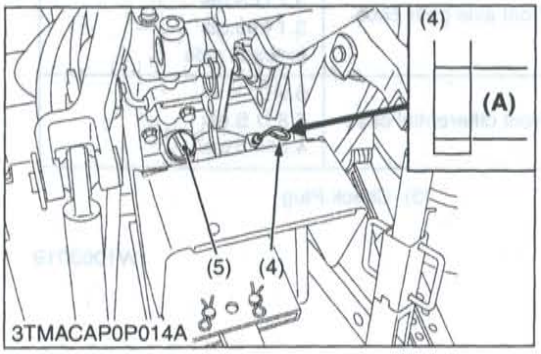
- **To prevent serious damage to the engine, use only a KUBOTA genuine filter.**

(1) Engine Oil Filter

W1021852







Replacing Hydraulic Oil Filter

CAUTION

- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. Remove the drain plug (1) at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug (1) .
3. Remove the two oil filters (2).
4. Wipe off metal fillings with clean rags at the magnetic filters (3).
5. Put a film of clean transmission fluid on rubber seal of new filters.
6. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand and additional 1/2 turn only.
7. After the new filter has been replaced, fill with the oil up to the upper notch on the dipstick (4).
8. After running the engine for a few minutes, stop it and check the oil level again, add oil to the prescribed level.
9. Make sure that the transmission fluid doesn't leak through the seal.

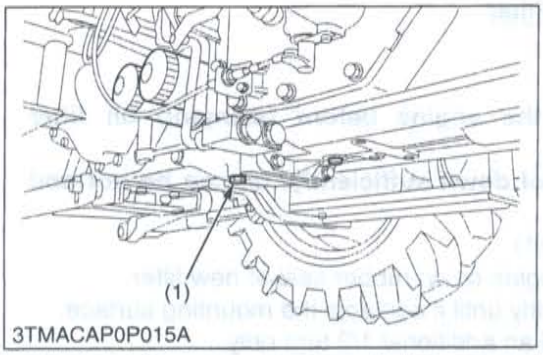
■ IMPORTANT

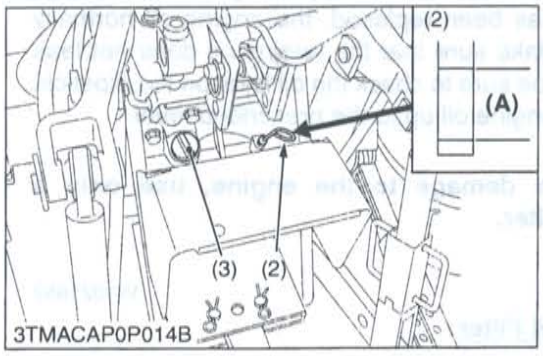
- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**

(1) Drain Plug
(2) Hydraulic Oil Filter
(3) Magnetic Filter (Clean off Metal Fillings)
(4) Dipstick
(5) Oil Filling Plug

(A) Oil level is acceptable within this range.

W1022033





Changing Transmission Fluid

CAUTION

- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. To drain the used oil, remove the drain plug (1) at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug.
3. Fill with the new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick (2).
4. (Refer to "4. LUBRICANTS, FUEL AND COOLANT" in this section.)
5. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.

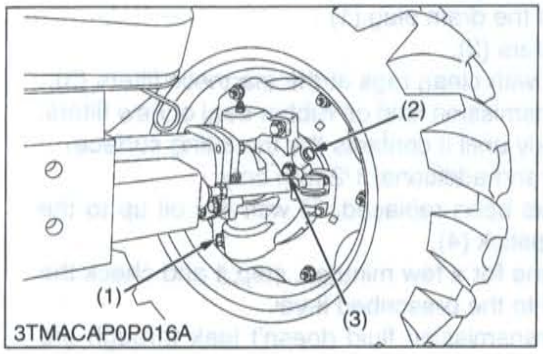
IMPORTANT

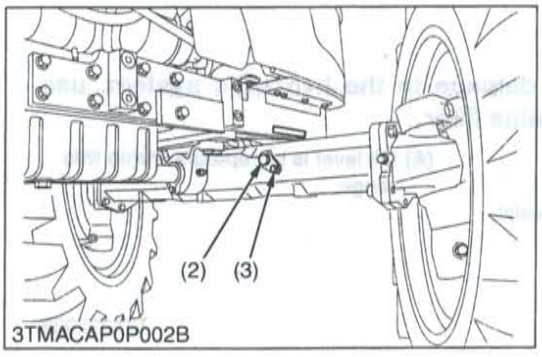
- **Do not operate the tractor immediately after changing the transmission fluid.**
  Run the engine at medium speed for a few minutes to prevent damage to the transmission.

Oil capacity	56 L 59.2 U.S.qts. 49.3 Imp.qts.

(1) Drain Plug
(2) Dipstick
(3) Oil Inlet
(A) Oil level is acceptable within the range.

W1022400





Changing Front Differential Case Oil and Front Axle Case Oil

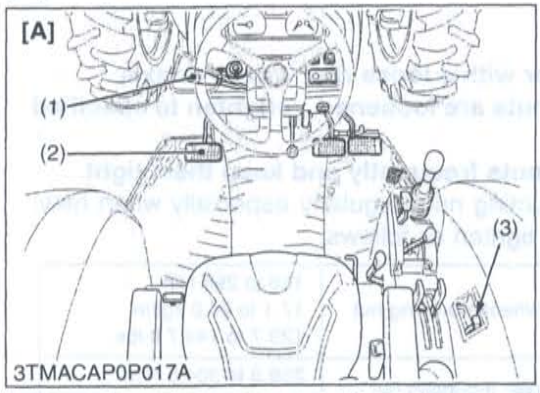
1. To drain the used oil, remove the drain plugs at the both front axle gear cases and filling plugs, and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs (1).
3. Remove the oil level check plugs (3).
4. Fill with the new oil up to the lower rim of check plug port on the both front axle gear cases.
5. Finally fill with the new oil up to the lower rim of check plug port on the front differential case. (Refer to "4. LUBRICANTS, FUEL AND COOLANT" in this section.)
6. After checking oil is visible through the openings of three check plugs, reinstall filling plugs and check plugs.

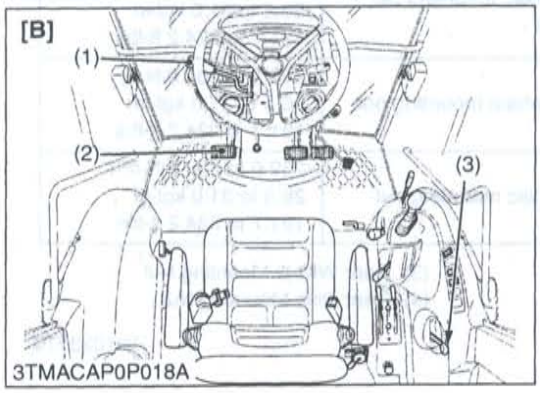
Oil capacity	Front axle gear case	3.5 L 3.7 U.S.qts 3.1 Imp.qts for each side
	Front differential case	5.5 L 5.8 U.S.qts 4.8 Imp.qts

(1) Drain Plug
(2) Filling Port
(3) Check Plug

W1063019

[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. Place all control levers in the **"NEUTRAL"** position.
2. Set the parking brake and stop the engine.

■ Test 1 : Switch for the shuttle shift lever.

1. Sit on operator's seat.
2. Shift the shuttle shift lever (1) to the desired position.
3. Depress the clutch pedal (2) fully.
4. Disengage the PTO clutch control lever (3).
5. Turn the key to **"START"** position.
6. The engine must not crank.
7. If it cranks, inspect the safety switch.

■ Test 2 : Switch for the PTO clutch control lever.

⚠ WARNING

- **Disconnect the implement drive universal joint from the PTO shaft, if the implement has mounted.**

1. Sit on operator's seat.
2. Engage the PTO clutch control lever (3).
3. Depress the clutch pedal (2) fully.
4. Shift the shuttle shift lever (1) to the neutral position.
5. Turn the key to **"START"** position.
6. The engine must not crank.
7. If it cranks, inspect the safety switch.

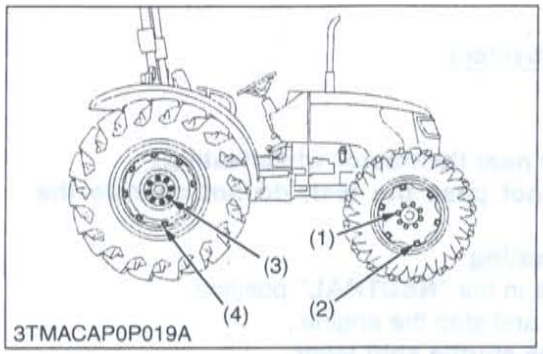
■ Test 3 : Checking Operator Presence Control (OPC) System

1. Sit on the seat.
2. Turn the key to **"ON"** position.
3. Shift the PTO lever to **"ON"**.
   Make sure the warning buzzer does not whistle.
   If the buzzer whistles while sitting on the seat, check the parts which compose the PTO safety switch.
4. Stand up from the seat.
5. The warning buzzer whistles about one second after standing up.
   It whistles for 10 seconds.
   If the buzzer does not whistle, check the corresponding parts. (Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.)

(1) Shuttle Shift Lever
(2) Clutch Pedal
(3) PTO Clutch Control Lever

[A] ROPS Model
[B] CABIN Model

W1062967



Checking Wheel Mounting Nuts Tightening Torque

CAUTION

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

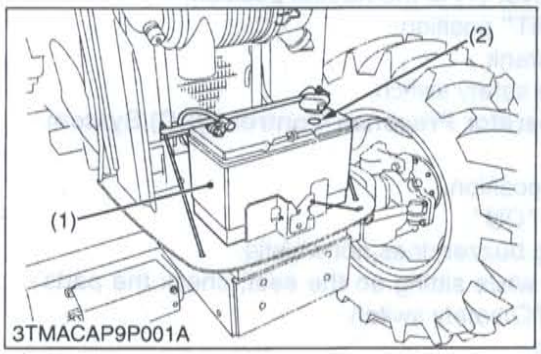
1. Check the wheel mounting nuts regularly especially when new. If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting nut	168 to 296 N·m 17.1 to 20.0 kgf·m 123.7 to 144.7 ft-lbs
	Front disc mounting nut (4WD)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs
	Rear wheel mounting nut	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs
	Rear disc mounting nut	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) Front Wheel Mounting Nut
(2) Front Disc Mounting Nut
(3) Rear Wheel Mounting Nut
(4) Rear Disc Mounting Nut

W1023970

[4] CHECK POINTS OF EVERY 100 HOURS



Checking Battery Condition

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.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**
- **Wear eye protection and rubber gloves when working around battery.**

1. The original battery is maintenance free type battery (Non-refillable type).
   When the performance becomes low, inspect the battery.
2. Clean the battery surface with a clean cloth.
   Keep the terminals clean and coated with petroleum jelly.
3. Check the battery condition by reading the indicator.

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.

(1) Battery
(2) Indicator

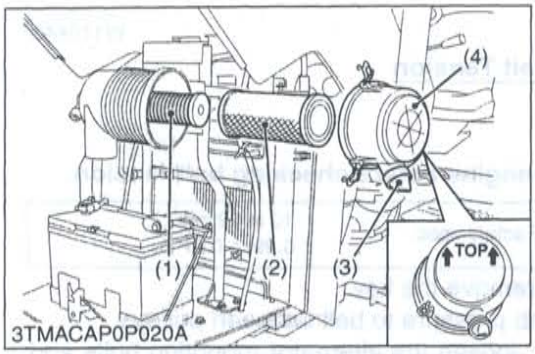
W1024321

Directions for Storage

CAUTION

- **When connecting the battery, do not reverse the polarities. Connection with reverse polarities will cause spark and troubles to the battery and electrical system in the tractor.**
- **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.**
- **Reversing the steps may cause shortcircuiting, should a metallic tool touch the terminals.**
- **When storing the tractor for long periods of time, remove the battery from the tractor and store in a cool, dry place.**

W1024462



Cleaning Air Cleaner Element

1. Remove the air cleaner cover (4) 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. Replace the primary element (2) :
   Once a year or after every six times of cleaning, whichever comes first.

■ **IMPORTANT**

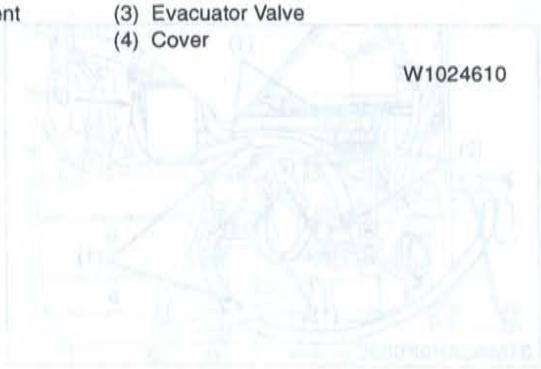
- **The air cleaner uses a dry element, never apply oil.**
- **Do not run the engine with filter element removed.**
- **Be sure to refit the dust cup with the arrow ↑ (on the rear of cup) upright. If the dust cup is improperly fitted, evacuator valve will not function and dust will adhere to the element.**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

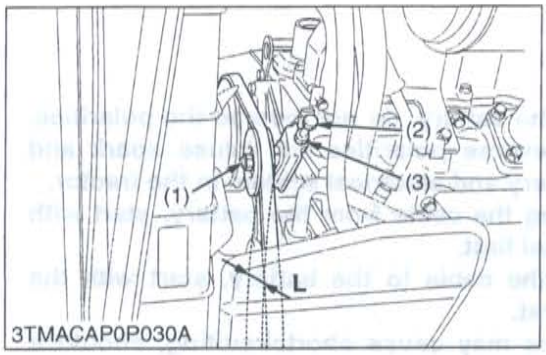
■ **Evacuator Valve**

Open evacuator valve 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) Evacuator Valve
(4) Cover

W1024610





Adjusting Fan/Air Conditioner Belt Tension

CAUTION

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

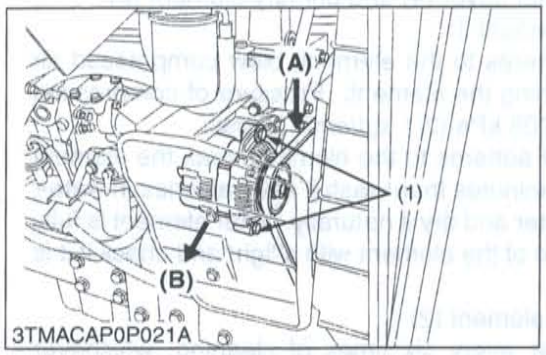
1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the tension pulley nut (1) and lock nut (3). And turn clockwise the tension adjusting screw (2) until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

Belt tension (L)	Factory spec.	10 to 12 mm 0.40 to 0.47 in.

(1) Tension Pulley Nut
(2) Adjusting Screw
(3) Lock Nut

L : Belt Tension

W1104407



Adjusting Alternator Belt Tension

CAUTION

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

Belt tension	Factory spec.	10 to 12 mm 0.39 to 0.47 in.

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is 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.

(1) Bolt

(A) Check the belt tension
(B) To tighten

W1024843

Adjusting Brake Pedal

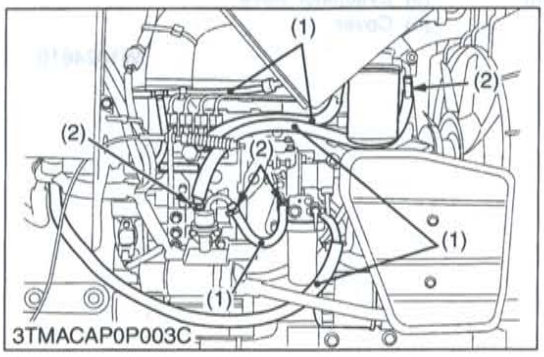
1. To check and adjusting for brake pedal, refer to "[1] CHECKING AND ADJUSTING" at "5. BRAKES" section.

W1025046

Adjusting Clutch Pedal (Synchro Shuttle Model)

1. To check and adjusting for clutch pedal, refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1109219



Checking Fuel Line

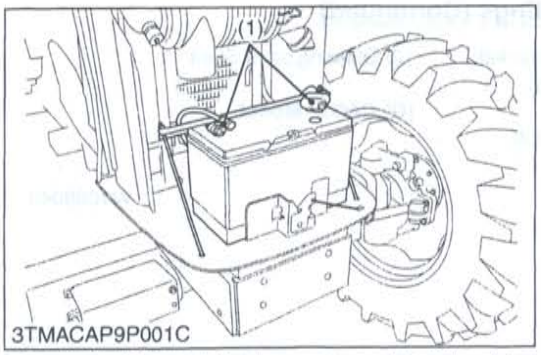
1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

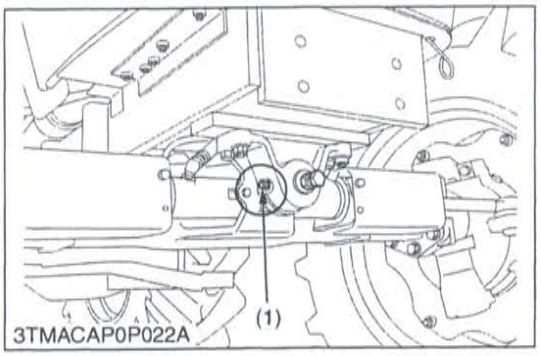
■ **NOTE**

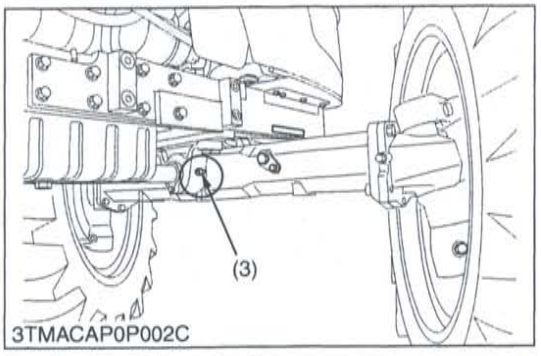
- **If the fuel line is removed, be sure to properly bleed the fuel system. (Refer to "[14] OTHERS" in this section.)**

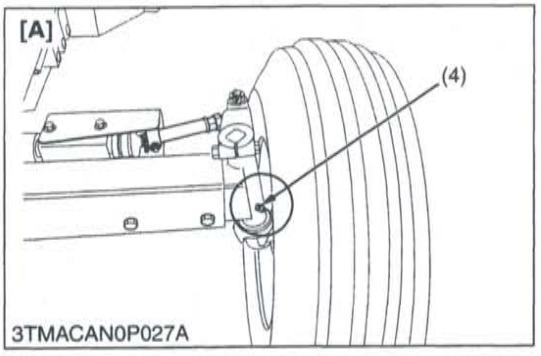
(1) Fuel Line (2) Clamp Band

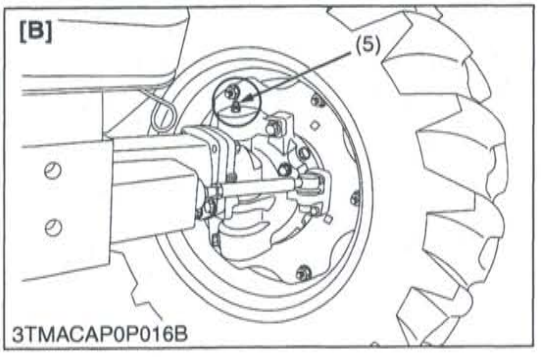
W1067279











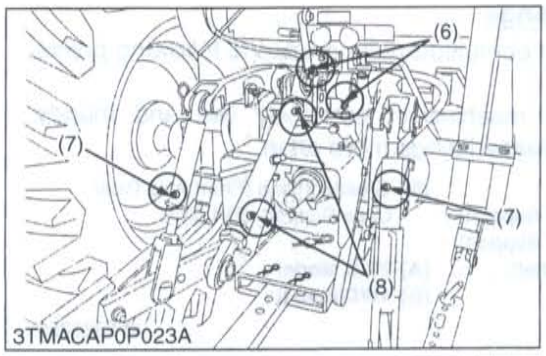
Lubricating Grease Fittings

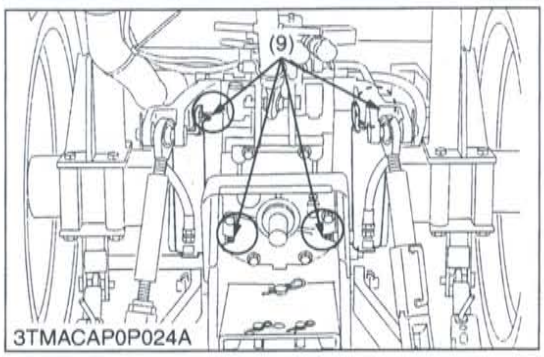
1. Apply a small amount of multipurpose grease to following points every 100 hours.
2. If you operated the machine in extremely wet and muddy condition, lubricate grease fittings more often.

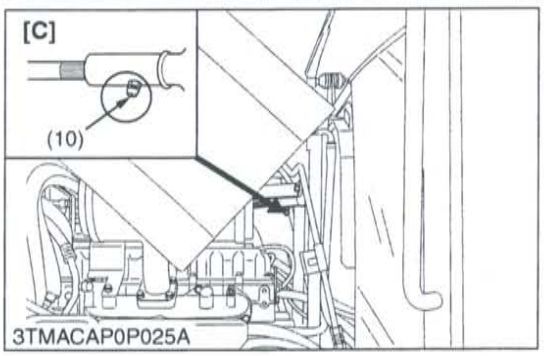
(1) Battery Terminals
(2) Grease Fitting (Front Axle Support)
(3) Grease Fitting (Front Axle Support)
(4) Grease Fitting (Knuckle Shaft) [RH, LH]
(5) Grease Fitting (Front Axle Gear Case Support) [RH, LH]

[A] 2WD Model
[B] 4WD Model

W1025259







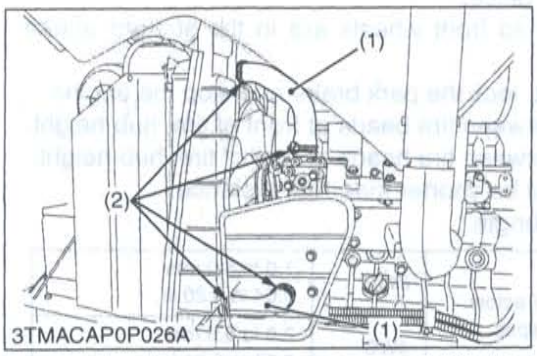
Lubricating Grease Fittings (Continued)

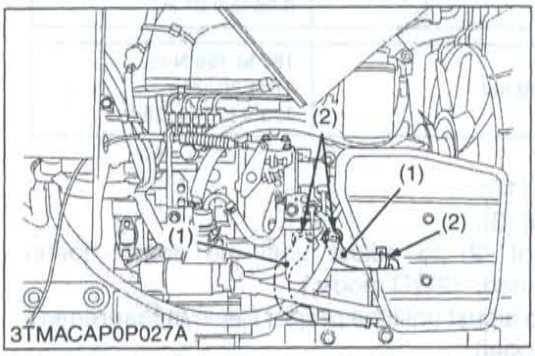
(6) Grease Fitting (Top Link Bracket)
(7) Grease Fitting (Lifting Rod)
(8) Grease Fitting (Top Link)
(9) Grease Fitting (Hydraulic Lift Cylinders Pin)
(10) Steering Joint Shaft

[C] CABIN Model

W1069043

[5] CHECK POINTS OF EVERY 200 HOURS





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 (2) are loose or water leaks, tighten bands (2) securely.
2. Replace hoses (1) and tighten hose clamps (2) securely, if radiator hoses (1) 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.

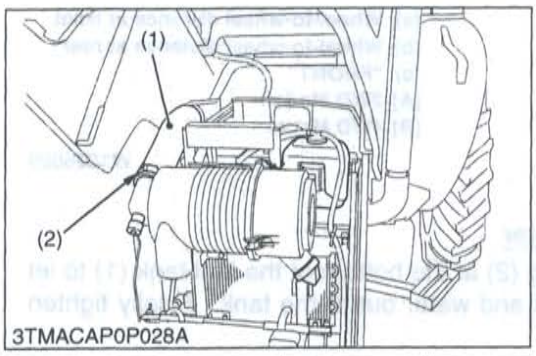
■ **Precaution at Overheating**

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. Do not 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 no danger such as burn. Get rid of the causes of overheating, refer to "1. TROUBLESHOOTING" at "1. ENGINE" section, and then start again the engine.

(1) Radiator Hose (2) Clamp

W1069560

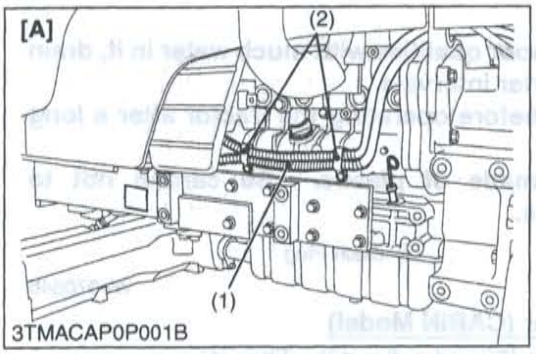


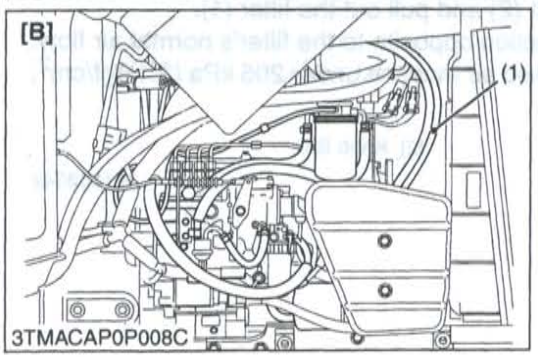
Checking Intake Air Line

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 (2) Clamp

W1069940



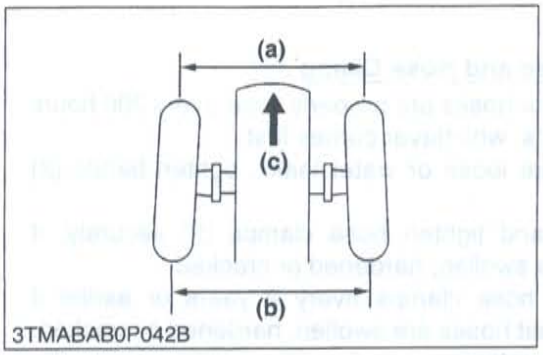


Checking Power Steering Line

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.

(1) Power Steering Hose [A] ROPS Model
(2) Clamp [B] CABIN Model

W1070096



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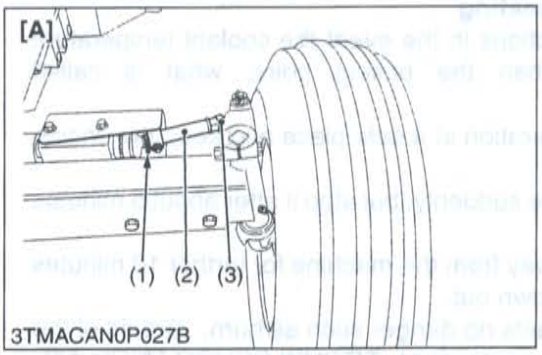

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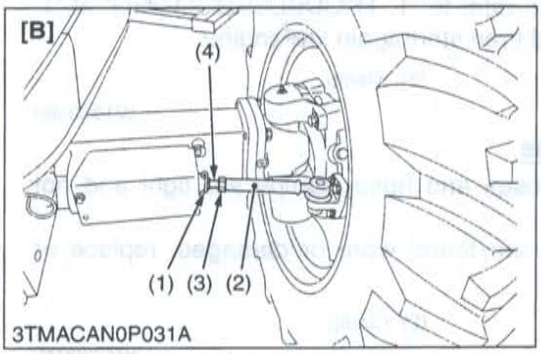

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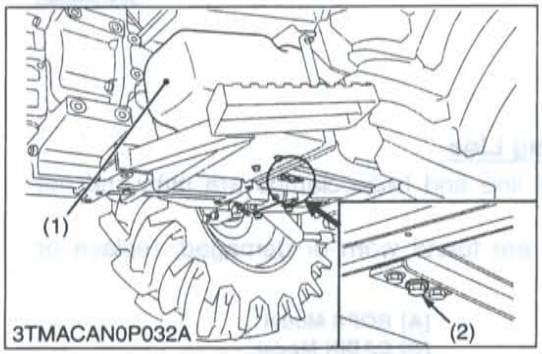

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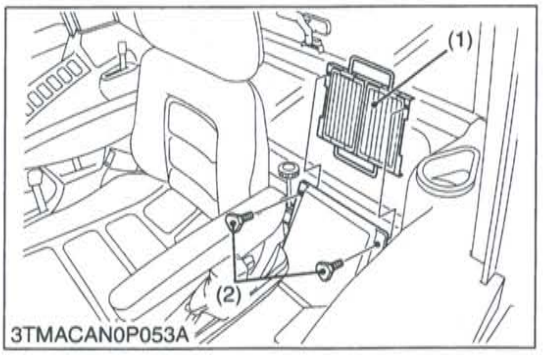


3TMACAN0P053A

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 shorter than rear distance.
7. If not, adjust tie-rod length.

Toe-in (b–a)	Factory spec.	2WD	1.0 to 5.0 mm 0.04 to 0.20 in.
		4WD	2.0 to 8.0 mm 0.08 to 0.31 in.

Tightening torque	Tie-rod nut	167 to 196 N·m 17 to 20 kgf·m 123.2 to 144.6 ft-lbs

■ Toe-in Adjustment

1. Detach the snap ring (1).
2. Loosen the tie-rod nut (3).
3. Turn the tie-rod joint (2) to adjust until the proper toe-in measurement is obtained. (2WD model)
   Turn the rod end (4) to adjust until the proper toe-in measurement is obtained. (4WD model)
4. Retighten the tie-rod nut (3).
5. Attach the snap ring (1) of the tie-rod joint.

(1) Snap Ring
(2) Tie-rod Joint
(3) Tie-rod Nut
(4) Rod End
(a) Wheel-to-wheel distance at front
(b) Wheel-to-wheel distance at rear
(c) "FRONT"
[A] 2WD Model
[B] 4WD Model

W1026029

Draining Fuel Tank Water

1. Loosen the drain plug (2) at the bottom of the fuel tank (1) to let sediments, impurities and water out of the tank. Finally tighten up the plug.

■ IMPORTANT

- **If the fuel contains poor qualities with much water in it, drain the fuel tank at shorter intervals.**
- **Drain the fuel tank before operating the tractor after a long period of storage.**
- **The fuel tank is made of plastic. Be careful not to overtighten the bolts.**

(1) Fuel Tank
(2) Drain Plug

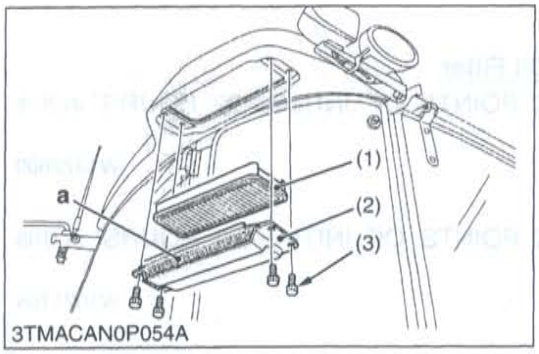
W1070846

Cleaning Inner Air Filter (CABIN Model)

1. Remove the knob bolt (2) and pull out the filter (1).
2. Blow air from the direction opposite to the filter's normal air flow. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).

(1) Inner Air Filter
(2) Knob Bolt

W1103342



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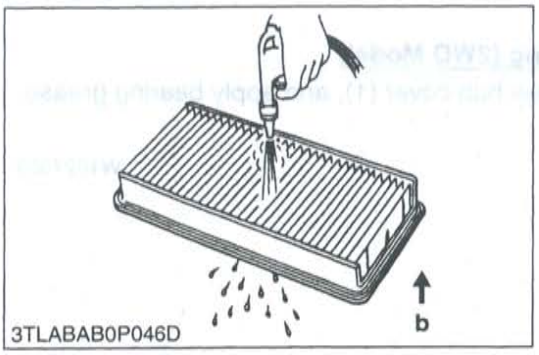

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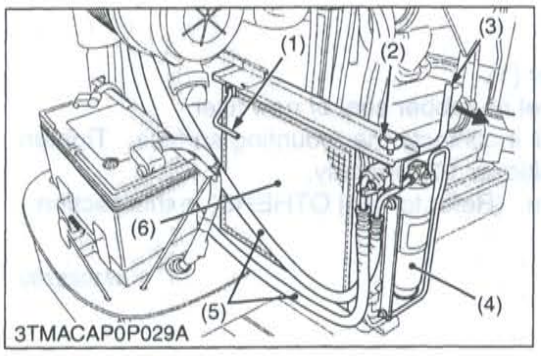


3TMACAP0P029A

Cleaning Air Filter (CABIN Model)

■ Fresh Air Filter

1. Remove the knob bolts (3) and pull out the fresh air filter (1).
2. Blow air from the opposite direction to the filter's normal air flow.

■ NOTE

- **If the filter is very dirty :**
  Dip the filter in lukewarm water with mild dish washing detergent.
  Move it up and down as well as left and right to loosen dirt.
  Rinse the filter with clean water and let it air-dry.

■ IMPORTANT

- **Do not use gasoline, thinner or similar chemicals to clean the filter as damage to the filter may occur.**
- **If may also cause an unpleasant odor in the cabin when the system is used next.**
- **Do not hit the filter. If the filter becomes deformed, dust may enter into the air-conditioner, which may cause damage and malfunction.**

(1) Fresh Air Filter
(2) Cover
(3) Knob Bolt

a : Air Inlet Port
b : Air Conditioner Air Flow

W1019336

Checking Air Conditioner Condenser (CABIN Model)

1. Release the air conditioner hoses off the hook (1).
2. Loosen the wing nut (2).
3. Hold the handle (3), slide out the air conditioner condenser assembly (6).
4. Check air conditioner condenser to be sure it is clean of debris.

⚠ CAUTION

- **Be sure to stop the engine before removing the screen.**
- **The condenser and receiver become hot while the air conditioner is running. Before checking or cleaning them, wait long enough until they cool down.**

■ IMPORTANT

- **Do not hold the air conditioner receiver or the air conditioner pipes when sliding out the condenser for cleaning.**

(1) Hook
(2) Wing Nut
(3) Handle
(4) Receiver
(5) Air Condenser Hose
(6) Condenser

W1019699

[6] CHECK POINTS OF EVERY 300 HOURS

Replacing Hydraulic Oil Filter

1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

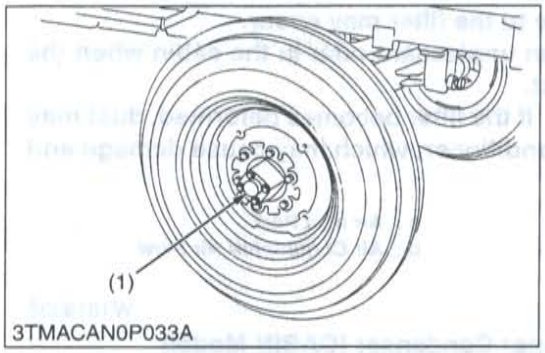
W1072600

Changing Engine Oil

1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1071704

[7] CHECK POINTS OF EVERY 400 HOURS



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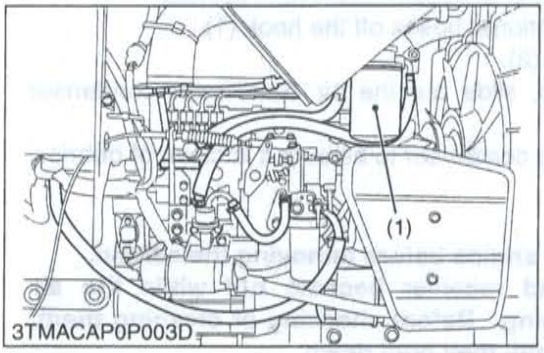
Lubricate Grease Fitting (2WD Model)

1. Detach the front wheel hub cover (1), and apply bearing grease.

(1) Front Wheel Hub Cover

W1027029



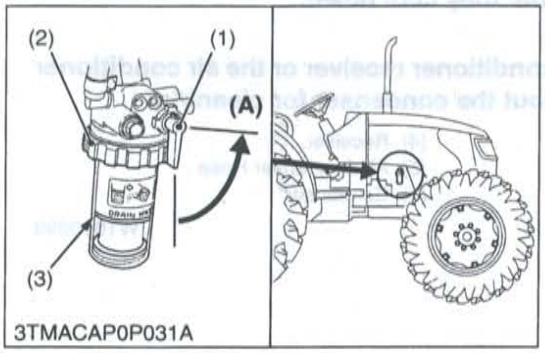
3TMACAP0P003D

Replacing Fuel Filter

1. Remove the fuel filter (1).
2. Put a film of clean fuel on rubber seal of new filter.
3. Tighten the filter until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. Bleed the fuel system. (Refer to "[14] OTHERS" in this section.)

(1) Fuel Filter

W1026760



3TMACAP0P031A

Cleaning Water Separator

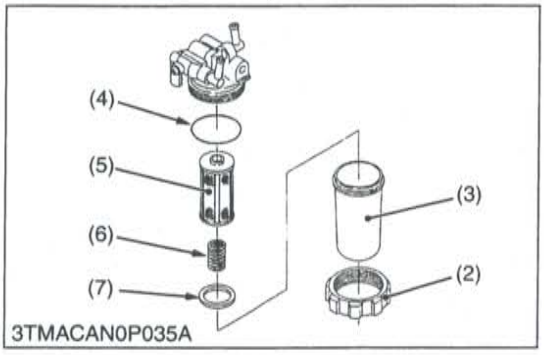
This job should not be done in the field, but in a clean place.

1. Close the fuel cock (1).
2. Unscrew the retainer ring (2) and remove the cup (3), and rinse the inside with kerosene.
3. Take out the element (5) and dip it in the kerosene to rinse.
4. After cleaning, reassemble the water separator, keeping out dust and dirt.
5. Bleed the fuel system. (Refer to "[14] OTHERS" in this section.)

(1) Fuel Cock
(2) Retaining Ring
(3) Cup
(4) O-ring
(5) Element
(6) Spring
(7) Red Float

(A) Close

W1073022



3TMACAN0P035A

[8] CHECK POINTS OF EVERY 600 HOURS

Replacing Engine Oil Filter

1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1074023

Changing Transmission Fluid

1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1074077

Changing Front Differential Case Oil

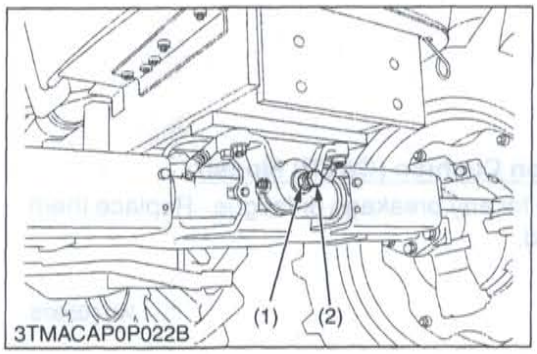
1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1074134

Changing Front Axle Gear Case Oil

1. Refer to "[2] CHECK POINTS OF INITIAL 50 HOURS" in this section.

W1074346



Adjusting Front Axle Pivot

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

■ **Adjusting Procedure**

1. Loosen the lock nut (1), tighten the adjusting screw (2) with specified torque. Then tighten the lock nut (1).

Tightening torque	Adjusting screw	19.6 to 29.4 N·m 2.0 to 3.0 kgf·m 14.5 to 21.7 ft-lbs
	Lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 ft-lbs

(1) Lock Nut (2) Adjusting Screw

W1027783

[9] CHECK POINT OF EVERY 800 HOURS

Adjusting Engine Valve Clearance

1. Refer to "[1] CHECKING AND ADJUSTING" at "1. ENGINE" section.

W1027950

[10] CHECK POINT OF EVERY 1500 HOURS

Checking Fuel Injection Nozzle (Injection Pressure)

1. Refer to "[1] CHECKING AND ADJUSTING" at "1. ENGINE" section.

W1075043

[11] CHECK POINTS OF EVERY 3000 HOURS

Checking Injection Pump

1. Refer to "[1] CHECKING AND ADJUSTING" at "1. ENGINE" section.

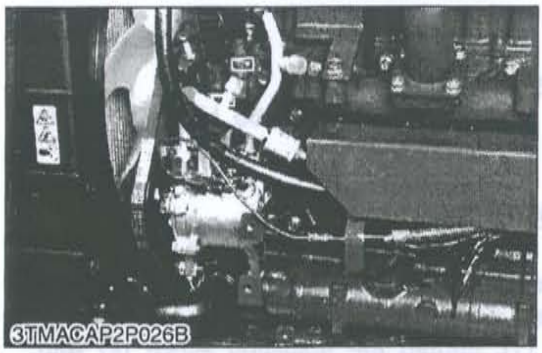
W1074724

[12] CHECK POINT OF EVERY 1 YEAR

Replacing Air Cleaner Primary Element and Secondary Element

1. Refer to "[4] CHECK POINTS OF EVERY 100 HOURS" in this section.

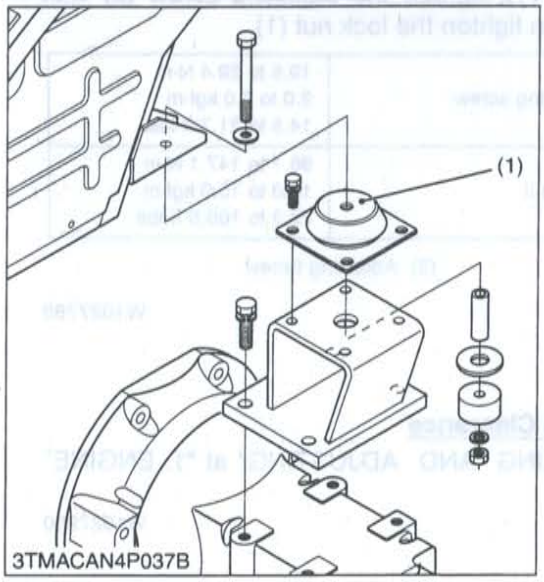
W1028012



Checking Air Conditioner Pipe and Hose (CABIN Model)

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

W1105842



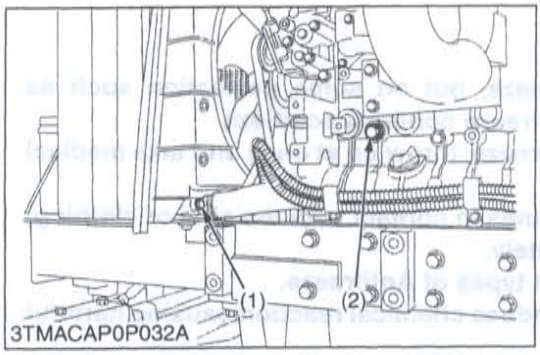
Checking Cabin Isolation Cushion (CABIN Model)

1. Check the cushion (1) for any breakage or fatigue. Replace them if they are deteriorated.

(1) Isolation Cushion

W1105936

[13] CHECK POINTS OF EVERY 2 YEARS



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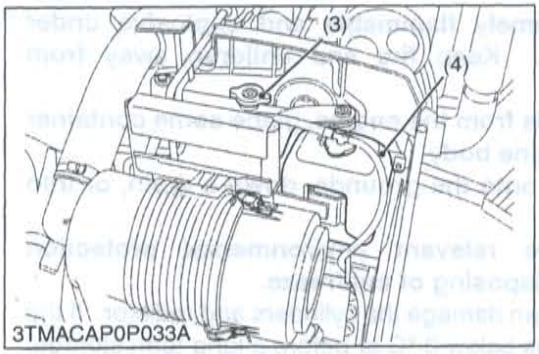


3TMACAP0P033A

Flush Cooling System and Changing Coolant

CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. To drain the coolant, open the radiator drain plug (1) and remove the drain plug (2) and radiator cap (3). The radiator cap (3) must be removed to completely drain the coolant.
3. After all coolant is drained, install the drain plug (1) and (2) securely.
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 (3) securely.
7. Fill with clean water and anti-freeze up to the upper line of recovery tank (4).
8. Start and operate the engine for few minutes.
9. Stop the engine. Check coolant level and add coolant if necessary.
10. Properly dispose of used coolant.

Coolant capacity	Engine block and radiator	8.0 L 8.5 U.S.qts. 7.0 Imp.qts.
	Recovery tank	1.0 L 1.1 U.S.qts. 0.9 Imp.qts.

■ IMPORTANT

- **Do not start engine without coolant.**
- **Use clean, fresh water and anti-freeze to fill the radiator.**
- **When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.**
- **Securely tighten radiator cap (3). If the cap is loose or improperly fitted, water may lead out and the engine could overheat.**

(1) Drain Plug (Radiator)
(2) Drain Plug (Crankcase)
(3) Radiator Cap
(4) Recovery Tank

W1028088

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 types 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 or before a long-term storage, let out coolant 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 coolant, 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 coolant 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.

■ **IMPORTANT**

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

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

*At 1.013 x 1000000 Pa (760 mmHg) pressure (atmospheric).

A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

W1052897

5. Adding the LLC
   (1) Add only water if the mixture reduces in amount by evaporation.
   (2) 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 represents 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.**

W1053945

Replacing Radiator Hose (Water Pipes)

1. Replace the hoses and clamps.
   Refer to "[5] CHECK POINTS OF EVERY 200 HOURS" in this section.

W1054349

Replacing Intake Air Line

1. Replace the hoses and clamps.
   Refer to "[5] CHECK POINTS OF EVERY 200 HOURS" in this section.

W1034887

Replacing Fuel Hose

1. Replace the fuel hose and clamps, if necessary.
   Refer to "[4] CHECK POINTS OF EVERY 100 HOURS" in this section.

W1054573

Replacing Power Steering Hose

1. Replace the hoses and clamps, if necessary.
   Refer to "[5] CHECK POINTS OF EVERY 200 HOURS" in this section.

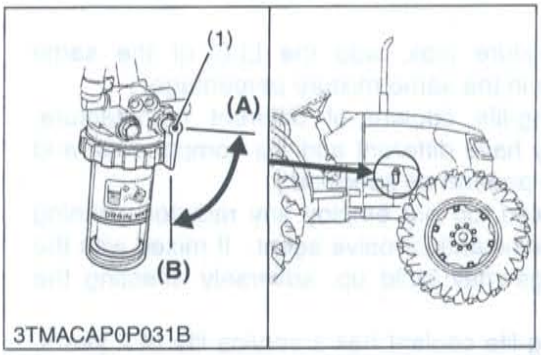
W1054527

Replacing Air Conditioner Hose

1. Check the air conditioner hoses, when the hose has damaged replace them.

W1106052

[14] OTHERS



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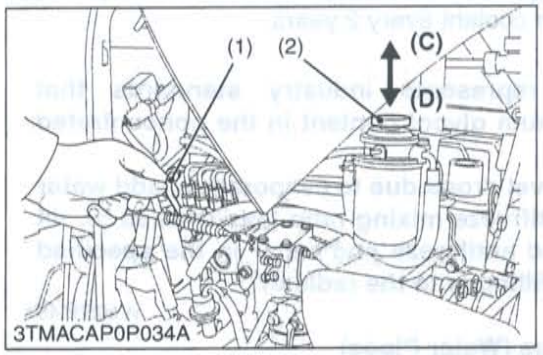


3TMACAP0P034A

Bleeding Fuel System

Air must be removed:

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

■ **Bleeding procedure is as follows:**

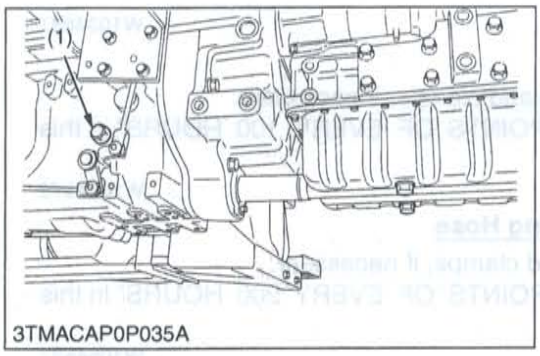
1. Fill the fuel tank with fuel, and open the fuel cock (1).
2. Pump the fuel pump knob (2) located on the top of the fuel filter. The fuel pump knob will pump easily at first and with added resistance as air is purged from the system. To make sure air is completely purged, pinch the fuel overflow hose (3) with fingers, if a pulsation is felt when the knob is pumped, then, no air remains.
3. Set the hand throttle lever at the maximum speed position, turn the key switch to start the engine, and then reset the throttle lever at the mid speed (around 1500 min^{-1} (rpm)) position.
   If engine does not start, try it several times at 30 second intervals.
4. Accelerate the engine to remove the small portion of air left in the fuel system.
5. If air still remains and the engine stops, repeat the above steps.

■ **IMPORTANT**

- **Do not hold key switch at engine start position for more than 10 seconds continuously. If more engine cranking is needed, try again after 30 seconds.**

(1) Fuel Cock
(2) Fuel Pump Knob
(3) Fuel Overflow Hose
(A) Close
(B) Open
(C) Up
(D) Down

W1055254



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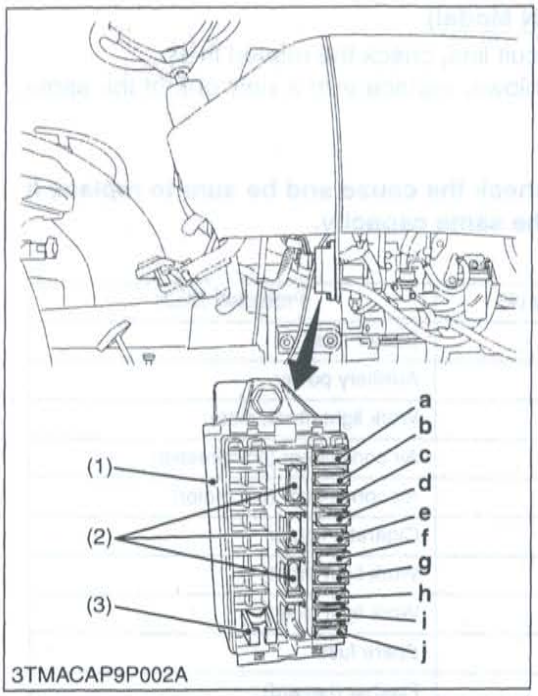
Draining Clutch Housing Water

1. The tractor is equipped with drain plug (1) under the clutch housing.
2. After operating in rain, snow or tractor has been washed, water may get into the clutch housing.
3. Remove the drain plug (1) and drain the water, then install the plug (1) again.

(1) Drain Plug (Water)

W1055587



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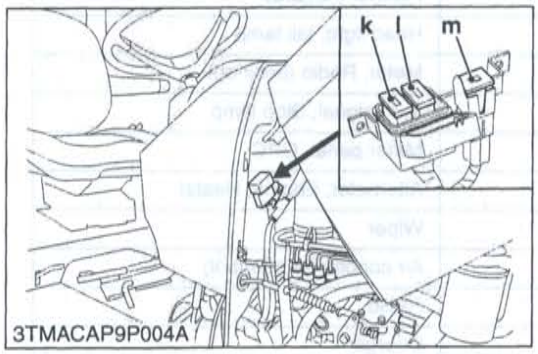


3TMACAP9P004A

Replacing Fuse (ROPS Model)

1. When inspect the circuit line, check the related fuses.
2. If any of the fuse is blown, replace with a new one of the same capacity.

■ **IMPORTANT**

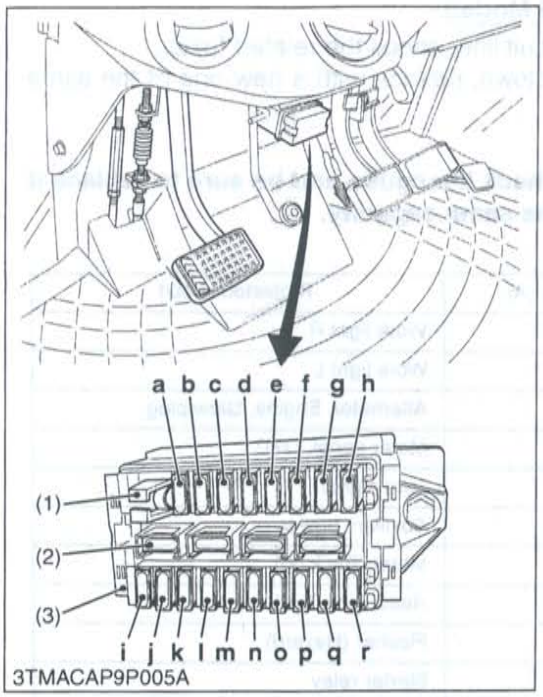
- **If a fuse is blown, check the cause and be sure to replace it with a new one of the same capacity.**

■ **Protected Circuit**

Fuse I.D.	Capacity (A)	Protected circuit
a	15	Work light R
b	15	Work light L
c	5	Alternator, Engine, Glow plug
d	5	Meter panel, OPC
e	10	Turn signal
f	15	Auxiliary power
g	5	Meter (Back up)
h	15	Head light, Tail lamp
i	15	Flasher (Hazard)
j	5	Starter relay
k	40	Key switch, Head light, Hazard
l	30	Fuel cut solenoid, Work light
m	50	Charge, Glow plug

(1) Fuse Case
(2) Spare Fuse
(3) Fuse Puller

W1054191



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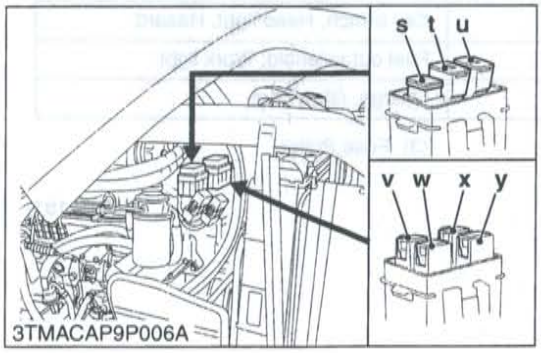


3TMACAP9P006A

Replacing Fuse (CABIN Model)

1. When inspect the circuit line, check the related fuses.
2. If any of the fuse is blown, replace with a new one of the same capacity.

■ **IMPORTANT**

- **If a fuse is blown, check the cause and be sure to replace it with a new one of the same capacity.**

■ **Protected Circuit**

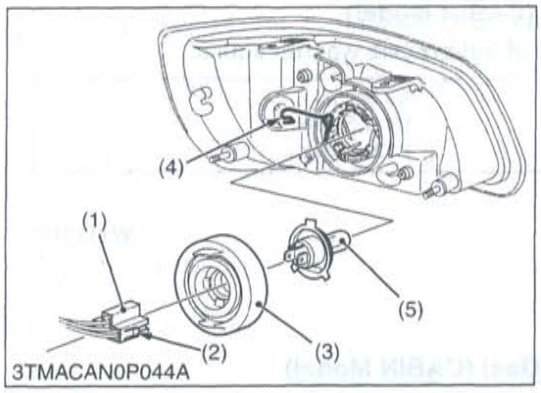
Fuse I.D.	Capacity (A)	Protected circuit
a	5	Starter relay
b	15	Auxiliary power
c	15	Work light (front, side)
d	10	Air conditioner (compressor)
e	30	Air conditioner (fan motor)
f	15	Cigarette lighter
g	15	Work light (front)
h	15	Work light (rear)
i	20	Spare fuse
j	20	Flasher (hazard)
k	20	Head light, tail lamp
l	5	Meter, Radio (back up)
m	10	Turn signal, Stop lamp
n	5	Meter panel, OPC
o	5	Alternator, Engine, Heater
p	15	Wiper
q	5	Air conditioner (control)
r	5	Radio
s	100	Charge
t	50	Air heater
u	50	Head light, Hazard
v	30	Work light, Fuel cut solenoid
w	30	Key switch
x	30	Electrical outlet
y	40	Air conditioner

■ **NOTE**

- **Refer to "5. DISASSEMBLING AND ASEEMBLING" at "9. ELECTRICAL SYSTEM" for replacing procedure of 100 A capacity fuse(s).**

(1) Fuse Puller
(2) Spare Fuse
(3) Fuse Case

W1054474



3TMACAN0P044A

Replacing Light Bulb

CAUTION

- **Be careful not to drop the bulb, hit anything against the lamp, apply excess force, and get the lamp scratched. If broken, glass may cause injury. Pay more attention to halogen lamps in particular, which have high pressure inside.**
- **Before replacing the lamp, be sure to turn off the light and wait until the bulb cools down, otherwise, you may get burned.**

■ Head lights

1. While pushing the right and left lock buttons (2), pull and remove the electrical connector (1).
2. Remove the rubber boot (3).
3. Remove the clamping fixture (4) and take out the bulb (5).
4. Replace with a new bulb and reinstall the head lamp assembly in the reverse order.

■ Other lights

1. Detach the lens and replace the bulb.

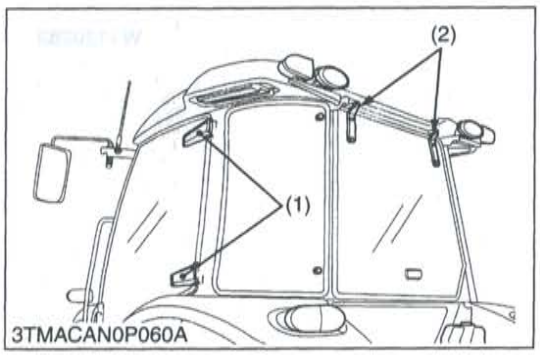
■ IMPORTANT

- **Be sure to use a new bulb of the specified wattage.**
- **Never touch the bulb surface (glass) with bare hands. Fingerprints, for example, may break the bulb.**

Light	Capacity	Remark
Head lights	12V, 55 / 60 W (H4)	
Hazard lights	12V, 23 W	
Turn signal	12V, 21 W	
Tail light	12 V, 5 W	
Work light (if equipped)	12 V, 35 W	Option for ROPS Model
Front work light	12 V, 21 W	
Work light (for outer roof)	12 V, 55 W	CABIN Model
Dome light (Room lamp)	12 V, 5 W	CABIN Model

(1) Electrical Connector
(2) Lock Button
(3) Rubber Boot
(4) Clamping Fixture
(5) Bulb

W1080544

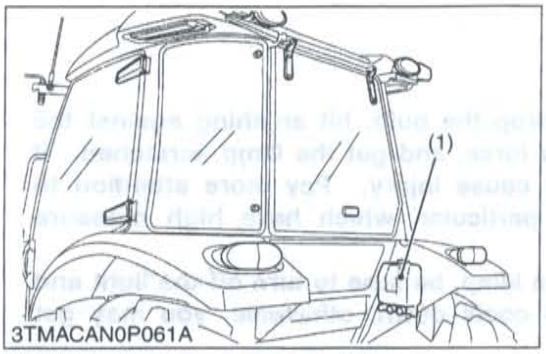


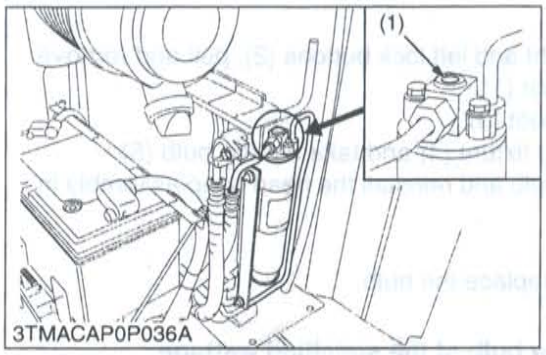
3TMACAN0P060A

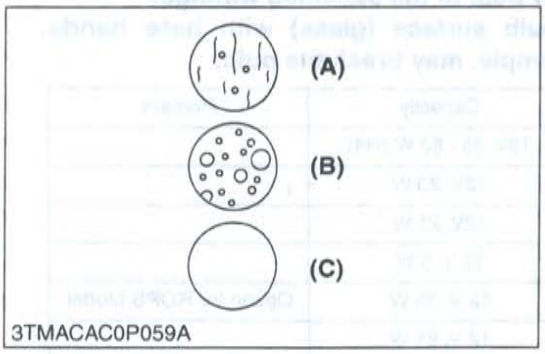
Lubricating Points (CABIN Model)

(1) Door Hinge
(2) Rear Window Hinge

W1120093







Adding Washer Liquid (CABIN Model)

1. Add a proper amount of automobile washer liquid.

Tank capacity	1.3 L 1.4 U.S.gals. 1.1 Imp.gals.

(1) Washer Liquid Tank

W1120170

Checking Refrigerant (Gas) (CABIN Model)

CAUTION

- **Liquid contact with eyes or skin may cause frostbite.**
- **In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes.**
- **In contact with a flame, R134a refrigerant gives a toxic gas.**
- **Do not disconnect any part of the refrigeration circuit of the air conditioning system.**

A shortage of refrigerant impairs the air-conditioner performance. Check the following points. If it is indicated that the amount of refrigerant is extremely low, inspect and charge. (Refer to "(4) Checking Charge Refrigerant Amount" at "10. CABIN" section.)

■ Checking Procedure

1. Run the air-conditioner in the following conditions.
   - Engine speed : About 1500 min^{-1} (rpm)
   - Temperature control lever : Maximum cooling position
   - Fan switch : Highest blow (**HI**)
   - Air-conditioner switch : **ON**
2. Look into the sight glass (1) to see if the refrigerant is flowing through its circuit.

■ IMPORTANT

- **Charge only with R134a not R12 refrigerant (gas).**

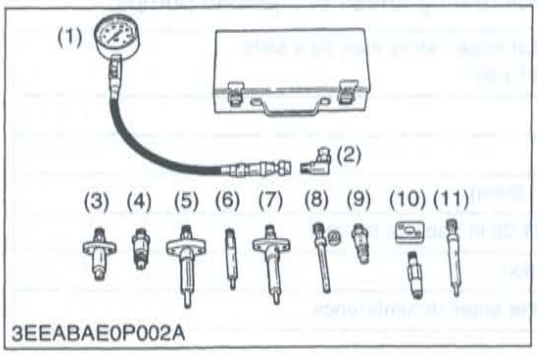
(1) Sight Glass

(A) Proper : Little or no air bubbles in the refrigerant flow.
(B) Low : Lots of air bubbles in the refrigerant flow (air bubbles or foam passing continuously).
(C) Overfull or no refrigerant : Colorless and transparent.

W1120282

8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE



3EEABAE0P002A

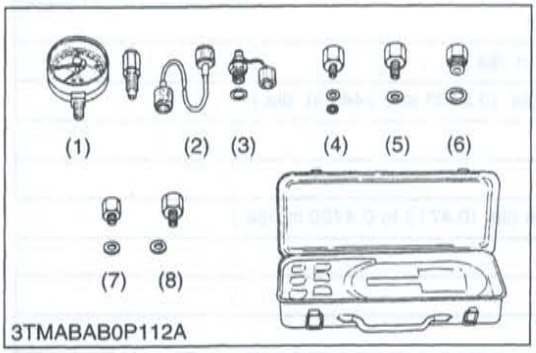
Diesel Engine Compression Tester

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**

W1024200



3TMABAB0P112A

Oil Pressure Tester

Code No: 07916-32032

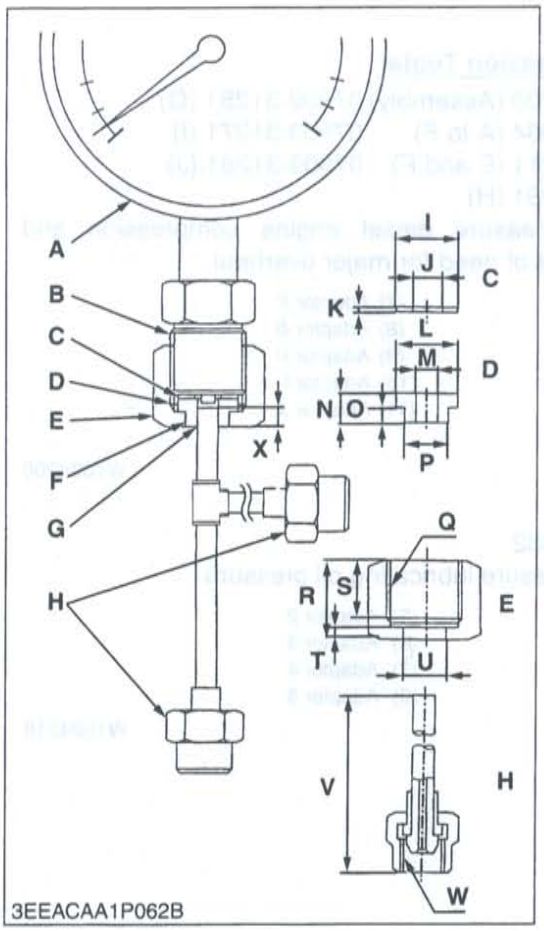
Application: Use to measure lubricating oil pressure.

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

W1024318

■ **NOTE**

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



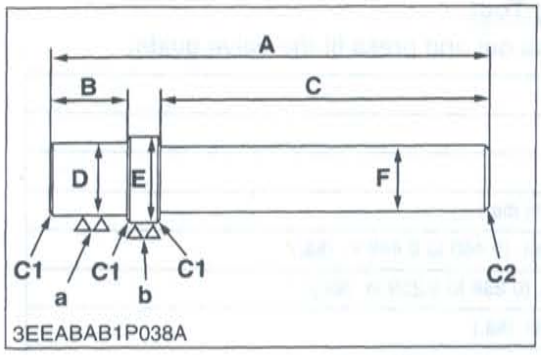
3EEACAA1P062B

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 (1.06 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 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. (0.2402 to 0.2441 in. dia.)
N	8 mm (0.31 in.)
O	4 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 mm (0.16 in.)
U	12.00 to 12.02 mm dia. (0.4724 to 0.4732 in. dia.)
V	100 mm (3.94 in.)
W	M12 x P1.5
X	5 mm (0.20 in.)

W10252400



3EEABAB1P038A

Small End Bushing Replacing Tool

Application: Use to press out and to press fit the small end bushing.

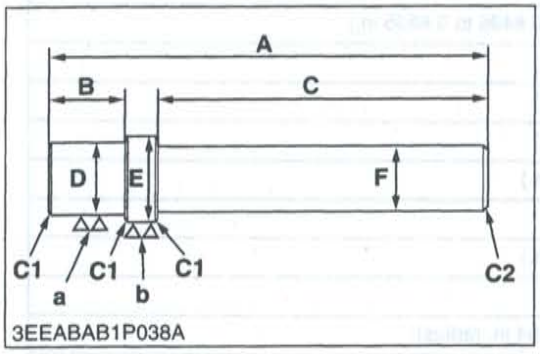
[Press out]

A	157 mm (6.181 in.)
B	14.0 mm (0.5512 in.)
C	120 mm (4.7244 in.)
D	27.4 mm dia. (1.0787 in. dia.)
E	30.95 mm dia. (1.2185 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

[Press fit]

A	157 mm (6.181 in.)
B	14.0 mm (0.5512 in.)
C	120 mm (4.7244 in.)
D	27.4 mm dia. (1.0787 in. dia.)
E	42.000 mm dia. (1.6535 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

W1040702



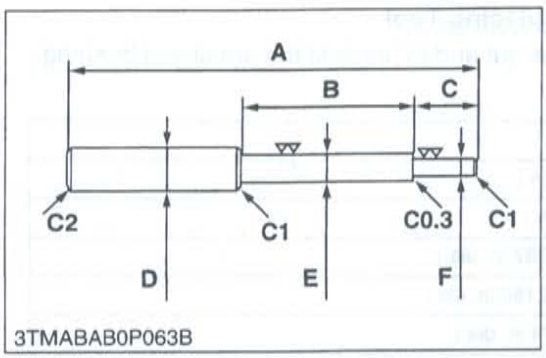
3EEABAB1P038A

Idle Gear Bushing Replacing Tool

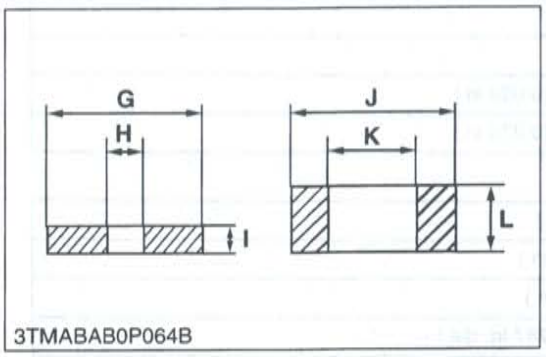
Application: Use to press out and to press fit the bushing.

A	196 mm (7.7165 in.)
B	25.0 mm (0.9843 in.)
C	150 mm (5.9055 in.)
D	34.5 mm dia. (1.3583 in. dia.)
E	38.075 to 38.100 mm dia. (1.4990 to 1.5000 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

W1040289



3TMABAB0P063B



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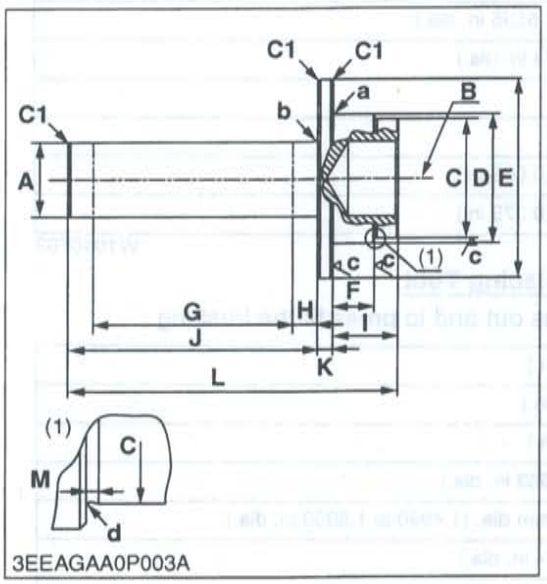


3EEAGAA0P003A

Valve Guide Replacing Tool

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

A	225 mm (8.86 in.)
B	70 mm (2.76 in.)
C	45 mm (1.77 in.)
D	20 mm dia. (0.79 in dia.)
E	11.7 to 11.9 mm dia. (0.460 to 0.468 in. dia.)
F	6.5 to 6.6 mm dia. (0.256 to 0.259 in. dia.)
G	25 mm dia. (0.98 in. dia.)
H	6.7 to 7.0 mm dia. (0.263 to 0.275 in. dia.)
I	5 mm (0.197 in.)
J	20 mm dia. (0.787 in.dia.)
K	12.5 to 12.8 mm dia. (0.492 to 0.504 in. dia.)
L	8.5 to 8.9 mm (0.3346 to 0.3504 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)

W1038887

Camshaft Cover Replacing Tool

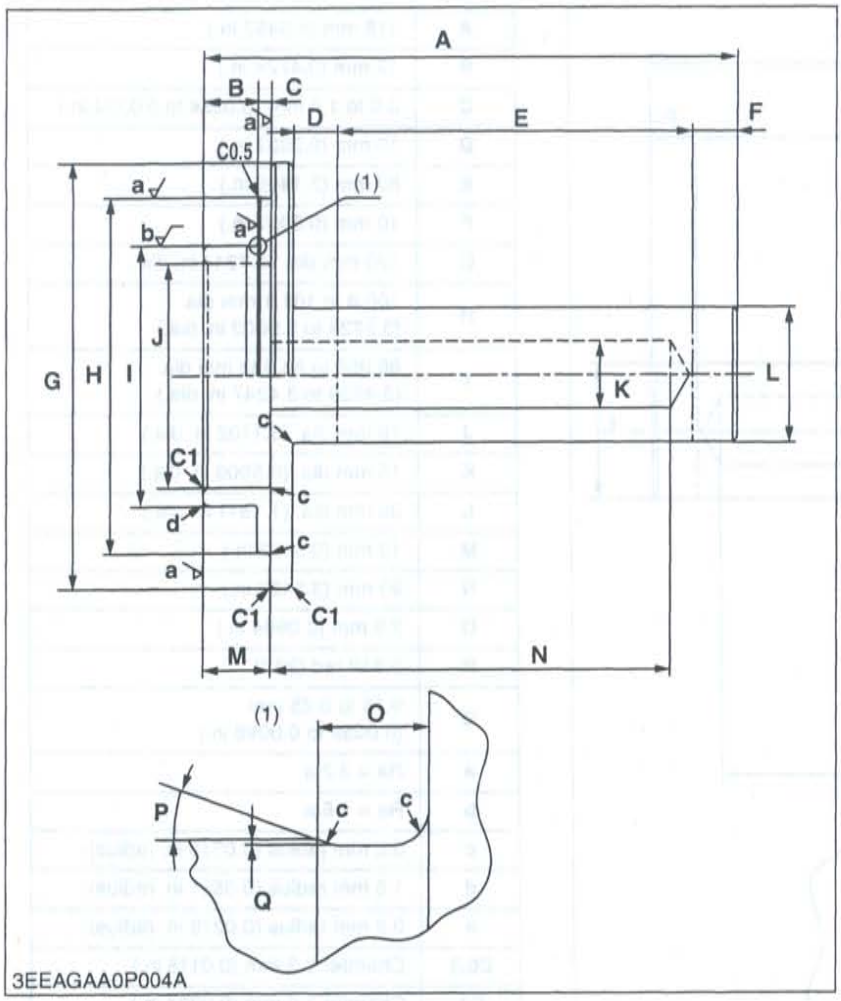
Application: Use to press fit the camshaft cover.

A	30 mm (1.1811 in.)
B	30 mm dia., 20 mm depth (1.1811 in. dia., 0.7874 in. depth)
C	47.975 to 48.000 mm (1.8888 to 1.8898 in.)
D	52 mm (2.0472 in.)
E	80 mm (3.1496 in.)
F	16.5 to 16.6 mm (0.6496 to 0.6535 in.)
G	80 mm (3.1496 in.)
H	10 mm (0.3937 in.)
I	26 mm (1.0236 in.)
J	100 mm (3.9370 in.)
K	6 mm (0.2362 in.)
L	132 mm (5.1969 in.)
M	1 mm (0.0394 in.)
a	1 mm radius (0.0394 in. radius)
b	2 mm radius (0.0787 in. radius)
c	Ra = 3.2a
d	0.4 mm radius (0.0157 in. radius)
C0.5	Chamfer 0.5 mm (0.0197 in.)
C1	Chamfer 1.0 mm (0.0394 in.)

W1014056

Front Cover Oil Seal Replacing Tool

Application: Use to press fit the front cover oil seal.



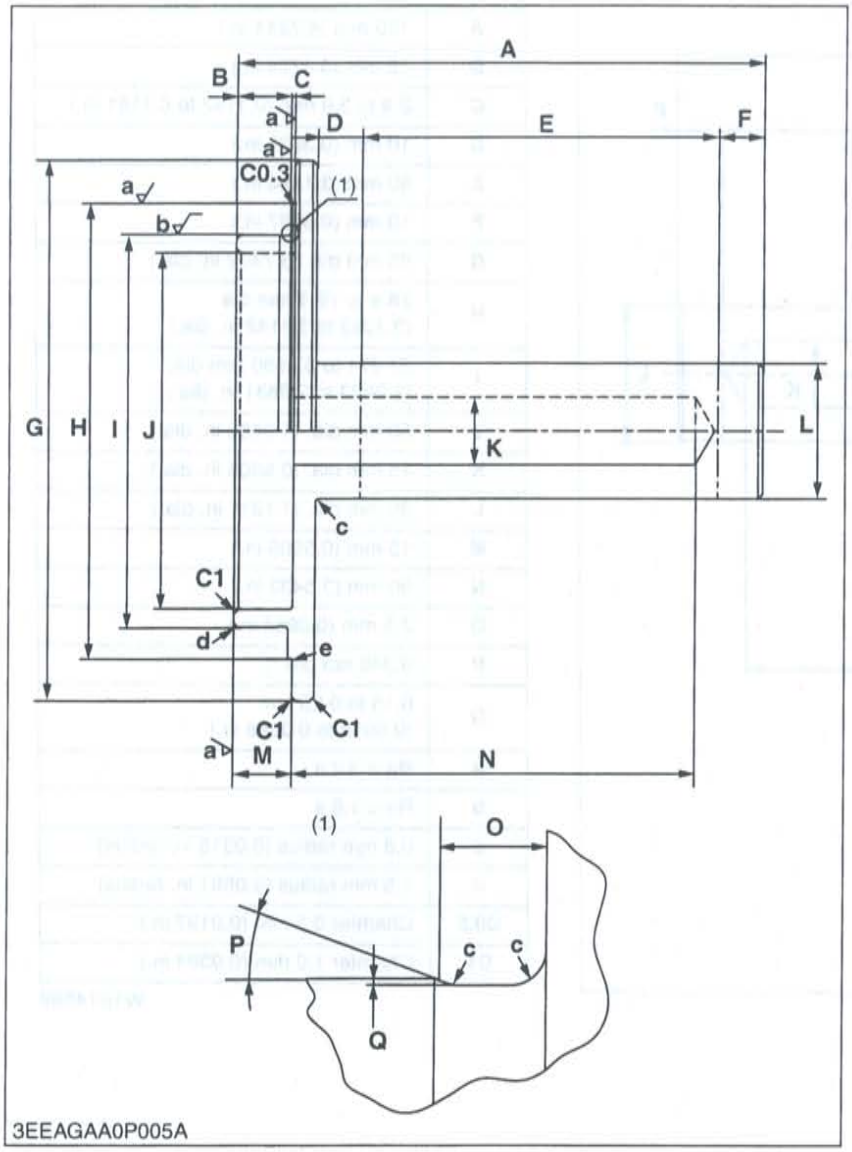
3EEAGAA0P004A

A	120 mm (4.7244 in.)
B	12 mm (0.4724 in.)
C	2.9 to 3.0 mm (0.1142 to 0.1181 in.)
D	10 mm (0.3937 in.)
E	80 mm (3.1496 in.)
F	10 mm (0.3937 in.)
G	95 mm dia. (3.7402 in. dia.)
H	78.9 to 79.1 mm dia. (3.1063 to 3.1142 in. dia.)
I	57.971 to 57.990 mm dia. (2.2823 to 2.2831 in. dia.)
J	50 mm dia. (1.9685 in. dia.)
K	15 mm dia. (0.5906 in. dia.)
L	30 mm dia. (1.1811 in. dia.)
M	15 mm (0.5906 in.)
N	90 mm (3.5433 in.)
O	2.5 mm (0.0984 in.)
P	0.349 rad (20 °)
Q	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.8 mm radius (0.0315 in. radius)
d	1.5 mm radius (0.0591 in. radius)
C0.5	Chamfer 0.5 mm (0.0197 in.)
C1	Chamfer 1.0 mm (0.0394 in.)

W1014589

Flywheel Housing Oil Seal Replacing Tool

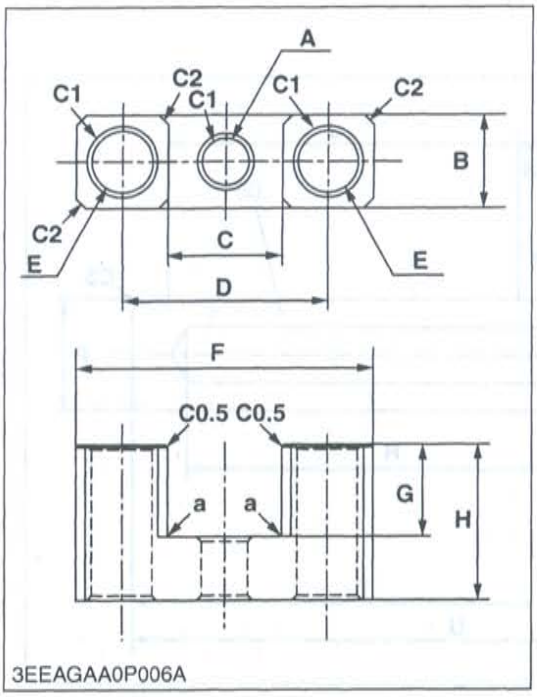
Application: Use to press fit the flywheel housing oil seal.



3EEAGAA0P005A

A	118 mm (4.6457 in.)
B	12 mm (0.4724 in.)
C	0.9 to 1.0 mm (0.0354 to 0.0394 in.)
D	10 mm (0.3937 in.)
E	80 mm (3.1496 in.)
F	10 mm (0.3937 in.)
G	120 mm dia. (4.7244 in. dia.)
H	100.9 to 101.1 mm dia. (3.9724 to 3.9803 in. dia.)
I	86.966 to 86.988 mm dia. (3.4239 to 3.4247 in. dia.)
J	79 mm dia. (3.1102 in. dia.)
K	15 mm dia. (0.5906 in. dia.)
L	30 mm dia. (1.1811 in. dia.)
M	13 mm (0.5118 in.)
N	90 mm (3.5433 in.)
O	2.5 mm (0.0984 in.)
P	0.349 rad (20 °)
Q	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.8 mm radius (0.0315 in. radius)
d	1.5 mm radius (0.0591 in. radius)
e	0.2 mm radius (0.0079 in. radius)
C0.3	Chamfer 0.3 mm (0.0118 in.)
C1	Chamfer 1.0 mm (0.0394 in.)

W1015151



3EEAGAA0P006A

Valve Bridge Shaft Replacing Tool

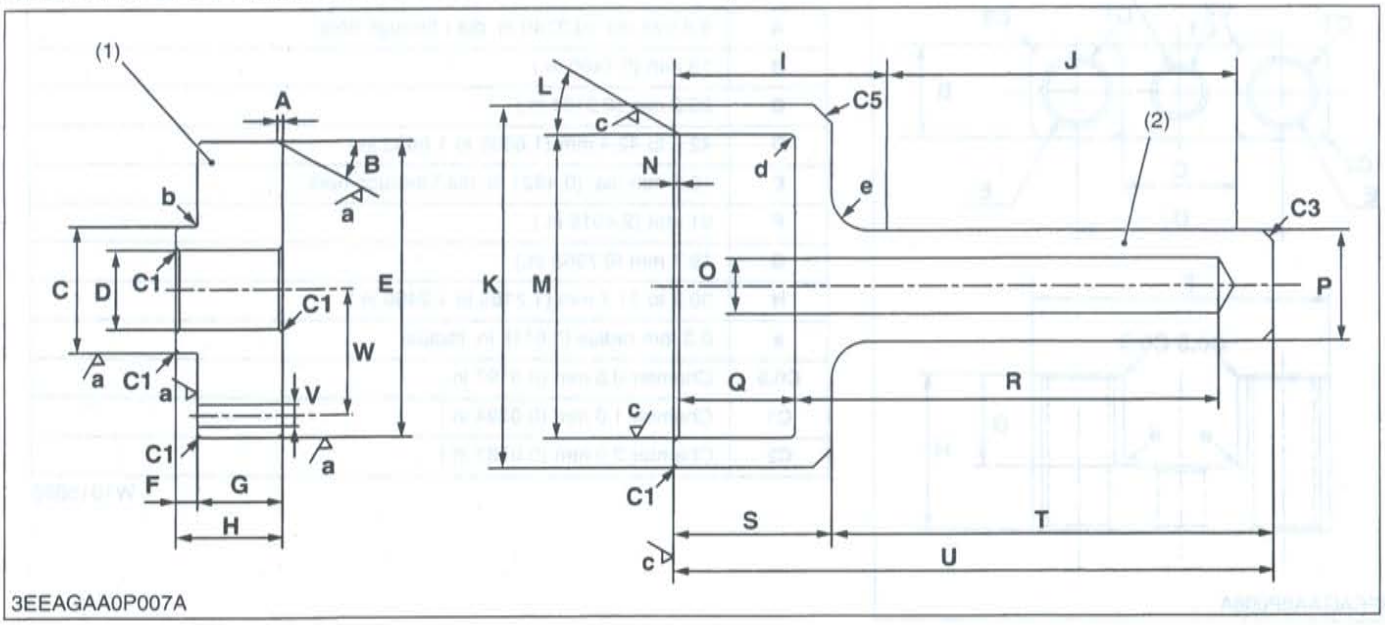
Application: Use to press fit the valve bridge shaft.

A	9.5 mm dia. (0.3740 in. dia.) through hole
B	19 mm (0.7480 in.)
C	23.2 mm (0.9134 in.)
D	42.0 to 42.4 mm (1.6535 to 1.6693 in.)
E	12.5 mm dia. (0.4921 in. dia.) through hole
F	61 mm (2.4016 in.)
G	18.7 mm (0.7362 in.)
H	30.9 to 31.7 mm (1.2165 to 1.2480 in.)
a	0.3 mm radius (0.0118 in. radius)
C0.5	Chamfer 0.5 mm (0.0197 in.)
C1	Chamfer 1.0 mm (0.0394 in.)
C2	Chamfer 2.0 mm (0.0787 in.)

W1015898

Auxiliary Socket for Fixing Crankshaft Sleeve

Application: Use to fix the crankshaft sleeve of the diesel engine.



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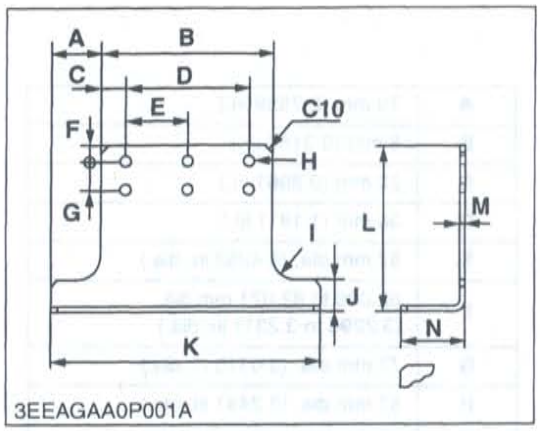
A	1.5 mm (0.0591 in.)	Q	33 mm (1.2992 in.)
B	0.523 rad (30 °)	R	115 mm (4.5276 in.)
C	34.925 to 34.950 mm dia. (1.3750 to 1.3760 in. dia.)	S	43 mm (1.6929 in.)
D	22 mm dia. (0.8661 in. dia.)	T	120 mm (4.7244 in.)
E	81.980 to 81.985 mm dia. (3.2276 to 3.2278 in. dia.)	U	163 mm (6.4173 in.)
F	6 mm (0.2362 in.)	V	8 mm dia. (0.315 in. dia.)
G	23.5 mm (0.9252 in.)	W	33.475 to 33.525 mm (1.3180 to 1.3198 in.)
H	29.5 mm (1.1614 in.)	a	Ra = 1.6 a
I	58 mm (2.2835 in.)	b	0.5 mm radius (0.0197 in. radius)
J	95 mm (3.7402 in.)	c	Ra = 3.2 a
K	98 mm dia. (3.8583 in. dia.)	d	1.5 mm radius (0.0591 in. radius)
L	0.523 rad (30 °)	e	10 mm radius (0.3937 in. radius)
M	82.1 to 82.2 mm dia. (3.2323 to 3.2362 in. dia.)	C1	Chamfer 1.0 mm (0.0394 in.)
N	1.5 mm (0.0591 in.)	C3	Chamfer 3.0 mm (0.1181 in.)
O	15 mm dia. (0.5906 in. dia.)	C5	Chamfer 5.0 mm (0.1969 in.)
P	30 mm dia. (1.1811 in. dia.)		

(1) Sleeve Guide (2) Auxiliary Socket for Pushing



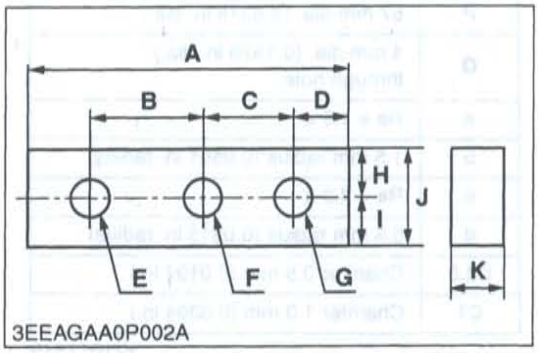
3EEAGAA0P001A

Engine Stand

Application: Use to support engine.

A	107 mm (4.213 in.)
B	246 mm (9.685 in.)
C	21 mm (0.827 in.)
D	204 mm (8.032 in.)
E	102 mm (4.016 in.)
F	15 mm (0.591 in.)
G	59 mm (2.323 in.)
H	14 mm dia. (0.551 in. dia.)
I	80 mm radius (3.150 in. radius)
J	70 mm (2.756 in.)
K	460 mm (18.110 in.)
L	270 mm (10.630 in.)
M	6 mm (0.236 in.)
N	70 mm (2.756 in.)
C10	Chamfer 10 mm (0.394 in.)

W1033645



3EEAGAA0P002A

Tool for Aligning the Crankcase 1 and 2

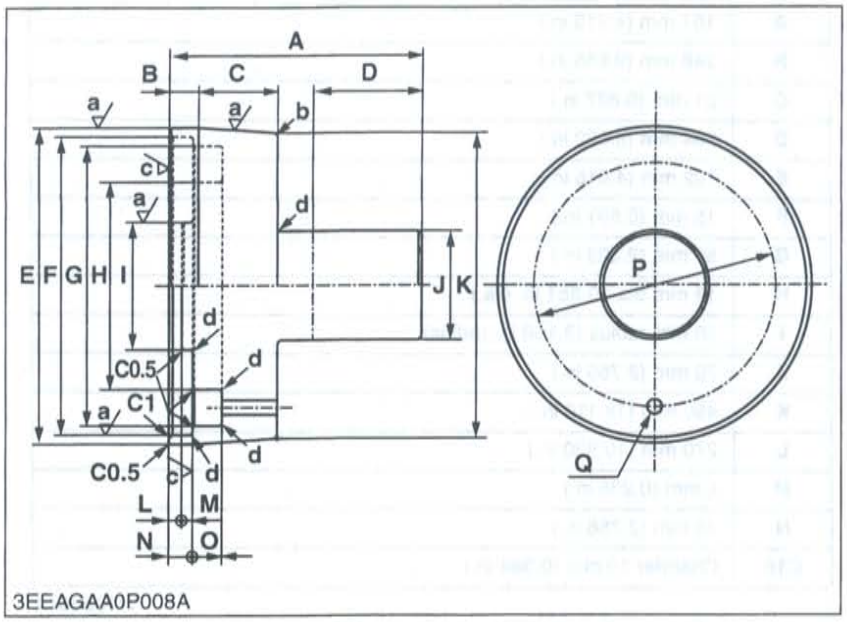
Application: Use for aligning the crankcase 1 and 2.

A	126.6 mm (4.9843 in.)
B	49.1 mm (1.9331 in.)
C	37.5 mm (1.4764 in.)
D	20 mm (0.7874 in.)
E	14 mm dia. (0.5512 in. dia.)
F	14 mm dia. (0.5512 in. dia.)
G	14 mm dia. (0.5512 in. dia.)
H	17.5 mm (0.6890 in.)
I	17.5 mm (0.6890 in.)
J	35 mm (1.3780 in.)
K	19 mm (0.7480 in.)

W1047882

Flywheel Housing Guide

Application: Use to install the flywheel housing to the crankcase.



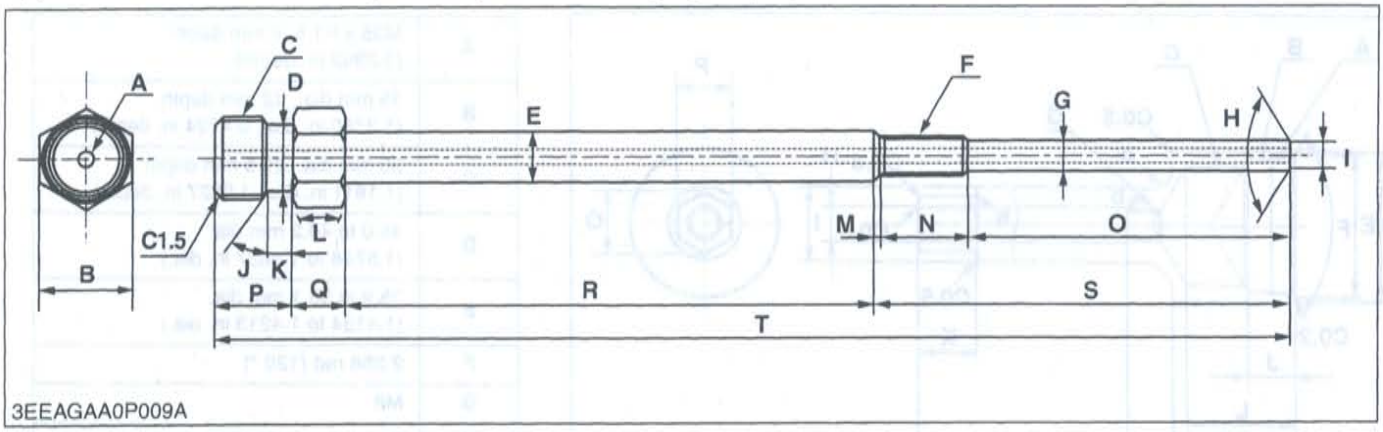
3EEAGAA0P008A

A	70 mm (2.7559 in.)
B	8 mm (0.3150 in.)
C	22 mm (0.8661 in.)
D	30 mm (1.1811 in.)
E	87 mm dia. (3.4252 in. dia.)
F	82.036 to 82.071 mm dia. (3.2298 to 3.2311 in. dia.)
G	77 mm dia. (3.0315 in. dia.)
H	57 mm dia. (2.2441 in. dia.)
I	35 mm dia. (1.3780 in. dia.)
J	30 mm dia. (1.1811 in. dia.)
K	84 mm dia. (3.3071 in. dia.)
L	3.5 mm (0.1378 in.)
M	3 mm (0.1181 in.)
N	6.6 to 6.8 mm (0.2598 to 0.2677 in.)
O	8 mm (0.3150 in.)
P	67 mm dia. (2.6378 in. dia.)
Q	4 mm dia. (0.1575 in. dia.) through hole
a	Ra = 1.6 a
b	1.5 mm radius (0.0591 in. radius)
c	Ra = 3.2 a
d	0.8 mm radius (0.0315 in. radius)
C0.5	Chamfer 0.5 mm (0.0197 in.)
C1	Chamfer 1.0 mm (0.0394 in.)

W1017819

Glow Plug Adapter

Application: Use to check compression pressure through glow plug hole.

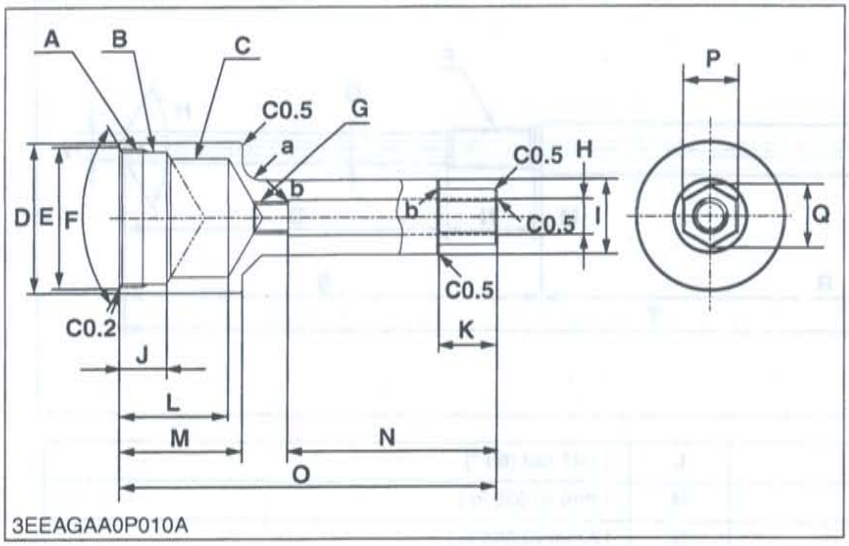


3EEAGAA0P009A

A	3 mm dia. (0.118 in. dia.) through hole	L	1.047 rad (60 °)
B	17 mm (0.669 in.)	M	1 mm (0.039 in.)
C	16 mm dia. (0.630 in. dia.) P0.5	N	17 mm (0.669 in.)
D	13 mm dia. (0.512 in. dia.)	O	61.5 mm (2.421 in.)
E	9.5 mm dia. (0.374 in. dia.)	P	15 mm (0.591 in.)
F	M8 x 1.0	Q	10 mm (0.394 in.)
G	6.5 to 6.7 mm dia. (0.256 to 0.264 in. dia.)	R	100 mm (3.937 in.)
H	2.144 to 2.147 rad (122.9 to 123.1 °)	S	79.5 mm (3.130 in.)
I	4.9 to 5.5 mm dia. (0.193 to 0.217 in. dia.)	T	204.5 mm (8.051 in.)
J	0.523 rad (30 °)	C1.5	Chamfer 1.5 mm (0.059 in.)
K	5 mm (0.197 in.)		

Injection Pump Gear Puller

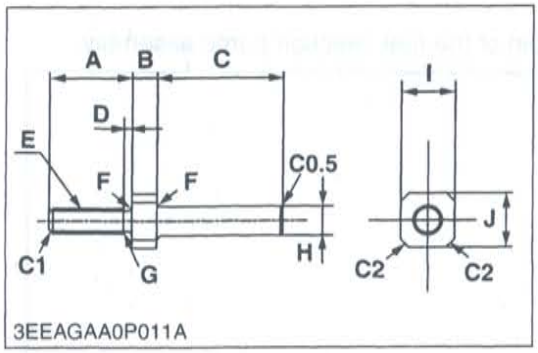
Application: Use for remove the injection pump gear from governor shaft.



3EEAGAA0P010A

A	M35 x P1.5, 6 mm depth (0.2362 in. depth)
B	35 mm dia., 12 mm depth (1.3780 in. dia., 0.4724 in. depth)
C	30 mm dia., 27.5 mm depth (1.1811 in. dia., 1.0827 in. depth)
D	40.0 to 40.2 mm dia. (1.5748 to 1.5827 in. dia.)
E	35.9 to 36.1 mm dia. (1.4134 to 1.4213 in. dia.)
F	2.256 rad (120 °)
G	M8
H	9 mm dia. (0.3543 in. dia.)
I	19 mm dia. (0.7480 in. dia.)
J	12 mm (0.4724 in.)
K	15 mm (0.5906 in.)
L	27.5 mm (1.0827 in.)
M	31 mm (1.2205 in.)
N	57.5 mm (2.2638 in.)
O	100 mm (3.9370 in.)
P	3.75 to 4.00 mm (0.1476 to 0.1575 in.)
Q	16.17 mm (0.6366 in.)
a	5 mm radius (0.1969 in. radius)
b	0.4 mm radius (0.0157 in. radius)
C0.2	Chamfer 0.2 mm (0.0079 in.)
C0.5	Chamfer 0.5 mm (0.0197 in.)

W1018612



3EEAGAA0P011A

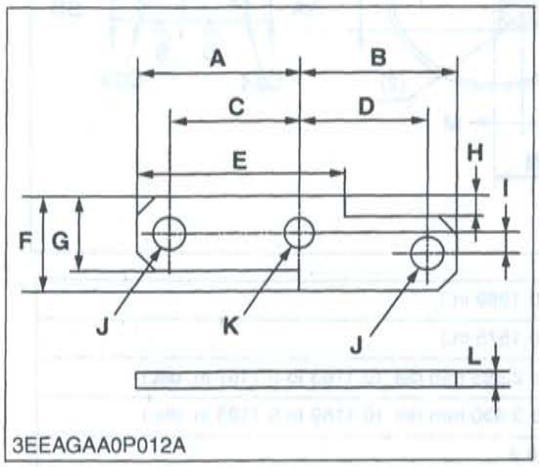
Injection Pump Rack Fixing Tool

Application: Use to fix the injection pump control rack.

1) Shaft

A	20 mm (0.787 in.)
B	6 mm (0.236 in.)
C	29.9 to 30.1 mm (1.177 to 1.185 in.)
D	2.0 to 3.0 mm (0.079 to 0.118 in.)
E	M6 x P1.0
F	1 mm radius (0.0394 in. radius)
G	0.5 mm radius (0.0197 in. radius)
H	7 mm dia. (0.276 in. dia.)
I	13 mm (0.512 in.)
J	13 mm (0.512 in.)
C0.5	Chamfer 0.5 mm (0.0197 in.)
C1	Chamfer 1.0 mm (0.0394 in.)
C2	Chamfer 2.0 mm (0.0787 in.)

W1018945



3EEAGAA0P012A

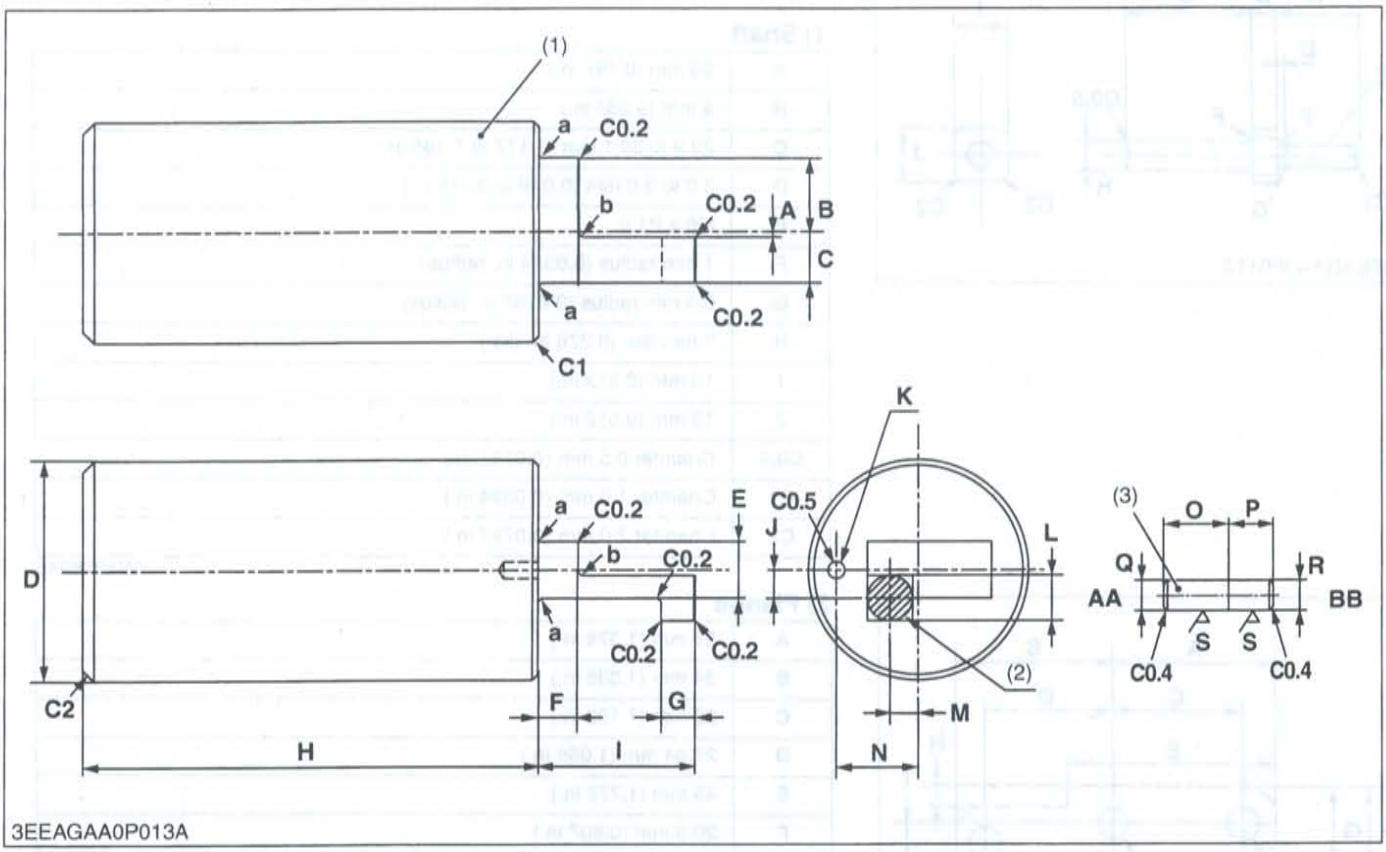
2) Flange

A	35 mm (1.378 in.)
B	34 mm (1.339 in.)
C	28 mm (1.102 in.)
D	27.64 mm (1.088 in.)
E	45 mm (1.772 in.)
F	20.5 mm (0.807 in.)
G	16 mm (0.630 in.)
H	4.5 mm (0.177 in.)
I	4.5 mm (0.177 in.)
J	7.0 mm dia. (0.276 in. dia.) through hole
K	6.5 mm dia. (0.256 in. dia.) through hole
L	3.2 mm (0.126 in.)

W1019425

Jig for Govenor Connecting Rod

Application: Use for connecting the governor connecting rod to the rack pin of the fuel injection pump assembly.



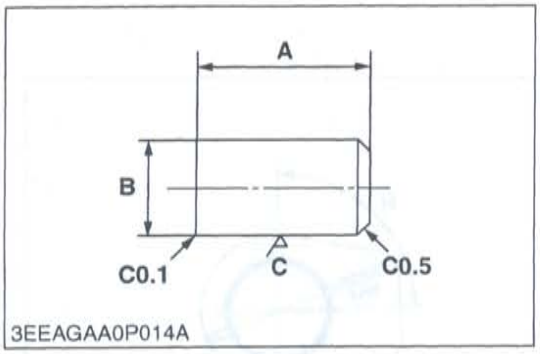
3EEAGAA0P013A

A	0.5 mm (0.0197 in.)	**O**	5 mm (0.1969 in.)
B	12.7 to 13.0 mm (0.5000 to 0.5118 in.)	**P**	4 mm (0.1575 in.)
C	8.7 to 9.0 mm (0.3425 to 0.3543 in.)	**Q**	2.955 to 2.965 mm dia. (0.1163 to 0.1167 in. dia.)
D	39 mm (1.5354 in.)	**R**	3.020 to 3.030 mm dia. (0.1189 to 0.1193 in. dia.)
E	10 mm (0.3937 in.)	**S**	Ra = 1.6 a
F	7 mm (0.2756 in.)	**AA**	Governor housing side
G	6 mm (0.2362 in.)	**BB**	Press in side
H	80 mm (3.1496 in.)	**a**	0.6 mm radius (0.0236 in. radius)
I	27.95 to 28.05 mm (1.1004 to 1.1043 in.)	**b**	1 mm radius (0.0394 in. radius)
J	5 mm (0.1969 in.)	**C0.2**	Chamfer 0.2 mm (0.0079 in.)
K	3.00 to 3.01 mm dia., 6 mm depth (0.1181 to 0.1185 in. dia., 0.2362 in. depth)	**C0.4**	Chamfer 0.4 mm (0.0157 in.)
L	9 mm (0.3543 in.)	**C0.5**	Chamfer 0.5 mm (0.0197 in.)
M	5 mm (0.1969 in.)	**C1**	Chamfer 1.0 mm (0.0394 in.)
N	14.45 to 14.55 mm (0.5689 to 0.5728 in.)	**C2**	Chamfer 2.0 mm (0.0787 in.)

(1) Material : S43C-D

(2) Permanent Magnet : 8 mm dia. (0.3150 in. dia.)
Thickness : 3 mm (0.1181 in.)

(3) Pin



3EEAGAA0P014A

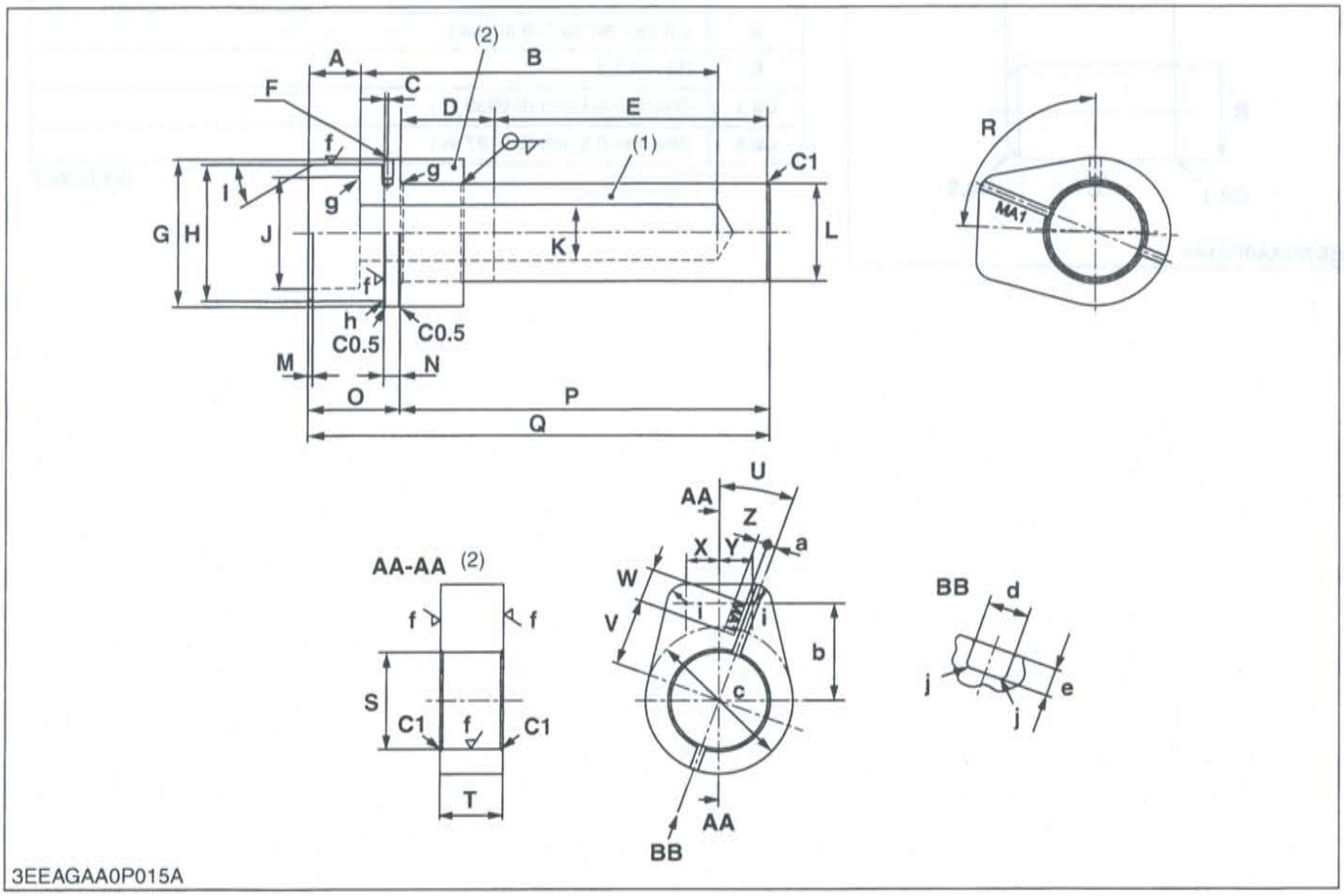
Pin for Balancer Shaft Bearing Replacing Tool

A	7.2 to 7.4 mm (0.283 to 0.291 in.)
B	4.0 mm dia. (0.158 in. dia.)
C	Ra = 0.8 a
C0.1	Chamfer 0.1 mm (0.0039 in.)
C0.5	Chamfer 0.5 mm (0.0197 in.)

W1020662

Balancer Shaft 1 Bearing A Replacing Tool

Application: Use to press fit the bearing.



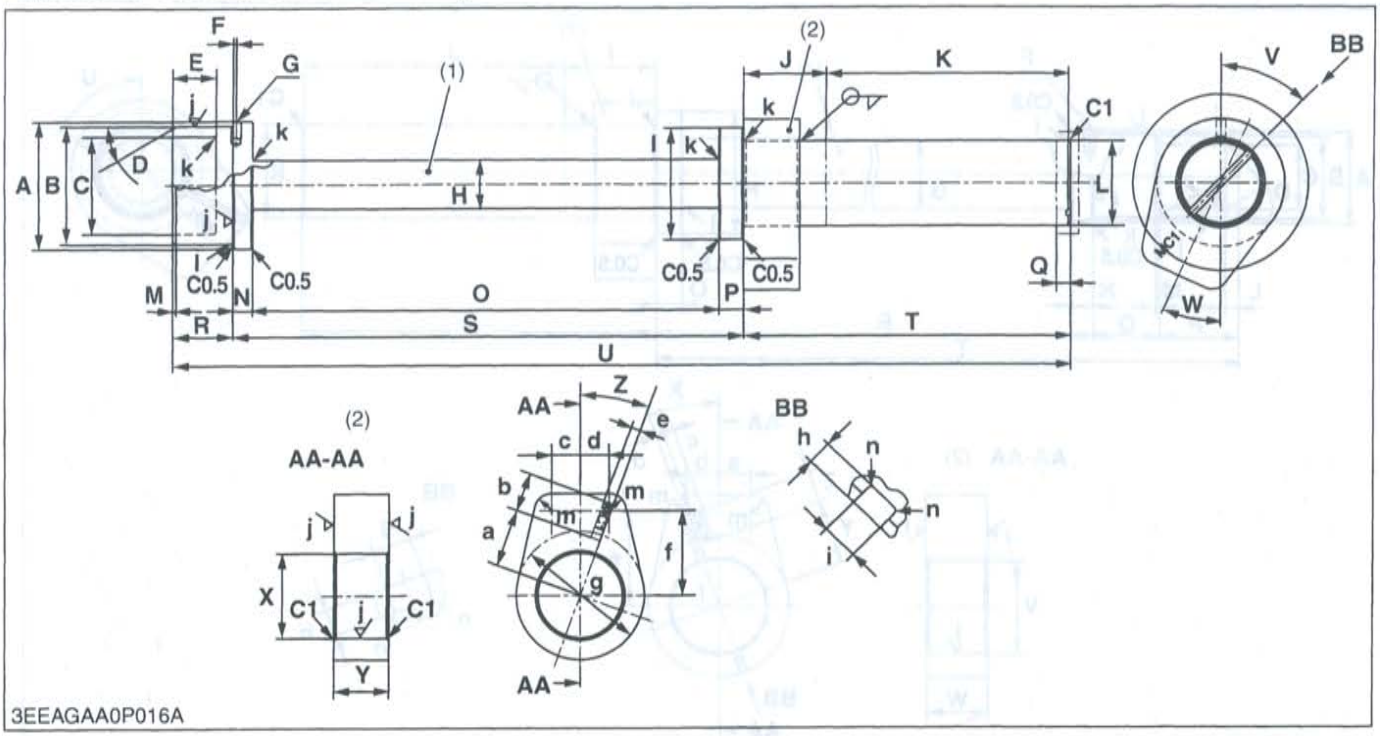
3EEAGAA0P015A

A	18 mm (0.7087 in.)	T	23 mm (0.9055 in.)
B	130 mm (5.1181 in.)	U	0.349 rad (20 °)
C	1.2 mm (0.0472 in.)	V	24 mm (0.9449 in.)
D	34 mm (1.3386 in.)	W	12 mm (0.4724 in.)
E	99 mm (3.8976 in.)	X	12 mm (0.4724 in.)
F	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	Y	12 mm (0.4724 in.)
G	53 mm dia. (2.0866 in. dia.)	Z	4 mm (0.1575 in.)
H	48.8 to 48.9 mm dia. (1.9213 to 1.9252 in. dia.)	a	3 mm (0.1181 in.)
I	0.523 rad (30 °)	b	35 mm (1.3780 in.)
J	40 mm dia. (1.5748 in. dia.)	c	53 mm (2.0866 in.)
K	20 mm dia. (0.7874 in. dia.)	d	3 mm (0.1181 in.)
L	34.9 to 35.0 mm dia. (1.3740 to 1.3780 in. dia.)	e	2 mm (0.0787 in.)
M	1.5 mm (0.0591 in.)	f	Ra = 3.2 a
N	5.5 to 6.5 mm (0.2165 to 0.2559 in.)	g	0.8 mm radius (0.0315 in. radius)
O	33 mm (1.2992 in.)	h	0.3 mm radius (0.0118 in. radius)
P	134 mm (5.2756 in.)	i	7.0 mm radius (0.2756 in. radius)
Q	167 mm (6.5748 in.)	j	0.4 mm radius (0.0157 in. radius)
R	1.526 rad (87.5 °)	C0.5	Chamfer 0.5 mm (0.0197 in.)
S	35 mm dia. (1.3780 in. dia.)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

Balancer Shaft 1 Bearing C Replacing Tool

Application: Use to press fit the bearing.



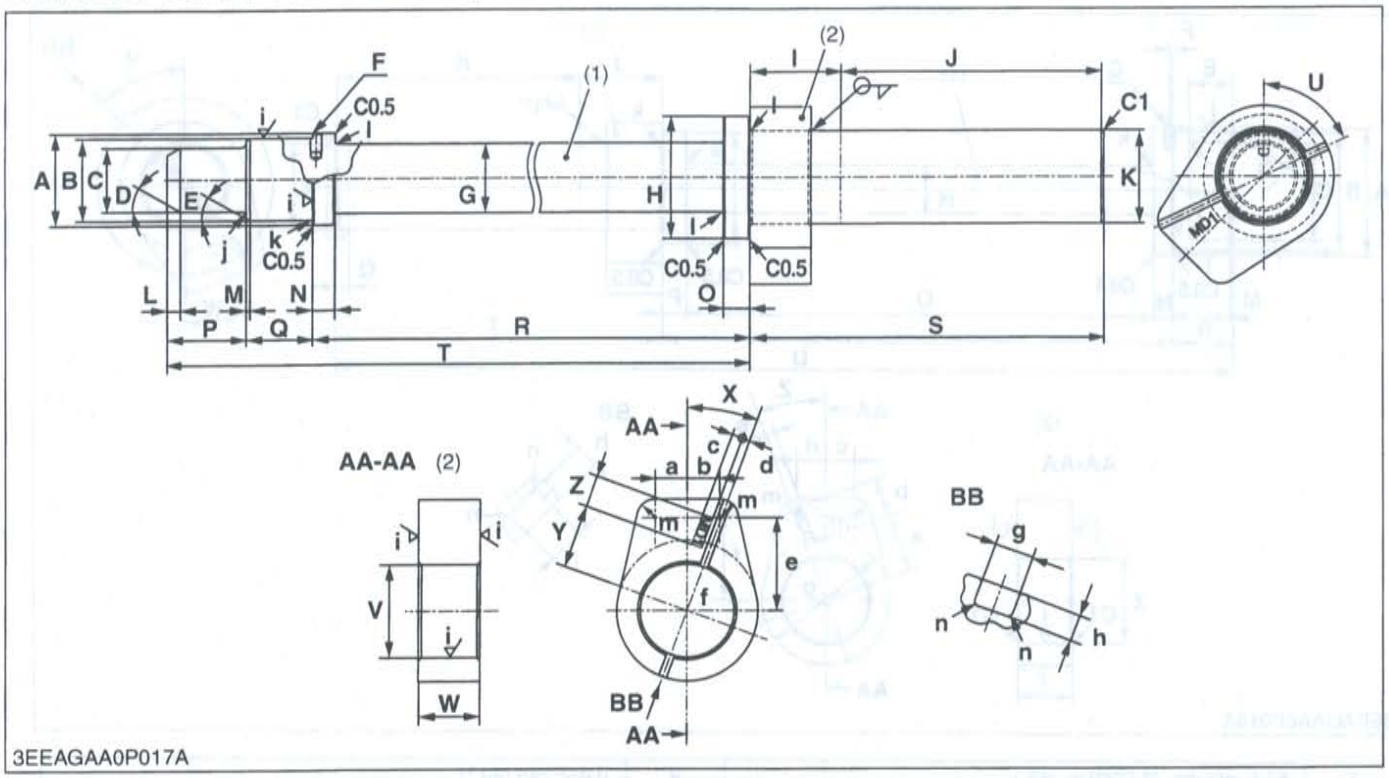
3EEAGAA0P016A

A	52.5 mm dia. (2.0669 in. dia.)	V	0.855 rad (49 °)
B	48.4 to 48.5 mm dia. (1.9055 to 1.9095 in.)	W	0.427 rad (24.5 °)
C	40 mm dia. (1.5748 in. dia.)	X	35 mm dia. (1.3780 in. dia.)
D	0.523 rad (30 °)	Y	23 mm (0.9055 in.)
E	18 mm (0.7087 in.)	Z	0.349 rad (20 °)
F	1.2 mm (0.0472 in.)	a	24 mm (0.9449 in.)
G	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	b	16 mm (0.6299 in.)
H	20 mm dia. (0.7874 in. dia.)	c	12 mm (0.4724 in.)
I	46 mm dia. (1.8110 in. dia.)	d	12 mm (0.4724 in.)
J	34 mm (1.3386 in.)	e	4 mm (0.1575 in.)
K	99 mm (3.8976 in.)	f	35 mm (1.3780 in.)
L	34.9 to 35.0 mm (1.3740 to 1.3780 in.)	g	53 mm (2.0866 in.)
M	1.5 mm (0.0591 in.)	h	2 mm (0.0787 in.)
N	8 mm (0.3150 in.)	i	3 mm (0.1181 in.)
O	193.5 mm (7.6181 in.)	j	Ra = 3.2 a
P	10 mm (0.3937 in.)	k	0.8 mm radius (0.0315 in. radius)
Q	6 mm (0.2362 in.)	l	0.3 mm radius (0.0118 in. radius)
R	25 mm (0.9843 in.)	m	7.0 mm radius (0.2756 in. radius)
S	211.0 to 212.0 mm (8.3071 to 8.3465 in.)	n	0.4 mm radius (0.0157 in. radius)
T	134 mm (5.2756 in.)	C0.5	Chamfer 0.5 mm (0.0197 in.)
U	370.5 mm (14.5866 in.)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

Balancer Shaft 1 Bearing D Replacing Tool

Application: Use to press fit the bearing.



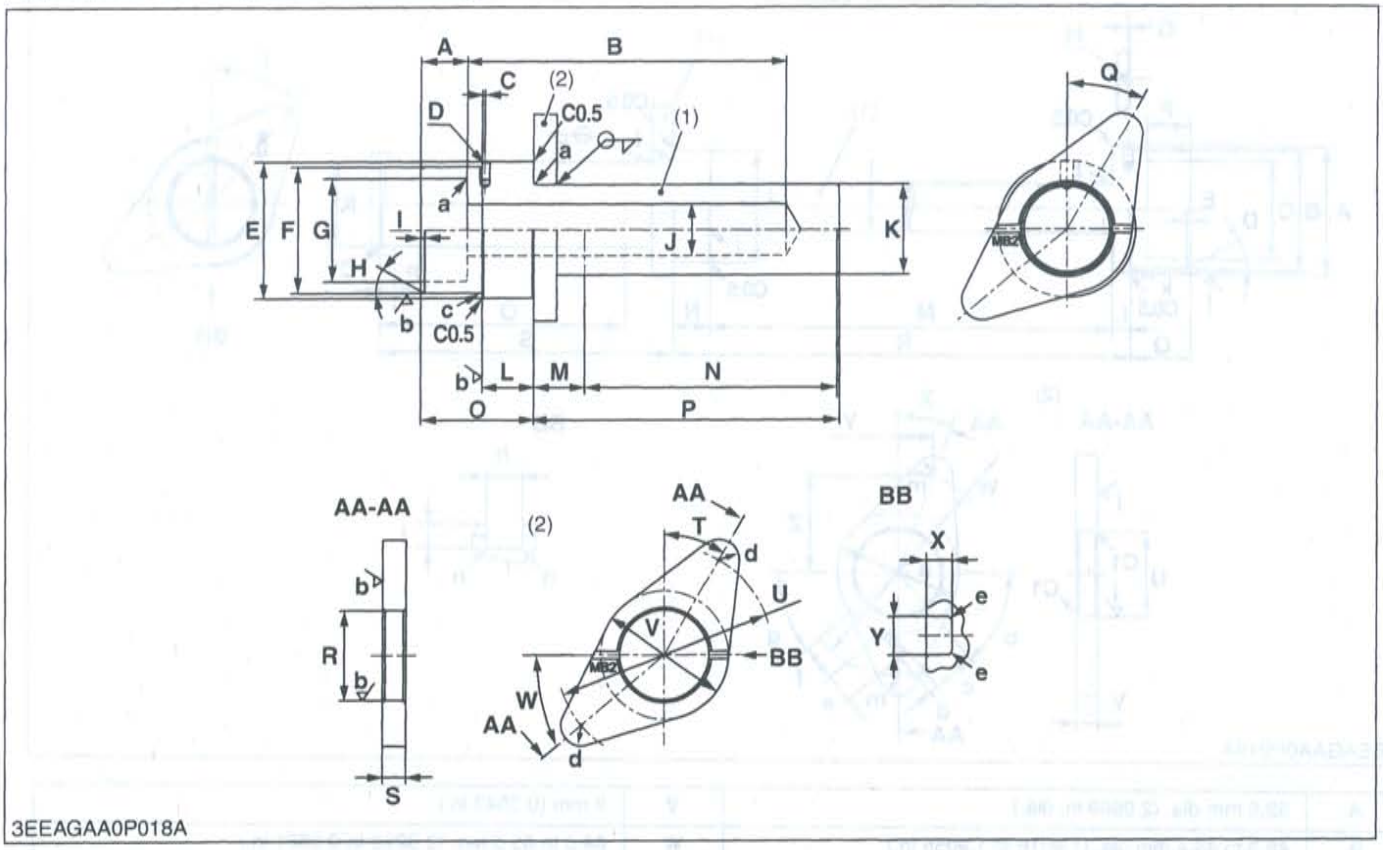
3EEAGAA0P017A

A	34.5 mm dia. (1.3583 in. dia.)	V	35 mm dia. (1.3780 in. dia.)
B	30.8 to 30.9 mm dia. (1.2126 to 1.2165 in. dia.)	W	23 mm (0.9055 in.)
C	24 mm dia. (0.9449 in. dia.)	X	0.349 rad (20 °)
D	0.523 rad (30 °)	Y	24 mm (0.9449 in.)
E	0.523 rad (30 °)	Z	12 mm (0.4724 in.)
F	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	a	12 mm (0.4724 in.)
G	26 mm dia. (1.0236 in. dia.)	b	12 mm (0.4724 in.)
H	46 mm dia. (1.8110 in. dia.)	c	4 mm (0.1575 in.)
I	34 mm (1.3386 in.)	d	3 mm (0.1181 in.)
J	99 mm (3.8976 in.)	e	35 mm (1.3780 in.)
K	34.9 to 35.0 mm (1.3740 to 1.3780 in.)	f	53 mm (2.0866 in.)
L	5 mm (0.1969 in.)	g	3 mm (0.1181 in.)
M	1.5 mm (0.0591 in.)	h	2 mm (0.0787 in.)
N	8 mm (0.3150 in.)	i	Ra = 3.2 a
O	10 mm (0.3937 in.)	j	2.0 mm radius (0.0787 in. radius)
P	29.5 mm (1.1614 in.)	l	0.3 mm radius (0.0118 in. radius)
Q	24.5 mm (0.9646 in.)	k	0.8 mm radius (0.0315 in. radius)
R	413.5 to 414.5 mm (16.2795 to 16.3189 in.)	m	7.0 mm radius (0.2756 in. radius)
S	134 mm (5.2756 in.)	n	0.4 mm radius (0.0157 in. radius)
T	468 mm (18.4252 in.)	C0.5	Chamfer 0.5 mm (0.0197 in.)
U	1.134 rad (65 °)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

Balancer Shaft 2 Bearing B Replacing Tool

Application: Use to press fit the bearing.



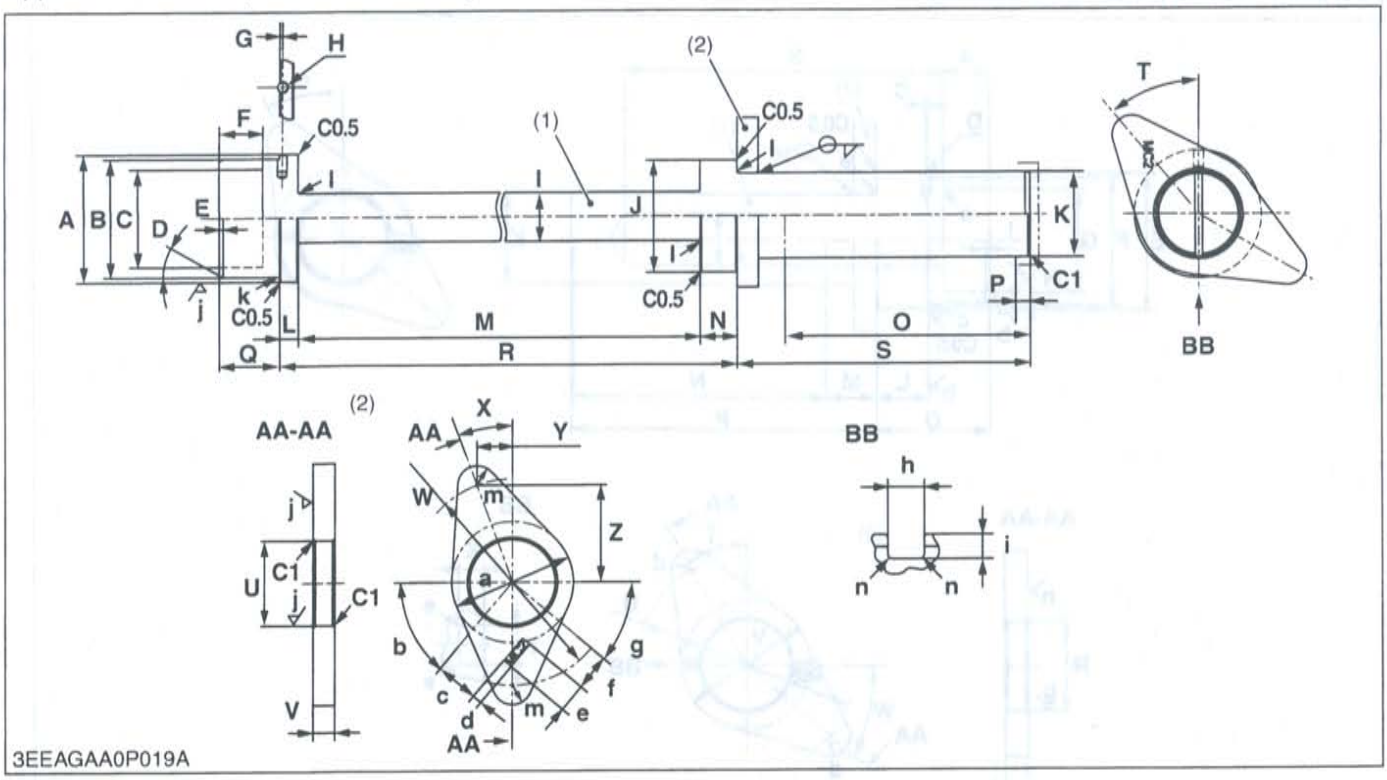
3EEAGAA0P018A

A	18 mm (0.7087 in.)	Q	0.523 rad (30 °)
B	125 mm (4.9213 in.)	R	35 mm dia. (1.3780 in. dia.)
C	1.2 mm (0.0472 in.)	S	9 mm (0.3543 in.)
D	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	T	0.523 rad (30 °)
E	53 mm dia. (2.0866 in.)	U	84.5 to 85.5 mm (3.3268 to 3.3661 in.)
F	48.8 to 48.9 mm dia. (1.9213 to 1.9252 in. dia.)	V	50 mm (1.9685 in.)
G	40 mm dia. (1.5748 in. dia.)	W	0.698 rad (40 °)
H	0.523 rad (30 °)	X	2 mm (0.0787 in.)
I	1.5 mm (0.0591 in.)	Y	3 mm (0.1181 in.)
J	20 mm dia. (0.7874 in. dia.)	a	0.8 mm radius (0.0315 in. radius)
K	34.9 to 35.0 mm dia. (1.3740 to 1.3780 in. dia.)	b	Ra = 3.2 a
L	19.5 to 20.5 mm dia. (0.7677 to 0.8071 in. dia.)	c	0.2 mm radius (0.0079 in. radius)
M	20 mm (0.7874 in.)	d	8.0 mm radius (0.3150 in. radius)
N	99 mm (3.8976 in.)	e	0.4 mm radius (0.0157 in. radius)
O	44 mm (1.7323 in.)	C0.5	Chamfer 0.5 mm (0.0197 in.)
P	120 mm (4.7244 in.)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

Balancer Shaft 2 Bearing C Replacing Tool

Application: Use to press fit the bearing.



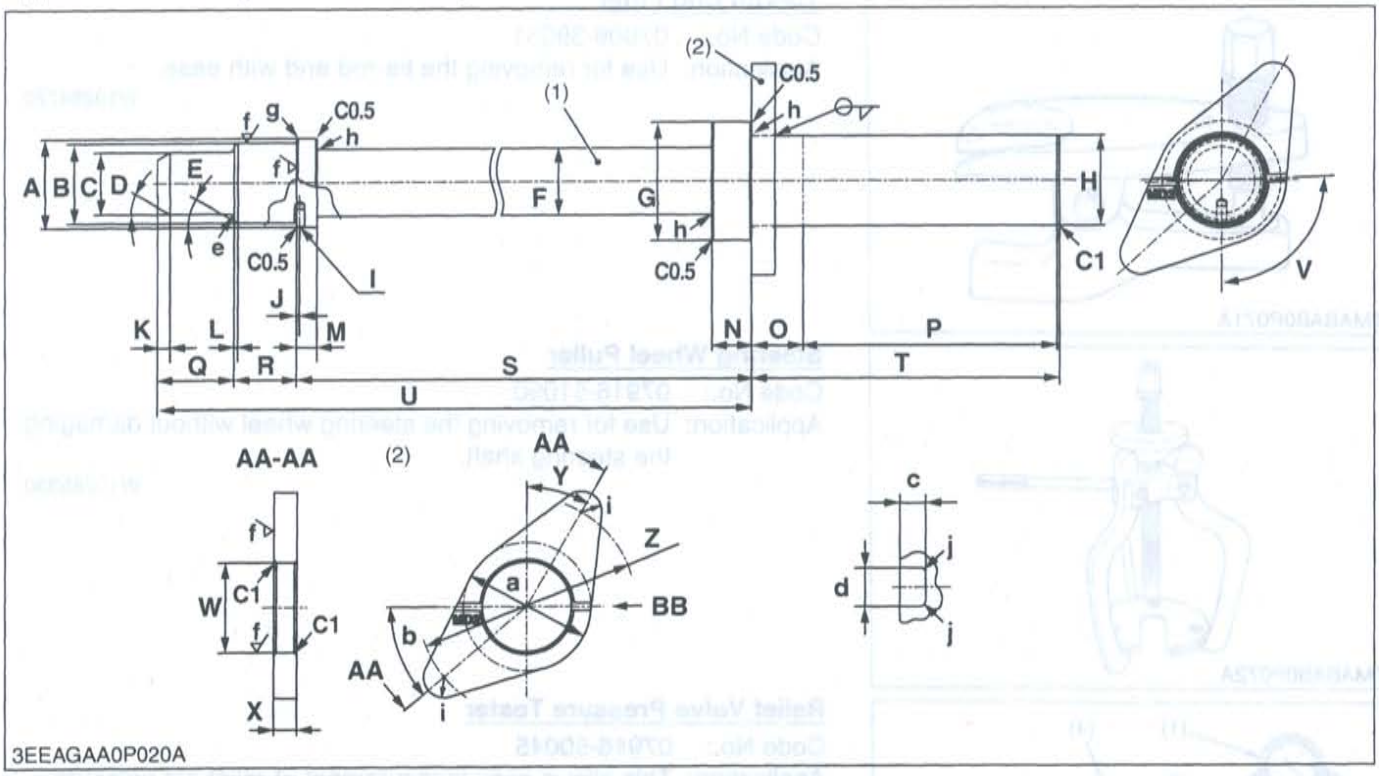
3EEAGAA0P019A

A	52.5 mm dia. (2.0669 in. dia.)	V	9 mm (0.3543 in.)
B	48.3 to 48.4 mm dia. (1.9016 to 1.9055 in.)	W	84.5 to 85.5 mm (3.3268 to 3.3661 in.)
C	40 mm dia. (1.5748 in. dia.)	X	0.349 rad (20 °)
D	0.523 rad (30 °)	Y	14.54 mm (0.5724 in.)
E	1.5 mm (0.0591 in.)	Z	39.94 mm (1.5724 in.)
F	18 mm (0.7087 in.)	a	50 mm (1.9685 in.)
G	1.2 mm (0.0472 in.)	b	0.872 rad (50 °)
H	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	c	18 mm (0.7087 in.)
I	20 mm dia. (0.7874 in. dia.)	d	4 mm (0.1575 in.)
J	46 mm dia. (1.8110 in. dia.)	e	12 mm (0.4724 in.)
K	34.9 to 35.0 mm dia. (1.3740 to 1.3780 in. dia.)	f	15 mm (0.5906 in.)
L	8 mm (0.3150 in.)	g	0.698 rad (40 °)
M	199.5 mm (7.8543 in.)	h	3 mm (0.1181 in.)
N	15 mm (0.5906 in.)	i	2 mm (0.0787 in.)
O	100 mm (3.9370 in.)	j	Ra = 3.2 a
P	6 mm (0.2362 in.)	l	0.2 mm radius (0.0079 in. radius)
Q	25 mm (0.9843 in.)	k	0.8 mm radius (0.0315 in. radius)
R	222.0 to 223.0 mm (8.7402 to 8.7795 in.)	m	8.0 mm radius (0.3150 in. radius)
S	120 mm (4.7244 in.)	n	0.4 mm radius (0.0157 in. radius)
T	0.698 rad (40 °)	C0.5	Chamfer 0.5 mm (0.0197 in.)
U	35 mm dia. (1.3780 in.)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

Balancer Shaft 2 Bearing D Replacing Tool

Application: Use to press fit the bearing.

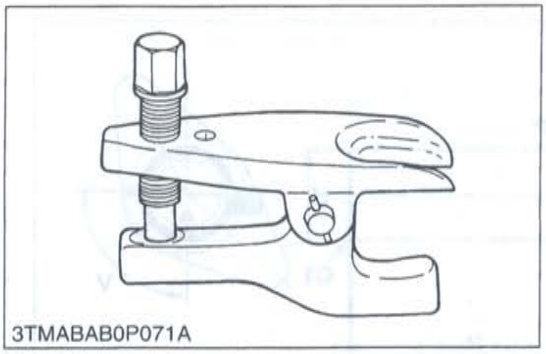


3EEAGAA0P020A

A	34.5 mm dia. (1.3583 in. dia.)	T	120 mm (4.7244 in.)
B	30.8 to 30.9 mm dia. (1.2126 to 1.2165 in.)	U	479 mm (18.8583 in.)
C	24 mm dia. (0.9449 in. dia.)	V	1.605 rad (92 °)
D	0.523 rad (30 °)	W	35 mm dia. (1.3780 in. dia.)
E	0.523 rad (30 °)	X	9 mm (0.3543 in.)
F	26 mm dia. (1.0236 in. dia.)	Y	0.523 rad (30 °)
G	46 mm dia. (1.8110 in. dia.)	Z	84.5 to 85.5 mm (3.3268 to 3.3661 in.)
H	34.9 to 35.0 mm dia. (1.3740 to 1.3780 in. dia.)	a	50 mm (1.9685 in.)
I	4.000 to 4.018 mm dia., 7 mm depth (0.1575 to 0.1582 in. dia., 0.2756 in. depth)	b	0.698 rad (40 °)
J	1.2 mm (0.0472 in.)	c	2 mm (0.0787 in.)
K	5 mm (0.1969 in.)	d	3 mm (0.1181 in.)
L	1.5 mm (0.0591 in.)	e	2 mm radius (0.0787 in. radius)
M	8 mm (0.3150 in.)	f	Ra = 3.2 a
N	15 mm (0.5906 in.)	g	0.3 mm radius (0.0118 in. radius)
O	20 mm (0.7874 in.)	h	0.8 mm radius (0.0315 in. radius)
P	99 mm (3.8976 in.)	i	8.0 mm radius (0.3150 in. radius)
Q	29.5 mm (1.1614 in.)	j	0.4 mm radius (0.0157 in. radius)
R	24.5 mm (0.9646 in.)	C0.5	Chamfer 0.5 mm (0.0197 in.)
S	424.5 to 425.5 mm (16.7126 to 16.7520 in.)	C1	Chamfer 1.0 mm (0.0394 in.)

(1) Shaft (2) Stopper

[2] SPECIAL TOOLS FOR TRACTOR

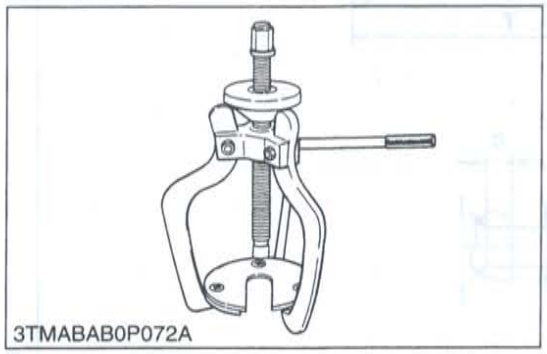

3TMABAB0P071A

Tie-rod End Lifter

Code No.: 07909-39051

Application: Use for removing the tie-rod end with ease.

W10264720

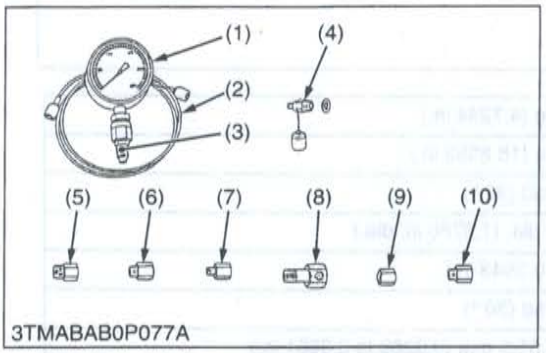

3TMABAB0P072A

Steering Wheel Puller

Code No.: 07916-51090

Application: Use for removing the steering wheel without damaging the steering shaft.

W10265330



3TMABAB0P077A

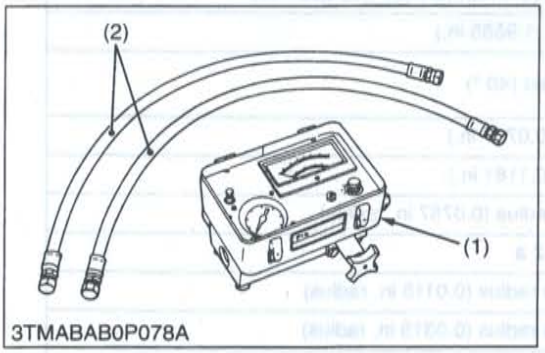
Relief Valve Pressure Tester

Code No.: 07916-50045

Application: This allows easy measurement of relief set pressure.

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

W10267410



3TMABAB0P078A

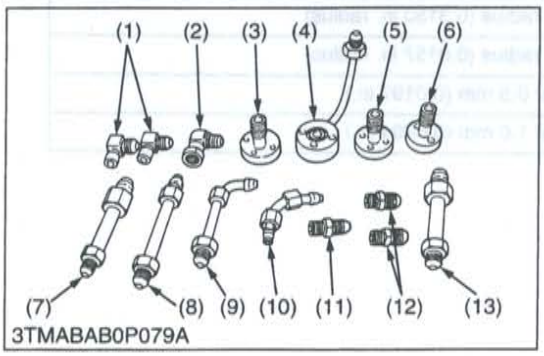
Flow Meter

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

W10313180



3TMABAB0P079A

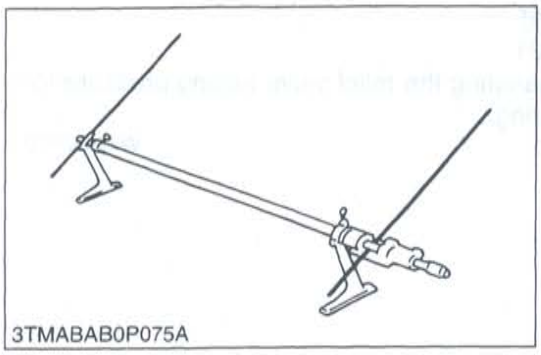
Adaptor Set for Flow Meter

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**

W10313960

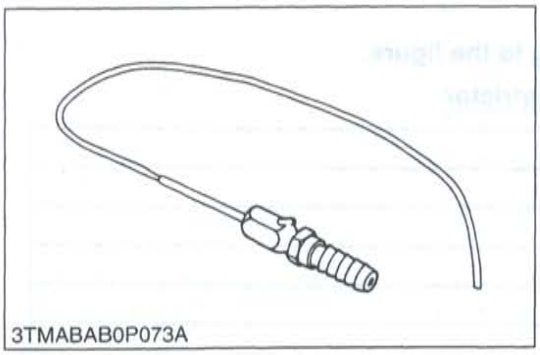

3TMABAB0P075A

Toe-in Gauge

Code No.: 07909-31681

Application: This allows easy measurement of toe-in for all machine models.

W10266890

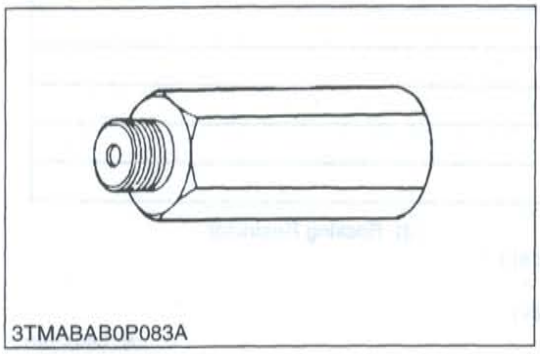

3TMABAB0P073A

Injector CH3

Code No.: 07916-52501

Application: Use for injecting calcium chloride solution into, and removing it from, rear wheel.

W10265850

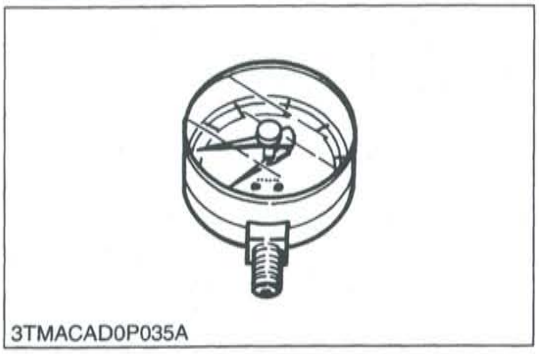

3TMABAB0P083A

Relief Valve Setting Pressure Adaptor G

Code No.: 07916-52751

Application: This offers easy measurement of relief valve setting pressure from the hydraulic coupler. This is available with the relief valve setting pressure tester.

W10623960

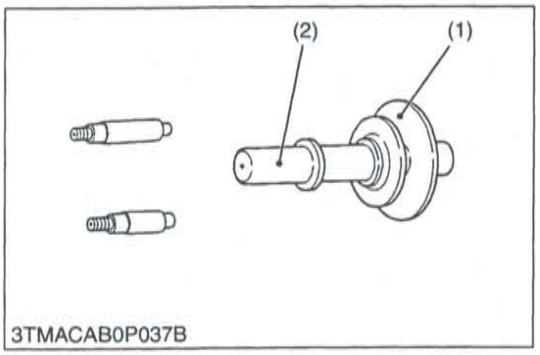

3TMACAD0P035A

Pressure Gauge 50

Code No.: 07916-52961

Application: This pressure gauge is used to measure the low oil pressure.

W10518650



3TMACAB0P037B

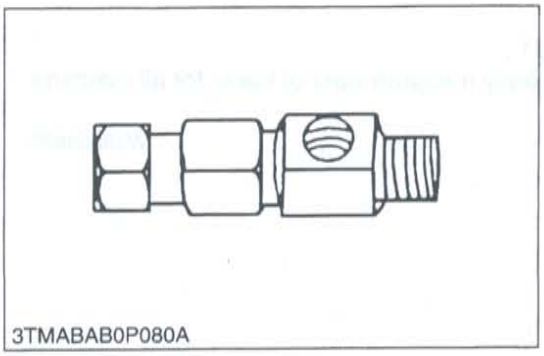
Clutch Tool B (Synchro Shuttle Model)

Code No.: 07916-53041

Application: Use for mounting the clutch to the flywheel.

(1) Gauge Ring (2) Center Par

W10520300


3TMABAB0P080A

Power Steering Adaptor

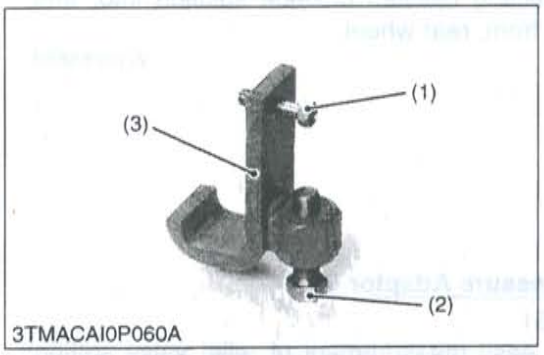
Code No.: 07916-54021

Application: Use for measuring the relief valve setting pressure for power steering.

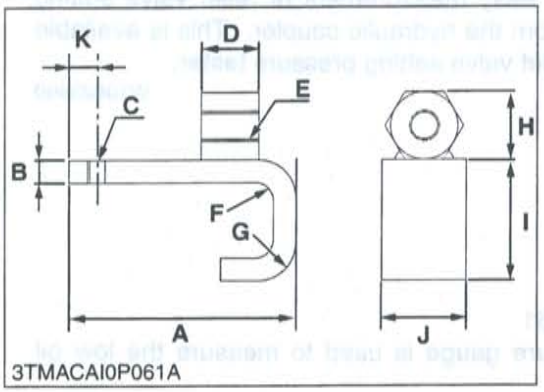
W10442870

■ **NOTE**

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



3TMACAI0P060A



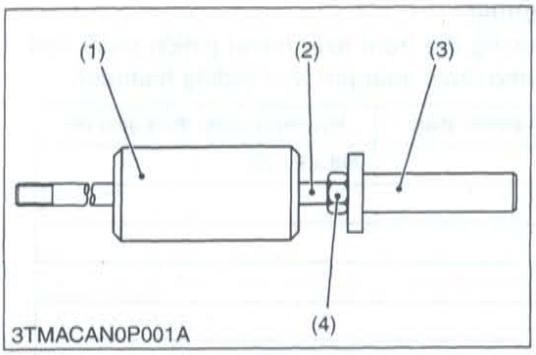
3TMACAI0P061A

Front Axle Rocking Restrictor

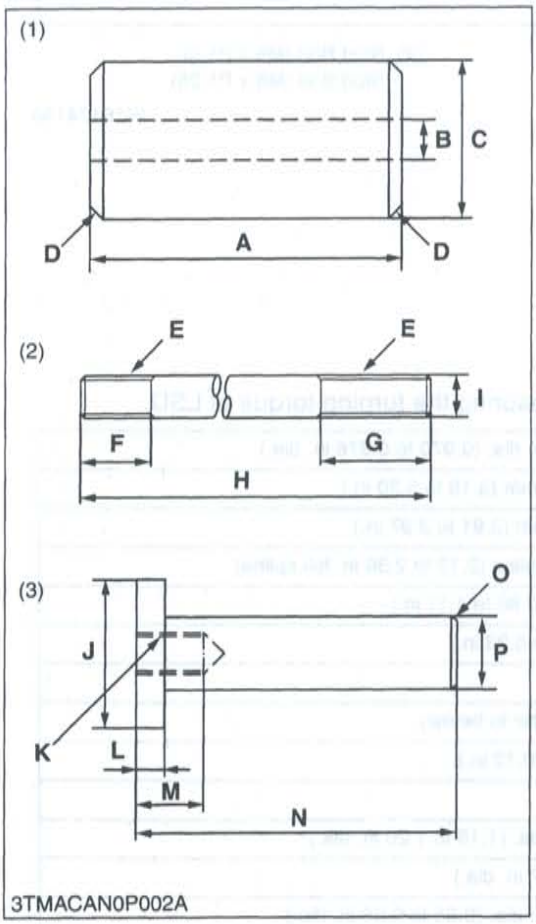
A	120 mm (4.72 in.)
B	12 mm (0.72 in.)
C	M10 × P1.25
D	30 mm (1.18 in.)
E	M16 × P1.5
F	10 mm (0.39 in.)
G	20 mm (0.79 in.)
H	36 mm (1.42 in.)
I	64 mm (2.52 in.)
J	45 mm (1.77 in.)
K	20 mm (0.79 in.)

(1) Screw
M10 × P1.25 × L50 mm (2 in.)
(2) Screw
M16 × P1.5 × L50 mm (2 in.)
(3) Rocking Restrictor

W10545380



3TMACAN0P001A



3TMACAN0P002A

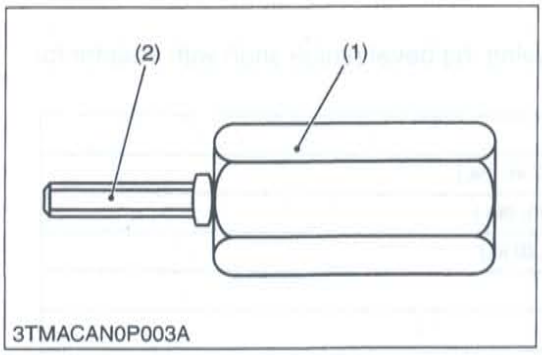
Sliding Hammer

Application : Use to removing the bevel pinion shaft with adaptor for front axle.

A	120 mm (4.72 in.)
B	14.5 mm dia. (0.57 in. dia.)
C	60 mm dia. (2.36 in. dia.)
D	Chamfer 5 mm (0.20 in.)
E	M14 x P1.5
F	25 mm (0.98 in.)
G	40 mm (1.57 in.)
H	450 mm (17.72 in.)
I	14 mm dia. (0.55 in. dia.)
J	50 mm dia. (1.97 in. dia.)
K	M14 x P1.5
L	10 mm (0.39 in.)
M	30 mm (1.18 in.)
N	110 mm (4.3 in.)
O	Chamfer 2 mm (0.08 in.)
P	25 mm dia. (0.98 in. dia.)

(1) Hammer
(2) Sliding Shaft
(3) Handle
(4) Nut (M14 x P1.5)

W10532280



3TMACAN0P003A

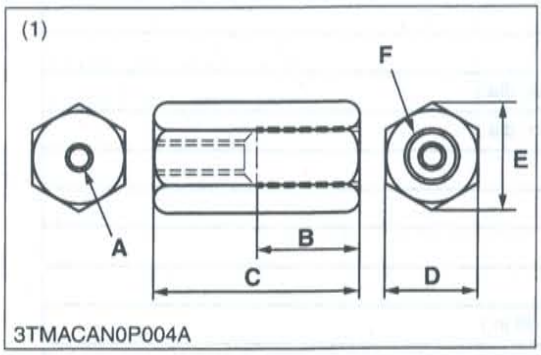
Adaptor for Sliding Hammer

Application : Use to removing the front axle bevel pinion shaft and hydraulic pump drive gear pin with sliding hammer.

	Front axle bevel pinion shaft	Hydraulic pump drive gear pin
A	M6 x P1.0	M8 x P1.25
B	25 mm (0.98 in.)	
C	50 mm (1.97 in.)	
D	23 mm (0.91 in.)	
E	27 mm (1.06 in.)	
F	M14 x P1.5	

(1) Adaptor (M6)
(2) Stud Bolt (M6 x P1.0)
Stud Bolt (M8 x P1.25)

W10124150



3TMACAN0P004A

LSD Adaptor

Application : Use for measuring the turning torque of LSD.

A	24.65 to 24.80 mm dia. (0.970 to 0.976 in. dia.)
B	131.85 to 132.15 mm (5.19 to 5.20 in.)
C	99.25 to 100.75 mm (3.91 to 3.97 in.)
D	54 to 60 mm full spline (2.12 to 2.36 in. full spline)
E	22.4 to 28.4 mm (0.88 to 1.11 in.)
F	4 to 6 mm (0.16 to 0.23 in.)
G	0.52 rad (30 °)
H	Involute spline (refer to below)
I	Chamfer 3.0 mm (0.12 in.)
J	1.05 rad (60 °)
K	29.5 to 30.5 mm dia. (1.16 to 1.20 in. dia.)
L	17.87 mm dia. (0.7 in. dia.)
M	13.95 to 14.25 mm dia. (0.55 to 0.56 in. dia.)
N	12.75 to 12.90 mm square (0.50 to 0.51 in. square)

(Involute Spline)

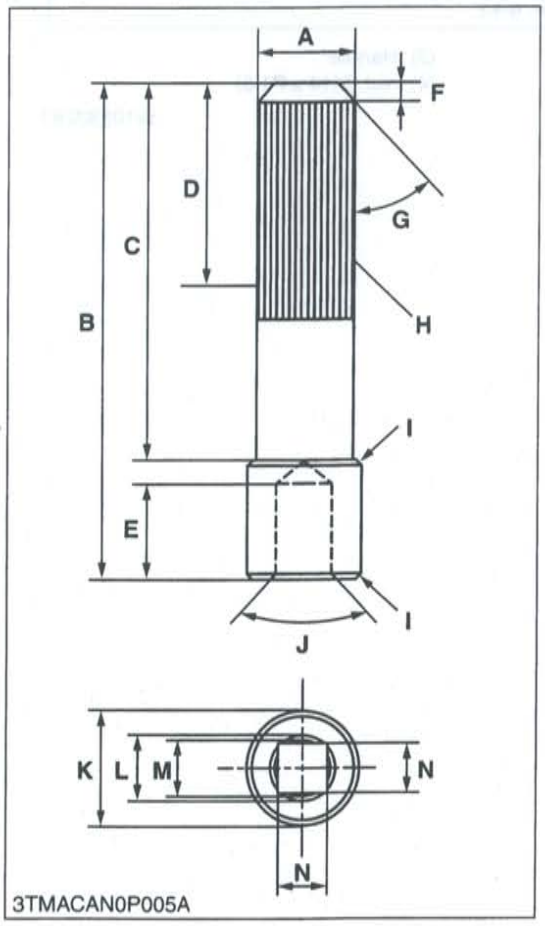
- EXTERNAL 25 x 24Z x 1.0 m x 30

Coefficient of profile shifting		0.000
Tool	Tooth form	Stub tooth
	Module	1.00
	Pressure angle	0.52 rad (30 °)
Number of teeth		24
Diameter of basic pitch circle		24 mm
Tooth thickness	Grade	Class a
	Over pitch diameter	26.534 to 26.645 mm (Pin diameter = 1.8 mm)

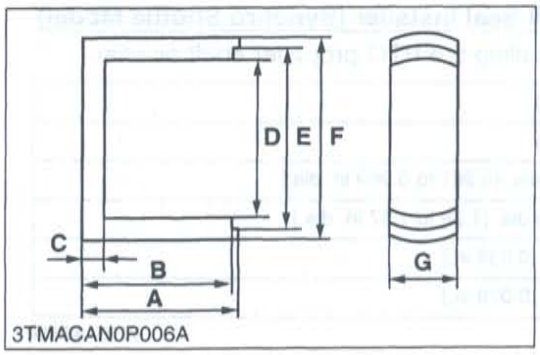
(Reference)

- This tool can be made by welding the yoke shaft R.H. (3C091-43210) and socket wrench.

W1088756



3TMACAN0P005A



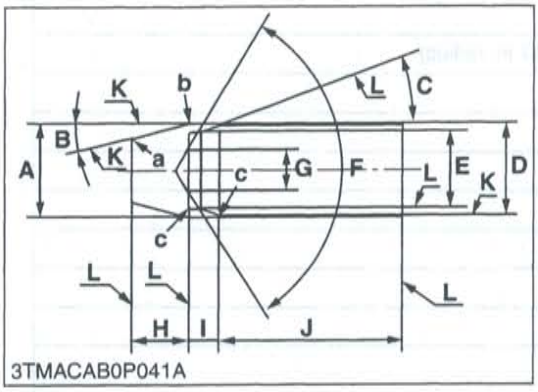
3TMACAN0P006A

Hydraulic Clutch Spring Compressor

Application: Use exclusively for pushing the spring, to remove the external circlip for hydraulic shuttle clutch and PTO hydraulic clutch.

	Hydraulic shuttle clutch	PTO hydraulic clutch
A	70 mm (2.76 in.)	70 mm (2.76 in.)
B	67.5 mm (2.66 in.)	67.5 mm (2.66 in.)
C	10 mm (0.39 in.)	10 mm (0.39 in.)
D	55 mm dia. (2.17 in. dia.)	80 mm dia. (3.15 in. dia.)
E	60.35 to 60.40 mm dia. (2.376 to 2.378 in. dia.)	85.35 to 85.40 mm dia. (3.360 to 3.362 in. dia.)
F	65 mm dia. (2.56 in. dia.)	90 mm dia. (3.54 in. dia.)
G	40 mm (1.57 in.)	40 mm (1.57 in.)

W1013752



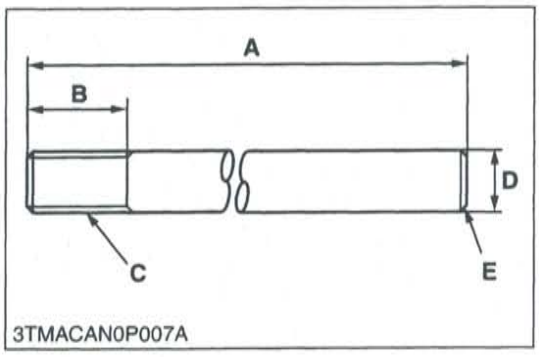
3TMACAB0P041A

PTO Propeller Shaft Guide (Synchro Shuttle Model)

Application: Use to installing the propeller shaft to 21T gear shaft.

A	24.85 to 24.95 mm dia. (0.9783 to 0.9823 in. dia.)
B	0.26 rad (15 °)
C	0.35 rad (20 °)
D	23.7 to 23.8 mm dia. (0.9331 to 0.9370 in. dia.)
E	20 mm dia. (0.79 in. dia.)
F	2.1 rad (120 °)
G	Under 12 mm dia. (0.47 in. dia.)
H	15 mm (0.59 in.)
I	8 mm (0.31 in.)
J	48 mm (1.89 in.)
K	Rmax = 25 S
L	Rmax = 6.3 S
a	1.0 mm radius (0.039 in. radius)
b	2.0 mm radius (0.079 in. radius)
c	0.8 mm radius (0.031 in. radius)

W1078372



3TMACAN0P007A

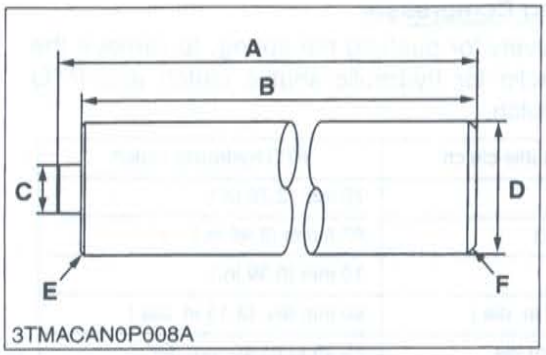
Guide Screw (Synchro Shuttle Model)

Application: Use for mounting the synchro shuttle together with PTO propeller shaft guide.

Quantity: 4 screws.

A	630 mm (24.8 in.)
B	20 mm (0.78 in.)
C	M10 x P1.25
D	10 mm dia. (0.39 in. dia.)
E	Chamfer 1.0 mm (0.039 in.)

W1014554



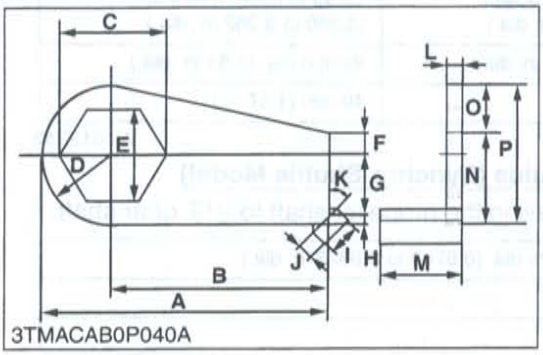
3TMACAN0P008A

PTO Propeller Shaft Oil Seal Installer (Synchro Shuttle Model)

Application : Use for installing the PTO propeller shaft oil seal.

A	200 mm (7.87 in.)
B	194 mm (7.64 in.)
C	24.4 to 24.6 mm dia. (0.961 to 0.969 in. dia.)
D	34.5 to 34.95 mm dia. (1.36 to 1.37 in. dia.)
E	Chamfer 1.0 mm (0.039 in.)
F	Chamfer 2.0 mm (0.078 in.)

W10148580



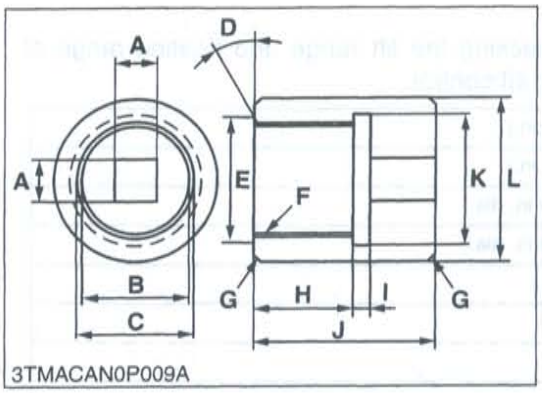
3TMACAB0P040A

Locking Wrench

Application : Use for locking pinion nut.

A	170 mm (6.69 in.)
B	130 mm (5.12 in.)
C	63.5 mm (2.5 in.)
D	40 mm radius (1.57 in. radius)
E	55 mm (2.17 in.)
F	15 mm (0.59 in.)
G	35 mm (1.38 in.)
H	5 mm (0.2 in.)
I	20 mm (0.55 in.)
J	10 mm (0.39 in.)
K	0.78 rad (45 °)
L	10 mm (0.39 in.)
M	50 mm (1.97 in.)
N	55 mm (2.17 in.)
O	25 mm (0.97 in.)
P	80 mm (3.15 in.)

W1034911



3TMACAN0P009A

Bevel Gear Shaft (9T) Tool

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

A	12.75 to 12.90 mm square (0.50 to 0.51 in. square)
B	30.000 to 30.025 mm dia. (1.1811 to 1.1821 in. dia.)
C	32.5 mm dia. (1.28 in. dia.)
D	0.52 rad (30 °)
E	32.6 to 33.0 mm dia. (1.28 to 1.29 in. dia.)
F	Involute spline (refer to below)
G	Chamfer 1.0 mm (0.039 in.)
H	30 mm (1.18 in.)
I	5 mm (0.19 in.)
J	55 mm (2.17 in.)
K	40 mm dia. (1.57 in. dia.)
L	50 mm dia. (1.97 in. dia.)

(Involute Spline)

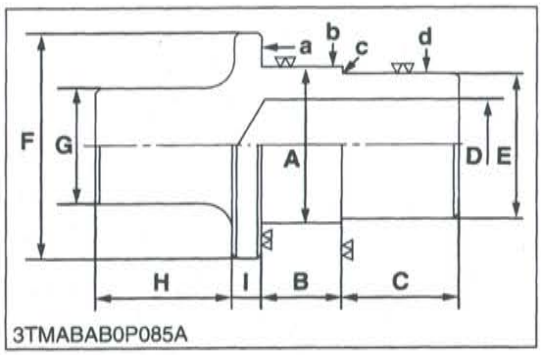
- INTERNAL 35 x 26Z x 1.25 m x 20

Coefficient of profile shifting		+0.800
Tool	Tooth form	Stub tooth
	Module	1.250
	Pressure angle	0.35 rad (20 °)
Number of teeth		24
Diameter of basic pitch circle		32.50 mm
Tooth thickness	Grade	Class a
	Between pin diameter	27.584 to 27.656 mm (Pin diameter = 2.50 mm)

(Reference)

- This tool can be made by welding the coupling (3C081-28910) and socket wrench.

W1015236



3TMABAB0P085A

Hydraulic Arm Shaft Bushing Press-Fitting Tool

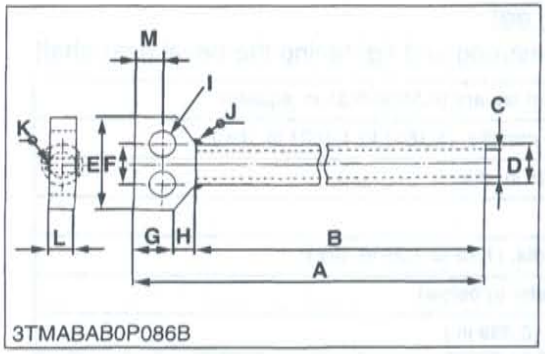
Application : Use for replacing the hydraulic arm shaft bushings in the hydraulic cylinder body.

■ **NOTE**

- **Unless otherwise specified : All surface 12.5 μm (0.0005 in.)**

A	49.85 to 49.95 mm (1.963 to 1.966 in.)
B	15 mm (0.59 in.)
C	50 mm (1.969 in.)
D	30 mm (1.18 in.)
E	44.85 to 44.95 mm (1.766 to 1.770 in.)
F	78 mm dia. (3.07 in. dia.)
G	40 mm dia. (1.57 in. dia.)
H	50 mm (1.97 in.)
I	20 mm (0.79 in.)
a	6.3 μm (0.00025 in.)
b	6.3 μm (0.00025 in.)
c	6.3 μm (0.00025 in.)
d	6.3 μm (0.00025 in.)

W10316550



3TMABAB0P086B

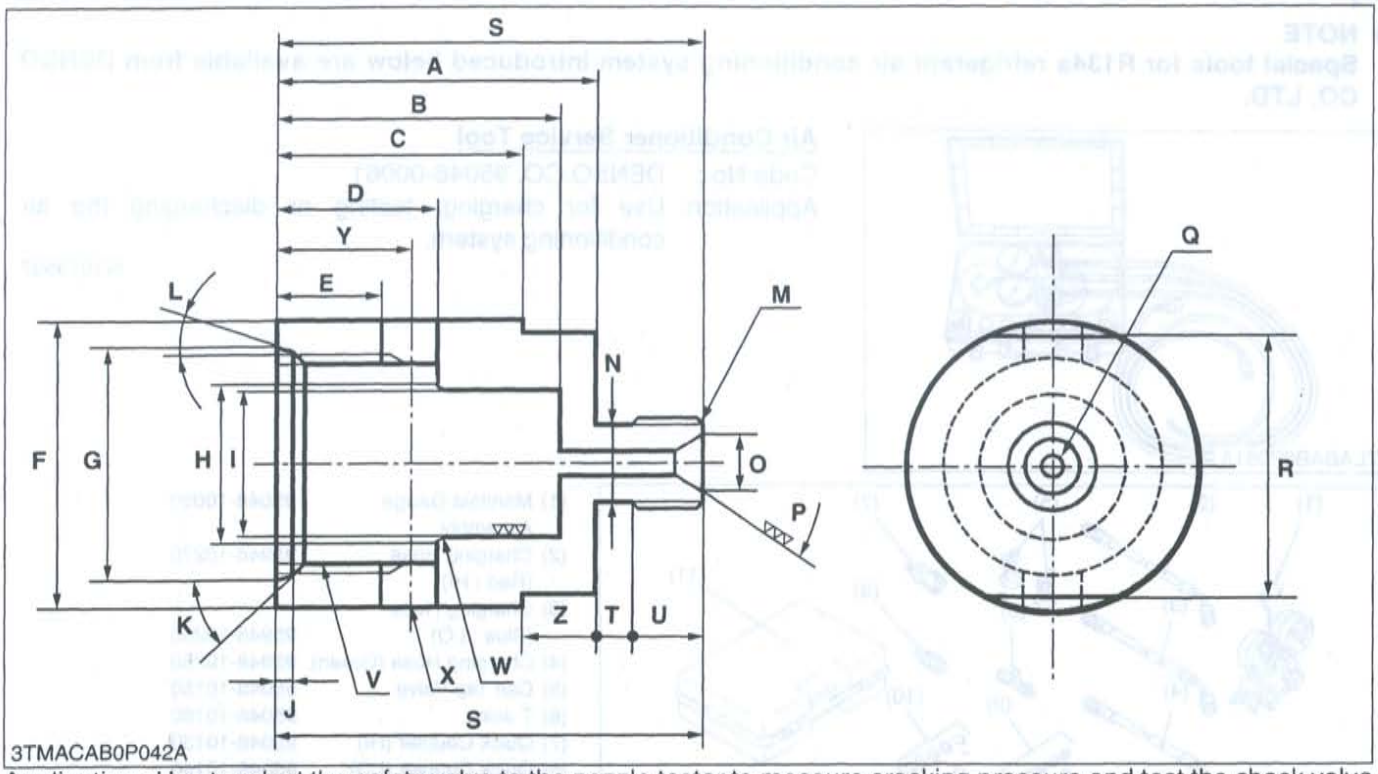
Draft Control Test Bar

Application : Use for checking the lift range and floating range of hydraulic draft control.

A	1045 mm (41.14 in.)
B	1000 mm (29.37 in.)
C	20 mm dia. (0.79 in. dia.)
D	30 mm dia. (1.18 in. dia.)
E	100 mm (3.94 in.)
F	35.5 mm (1.4 in.)
G	30 mm (1.18 in.)
H	15 mm (0.59 in.)
I	20 mm dia. (0.79 in. dia.)
J	Weld all around
K	Weld all around
L	20 mm (0.79 in.)
M	26 mm (1.02 in.)

W1062519

Cylinder Safety Valve Setting Pressure Adaptor



3TMACAB0P042A

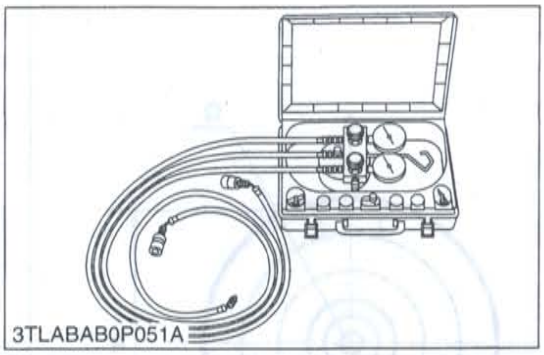
Application : Use to adapt the safety valve to the nozzle tester to measure cracking pressure and test the check valve on the safety valves.

A	45 mm (1.77 in.)	N	10 mm dia. (0.39 in. dia.)
B	40 mm (1.58 in.)	O	7.5 mm dia. (0.3 in. dia.)
C	35 mm (13.8 in.)	P	1.05 rad (60 °)
D	23 to 23.3 mm (0.9055 to 0.9713 in.)	Q	3 mm dia. (1.18 in. dia.)
E	16 mm (0.63 in.)	R	36 mm (1.18 in.)
F	40 mm dia. (1.58 in. dia.)	S	60 mm (2.36 in.)
G	32.4 to 32.7 mm dia. (1.2756 to 1.2874 in. dia.)	T	5 mm (0.20 in.)
H	21 mm dia. (0.83 in. dia.)	U	10 mm (0.39 in.)
I	20 to 20.05 mm dia. (0.7874 to 0.7894 in. dia.)	V	M30 × P1.5
J	2.5 to 2.59 mm (0.0984 to 0.1097 in.)	W	0.52 rad (30 °)
K	0.79 rad (45 °)	X	8 mm dia. (0.32 in. dia.)
L	0.26 rad (15 °)	Y	19 mm (0.75 in.)
M	M12 × P1.5	Z	10 mm (0.39 in.)

[3] SPECIAL TOOLS FOR AIR CONDITIONER UNIT

■ **NOTE**

- **Special tools for R134a refrigerant air conditioning system introduced below are available from DENSO CO. LTD.**

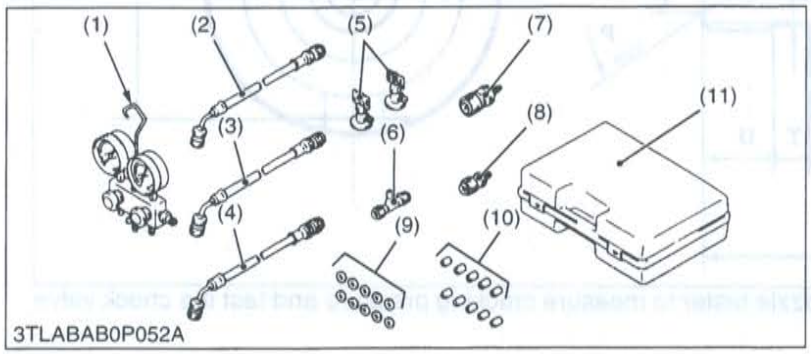

3TLABAB0P051A

Air Conditioner Service Tool

Code No.: DENSO.CO. 95048-00061

Application: Use for charging, testing or discharging the air conditioning system.

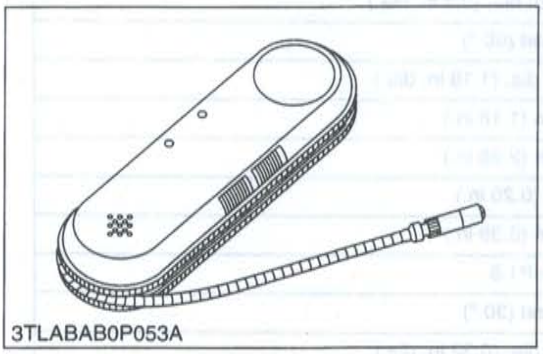
W1013507



3TLABAB0P052A

(1)	Manifold Gauge Assembly	95048-10090
(2)	Charging Hose (Red : HI)	95948-10270
(3)	Charging Hose (Blue : LO)	95948-10280
(4)	Charging Hose (Green)	95948-10260
(5)	Can Tap Valve	95048-10150
(6)	T Joint	95048-10160
(7)	Quick Coupler (HI)	95048-10130
(8)	Quick Coupler (LO)	95048-10140
(9)	Service Valve Packing	95906-10310
(10)	Charging Hose Packing	95906-10300
(11)	Tool Case	95949-10610

W1014733

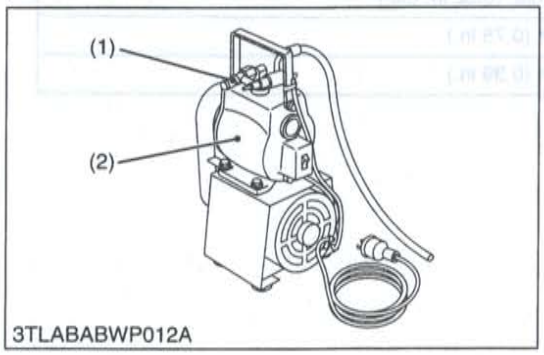

3TLABAB0P053A

Electric Gas Leak Tester

Code No.: DENSO.CO. 95146-00060

Application: Use for gas leak testing the air conditioning system.

W1013817



3TLABABWP012A

Vacuum Pump

Code No.: DENSO.CO. 95046-00040 (AC220V)
95046-00050 (AC240V)

Application: Use for evacuating the air conditioning system.

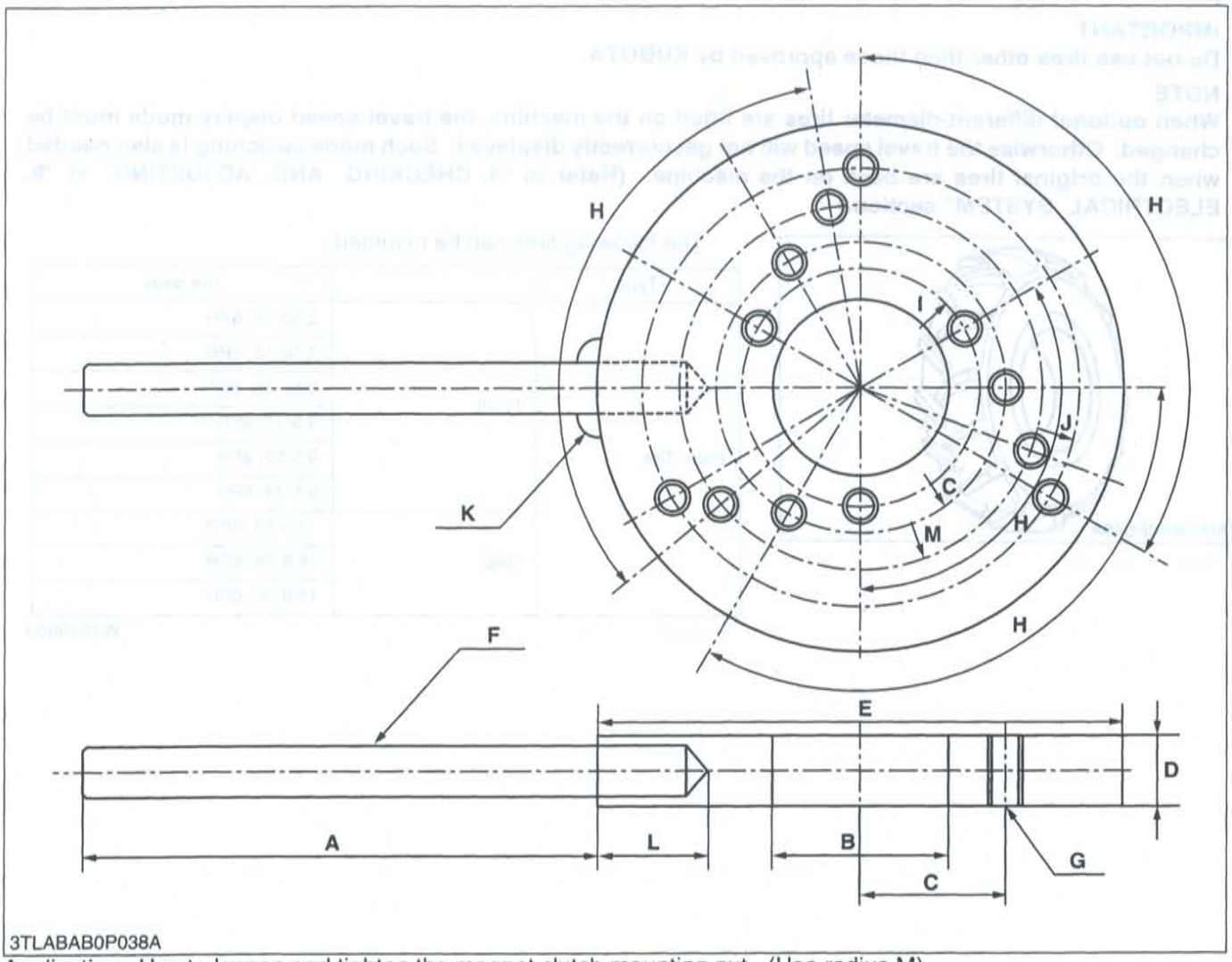
(1) Adaptor (For 134a) (2) Vacuum Pump

W1013764

■ **NOTE**

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

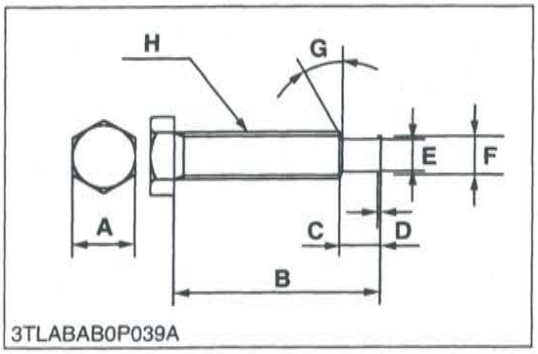
Stopper Magnet Clutch (For A/C Compressor)



3TLABAB0P038A

Application: Use to loosen and tighten the magnet clutch mounting nut. (Use radius M)

A	125 mm (4.92 in.)	H	4.52 rad (120 °)
B	40 mm dia. (1.57 in. dia.)	I	Radius 27 mm (Radius 1.06 in.)
C	Radius 33 mm (Radius 1.30 in.)	J	Radius 50 mm (Radius 1.97 in.)
D	16 mm (0.63 in.)	K	Weld all around
E	120 mm dia. (4.72 in. dia.)	L	20 mm (0.78 in.)
F	12 mm dia. (0.47 in. dia.)	M	Radius 41 mm (Radius 1.61 in.)
G	3 × M8 × 1.25 All screws		



3TLABAB0P039A

Stopper Bolt (for A/C Compressor)

Application : Use with the stopper magnet clutch.

A	12 mm (0.47 in.)	E	5.5 mm dia. (0.22 in. dia.)
B	35 mm (1.38 in.)	F	6.5 mm dia. (0.26 in. dia.)
C	7 mm (0.28 in.)	G	0.52 rad (30 °)
D	0.4 mm (0.016 in.)	H	M8 × P1.25

W1065437

9. TIRES

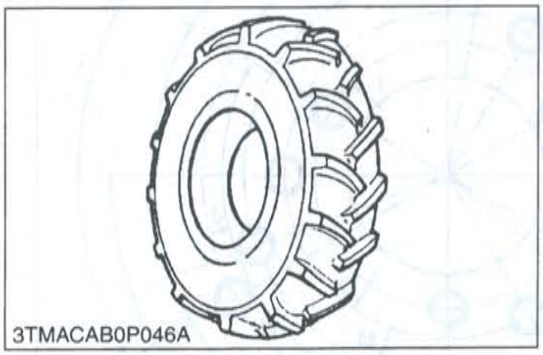
[1] TYPE OF TIRES

■ **IMPORTANT**

- **Do not use tires other than those approved by KUBOTA.**

■ **NOTE**

- **When optional different-diameter tires are fitted on the machine, the travel speed display mode must be changed. Otherwise the travel speed will not get correctly displayed. Such mode switching is also needed when the original tires are back on the machine. (Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.)**


3TMACAB0P046A

The following tires can be mounted.

Type		Tire sizes
Farm Tire	Front	6.50-16, 6PR
		7.50-16, 6PR
		9.5L-15, 6PR
		9.5-20, 6PR
		9.5-22, 6PR
		9.5-24, 6PR
	Rear	14.9-28, 6PR
		16.9-28, 6PR
		16.9-30, 6PR

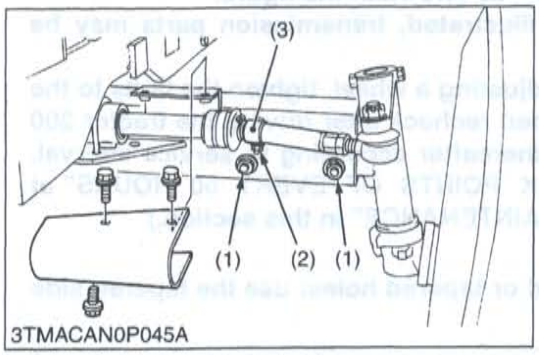
W1019656

[2] TREAD ADJUSTMENT

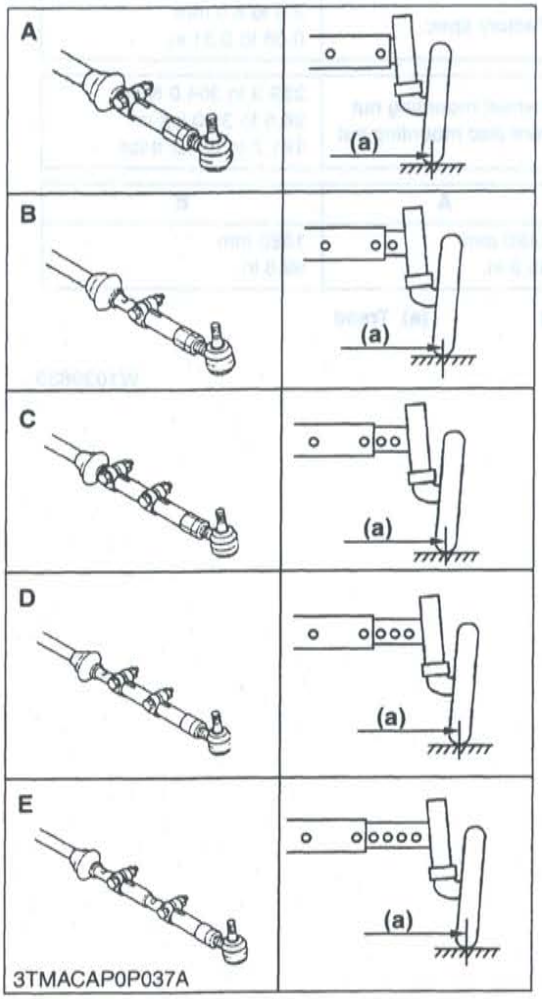
CAUTION

- **When working on slopes or when working with trailer, set the wheel tread as wide as practical for maximum stability.**
- **Support tractor securely on stands before removing a wheel.**
- **Do not work under any hydraulically supported devices. They can settle, suddenly leak down, or be accidentally lowered. If necessary to work under tractor or any machine elements for servicing or adjustment, securely support them with stands or suitable blocking beforehand.**
- **Never operate tractor with a loose rim, wheel, or axle.**

(1) Front Wheels [2WD Model]



3TMACAN0P045A



3TMACAP0P037A

Front tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

1. Remove the front axle mounting bolts (1)and the tie-rod mounting bolt (2).
2. Move the front axles (right and left) to the desired position, and tighten the bolts.
3. Adjust the toe-in. (Refer to "[5] CHECK POINTS OF EVERY 200 HOURS" at "7. CHECK AND MAINTENANCE" in this section.)

Toe-in	Factory spec.	1.0 to 5.0 mm 0.04 to 0.20 in.

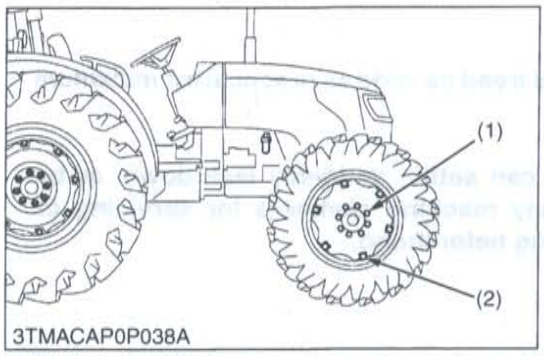
Tightening torque	Front axle mounting bolt	124 to 147 N·m 12.6 to 15.0 kgf·m 91.5 to 108.9 ft-lbs
	Tie-rod mounting bolt	61 to 71 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs

	A	B	C	D	E
Tread (a)	1420 mm 55.9 in.	1520 mm 59.8 in.	1620 mm 63.8 in.	1720 mm 67.7 in.	1820 mm 71.7 in.

(1) Front Axle Mounting Bolt
(2) Tie-rod Mounting Bolt
(3) Tie-rod Clamp
(4) Extension 1 (a short spacer)
(5) Extension 2 (a long spacer)
(a) Tread

W1082120

(2) Front Wheels [4WD Model]



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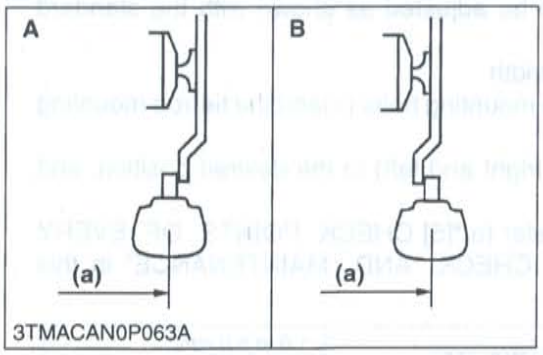


3TMACAN0P063A

Front tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

1. Remove the wheel rim and disc mounting bolts.
2. Change the position of the rim and disc (right and left) to the desired position, and tighten the bolts.
3. Adjust the toe-in. (Refer to "[5] CHECK POINTS OF EVERY 200 HOURS" at "7. CHECK AND MAINTENANCE" in this section.)

■ **IMPORTANT**

- **Always attach wheels as shown in the figure.**
- **If not attached as illustrated, transmission parts may be damaged.**
- **When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval. (Refer to "[5] CHECK POINTS OF EVERY 50 HOURS" at "7. CHECK AND MAINTENANCE" in this section.)**

■ **NOTE**

- **Wheels with beveled or tapered holes: use the tapered side of lug nut.**

Toe-in	Factory spec.	2.0 to 8.0 mm 0.08 to 0.31 in.

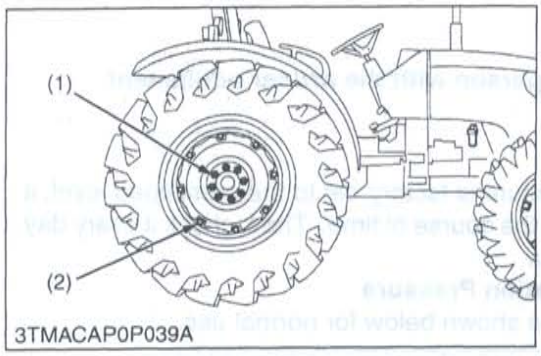
Tightening torque	Front wheel mounting nut and front disc mounting nut	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

	A	B
Tread **(a)**	1420 mm 55.9 in.	1520 mm 59.8 in.

(1) Front Wheel Mounting Nut
(2) Front Disc Mounting Nut
(a) Tread

W1039833

(3) Rear Wheels



3TMACAP0P039A

Rear tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

1. Remove the wheel rim and / or disc mounting bolts.
2. Change the position of the rim and disc (right and left) to the desired position, and tighten the bolts.

■ **IMPORTANT**

- **Always attach wheels as shown in the figure.**
- **If not attached as illustrated, transmission parts may be damaged.**
- **When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval. (Refer to "[5] CHECK POINTS OF EVERY 50 HOURS" at "7. CHECK AND MAINTENANCE" in this section.)**

Tightening torque	Rear wheel mounting nut and rear disc mounting nut	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 ft-lbs

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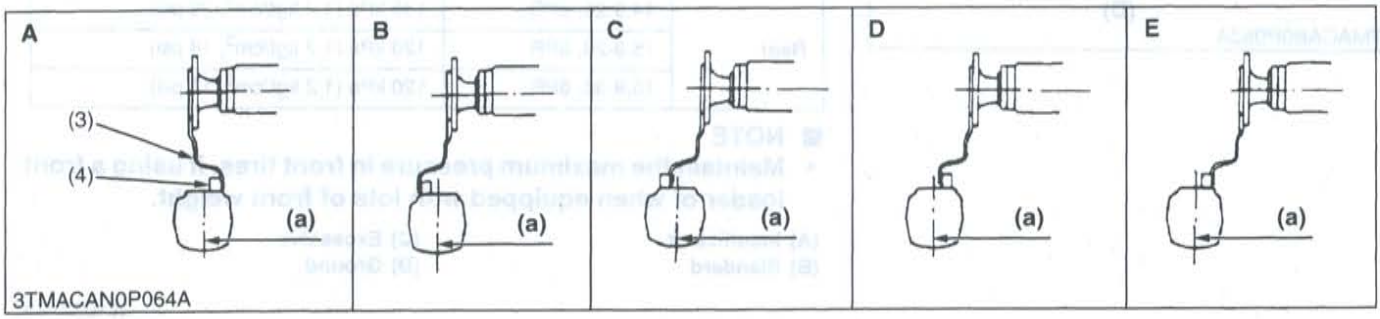
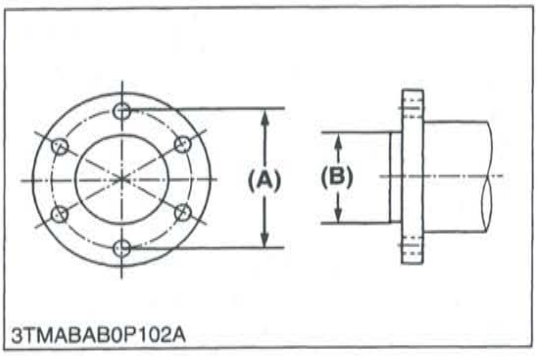


3TMACAN0P064A

Tread (a)	A	B	C	D	E
14.9-28 (M5040)	1320 mm 52.0 in.	1420 mm 55.9 in.	1520 mm 59.8 in.	1620 mm 63.8 in.	1720 mm 67.7 in.
16.9-28 (M6040)	–				
16.9-30 (M7040)	–				

(1) Rear Wheel Mounting Nut
(2) Rear Disc Mounting Nut
(3) Rear Wheel Disc
(4) Rear Wheel Rim
(a) Tread

[3] WHEEL HUB



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	Front wheel hub		Rear wheel hub
	2WD	4WD	–
Screw circle diameter (A)	152.4 mm (6 in.)	203.2 mm (8 in.)	203.2 mm (8 in.)
Number of screws	6	8	8
Screws	M14 × P1.5	M16 × P1.5	M16 × P1.5
Hub pilot diameter (B)	114.0 mm (4.488 in.)	152.4 mm (6 in.)	152.4 mm (6 in.)

W1043392

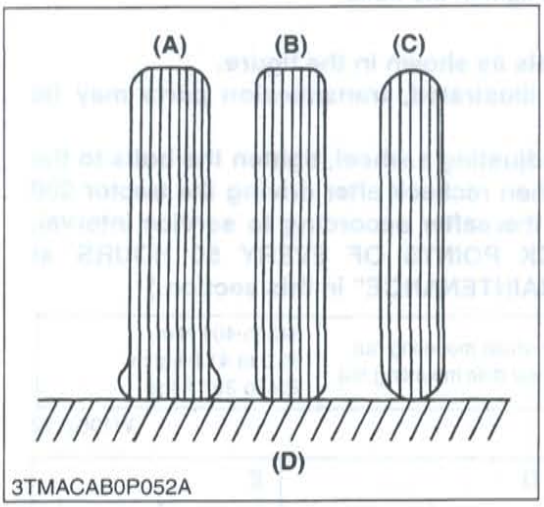
[4] TIRE PRESSURE

CAUTION

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

■ **IMPORTANT**

- **Excessive wear of tires may occur due to improper gear ratio.**



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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.

■ **Recommended Inflation Pressure**

- Maintain the pressure shown below for normal use.

	Tire sizes	Inflation pressure
Front	6.50-16, 6PR	320 kPa (3.2 kgf/cm^2, 46 psi)
	7.50-16, 6PR	280 kPa (2.8 kgf/cm^2, 40 psi)
	9.5L-15, 6PR	220 kPa (2.2 kgf/cm^2, 32 psi)
	9.5-20, 6PR	200 kPa (2.0 kgf/cm^2, 29 psi)
	9.5-22, 6PR	200 kPa (2.0 kgf/cm^2, 29 psi)
	9.5-24, 6PR	180 kPa (1.8 kgf/cm^2, 26 psi)
Rear	14.9-28, 6PR	140 kPa (1.4 kgf/cm^2, 20 psi)
	16.9-28, 6PR	120 kPa (1.2 kgf/cm^2, 18 psi)
	16.9-30, 6PR	120 kPa (1.2 kgf/cm^2, 18 psi)

■ **NOTE**

- **Maintain the maximum pressure in front tires, if using a front loader of when equipped with lots of front weight.**

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

W1027488

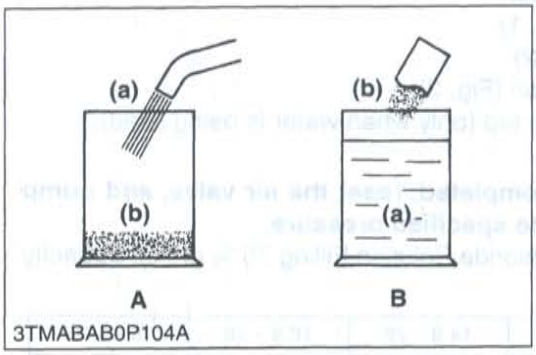
[5] TIRE LIQUID INJECTION

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

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.**



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Preparation of Calcium Chloride Solution

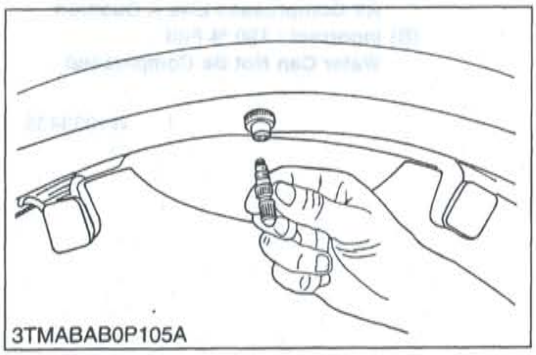
CAUTION

- **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)
–33 °C (–22 °F)	44 kg (97.0 lbs)
–35 °C (–31 °F)	49 kg (108.0 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)**

W1033083



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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

W1033331

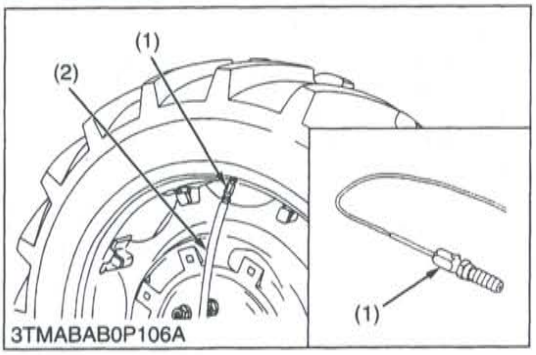

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Fig. 1

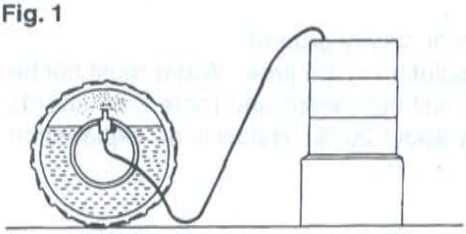


Fig. 2

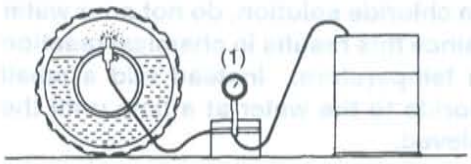
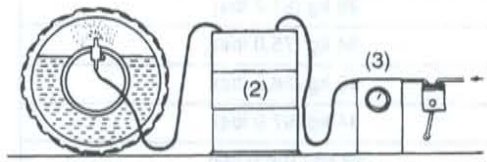


Fig. 3



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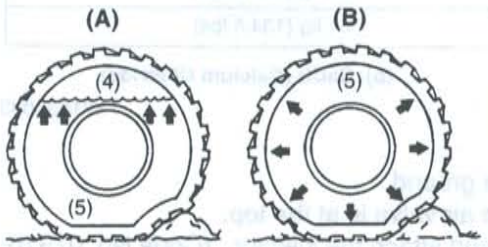

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Injection

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).**

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.**

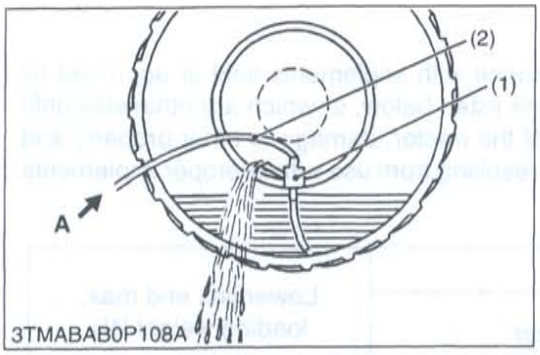
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

Tire sizes	14.9 – 28	16.9 – 28	16.9 – 30
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]	230 kg (570 lbs)	295 kg (651 lbs)	314 kg (693 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]	247 kg (545 lbs)	317 kg (699 lbs)	338 kg (746 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]	260 kg (574 lbs)	339 kg (747 lbs)	357 kg (787 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

W1033435



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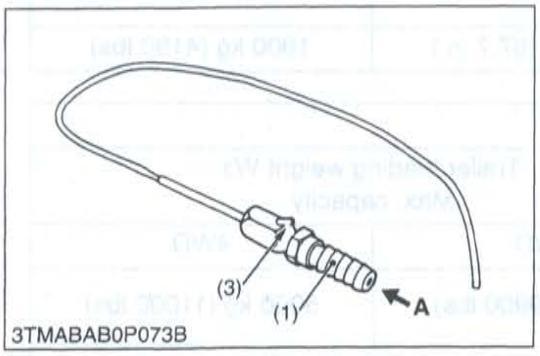


3TMABAB0P073B

Draining Water or Solution

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the bottom.
3. Remove the air valve, and drain liquid (liquid can only be drained to the level of the valve and liquid under that level remains inside).
4. To drain liquid completely, use the injector (1), and direct compressed air into the tire to force out the liquid through the injector's vent (3).

(1) Injector
(2) Hose
(3) Vent

A: Compressed Air

W1045167

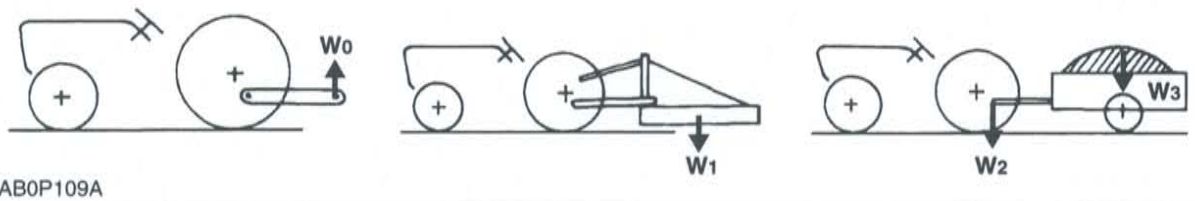
10. IMPLEMENT LIMITATIONS

The KUBOTA Tractor has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use with implements 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 W_0
Front		Rear	
2WD	4WD		
1820 mm (71.7 in.)	1520 mm (59.8 in.)	1720 mm (67.7 in.)	1900 kg (4190 lbs)

Actual figures			
Implement Weight W_1 and / or size	Max. Drawbar Load W_2	Trailer loading weight W_3 Max. capacity	
		2WD	4WD
As in the following list (shown on the next page)	1000 kg (2200 lbs)	4500 kg (9900 lbs)	5000 kg (11000 lbs)

Lower link end max. hydraulic lifting capacity .....W_0
Implement weight.....The implement's weight which can be put on the lower link : W_1
Max. drawbar load .....W_2
Trailer loading weight .....The max. loading weight for trailer (without trailer's weight) : W_3



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■ **NOTE**

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

No.	Implement		Remarks		M5040, M6040		M7040	
					2WD	4WD	2WD	4WD
1	Slurry Tank		Max. Tank Capacity		3000 L (790 U.S.gals., 660 Imp.gals.)			
			Max. Load Capacity		4000 kg (8800 lbs)			
2	Trailer		Max. Load Capacity		4500 kg (9900 lbs)	5000 kg (11000 lbs)	4500 kg (9900 lbs)	5000 kg (11000 lbs)
			Max. Drawbar Load		1000 kg (2200 lbs)			
3	Mower	Rotary-Cutter	Max. Cutting Width		2130 mm (84 in.)			
			Max. Weight		540 kg (1200 lbs)			
		Flail Mower (Heavy)	Max. Cutting Width		3050 mm (120 in.)			
			Max. Weight		800 kg (1760 lbs)			
		Sickle Bar	Max. Cutting Width		2130 mm (84 in.)			
4	Sprayer		Max. Tank-capacity	Mid	680 L (180 U.S.gals., 150 Imp.gals.)			
				Rear 3-point Hitch	680 L (180 U.S.gals., 150 Imp.gals.)			
				Draw-bar	3000 L (800 U.S. gals. 660 Imp.gals.)	3500 L (920 U.S.gals. 770 Imp.gals.)		4000 L (1030 U.S.gals. 880 Imp.gals.)
5	Rotary Tiller		Max. Tilling Width		2130 mm (84 in.)		2330 mm (91 in.)	
			Max. Weight		800 kg (1760 lbs)			
6	Bottom Plow		Max. Size		16 in. × 2 18 in. × 1	14 in. × 3 16 in. × 2 18 in. × 1	14 in. × 3 16 in. × 2	16 in. × 3 18 in. × 2
			Max. Weight (3-point Hitch Type)		450 kg (1000 lbs)		550 kg (1200 lbs)	
7	Disc-harrow	3-point Hitch Type	Max. Size		18 in. × 24			20 in. × 24
			Max. Harrowing Width		2130 mm (84 in.)			2450 mm (96 in.)
			Max. Weight		450 kg (1000 lbs)		550 kg (1200 lbs)	
		Drawbar Type	Max. Harrowing Width		2450 mm (96 in.)	2750 mm (108 in.)		3050 mm (120 in.)
8	Disc Plow		Max. Size		24 in. × 3 26 in. × 2			26 in. × 3
			Max. Weight		450 kg (1000 lbs)		550 kg (1200 lbs)	

W1012736

No.	Implement	Remarks	M5040, M6040		M7040	
			2WD	4WD	2WD	4WD
9	Sub Soiler	Numbers of Cultivating Tines	2			
		Cultivating Depth	300 mm (12 in.)	400 mm (16 in.)		450 mm (18 in.)
10	Cultivator	Max. Width	3050 mm (120 in.)	3660 mm (144 in.)		4270 mm (168 in.)
		Number of Rows	4			
		Max. Weight	450 kg (1000 lbs)		550 kg (1200 lbs)	
11	Front Blade*1, *2	Max. Cutting Width	1820 mm (72 in.)			2130 mm (84 in.)
		Max. Oil Pressure	19.6 MPa (200 kgf/cm^2, 2844 psi)			
12	Rear Blade	Max. Cutting Width	1820 mm (72 in.)			2130 mm (84 in.)
		Max. Oil Pressure	19.6 MPa (200 kgf/cm^2, 2844 psi)			
13	Front Loader*1, *2	Max. Lifting Capacity	1150 kg (2535 lbs)			
		Max. Oil Pressure	19.6 MPa (200 kgf/cm^2, 2844 psi)			
14	Box Blade	Max. Cutting Width	1820 mm (72 in.)			2130 mm (84 in.)
		Max. Weight	450 kg (1000 lbs)		550 kg (1200 lbs)	
15	Back Hoe*2	Max. Digging Depth	2530 mm (100 in.)			
		Max. Weight	900 kg (2000 lbs)			
16	Snow Blade	Max. Width	1820 mm (72 in.)			2130 mm (84 in.)
		Max. Weight	450 kg (1000 lbs)			550 kg (1200 lbs)

■ **NOTE**

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

***1 : Must remove front weight with this implement.**

***2 : Need subframe.**

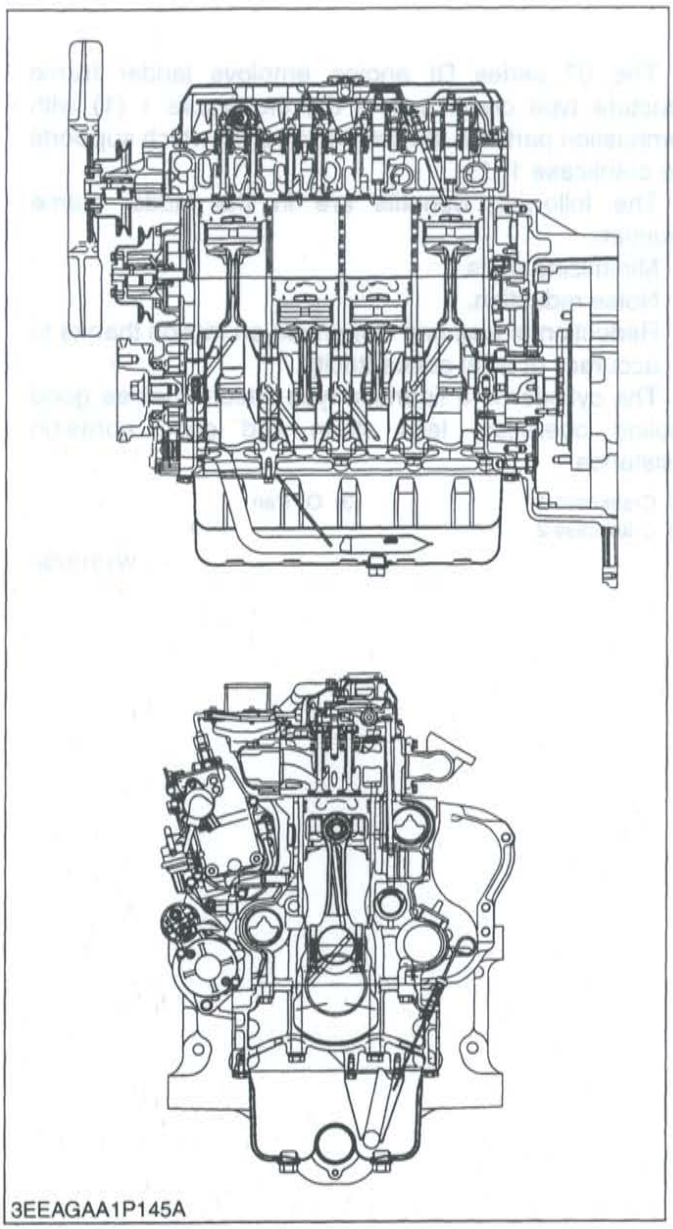
W1043839

1 ENGINE

MECHANISM

CONTENTS

1. FEATURE



3EEAGAA1P145A

The 07 series DI engine are the vertical type 4-cycle diesel engine featuring the advanced performances shown below.

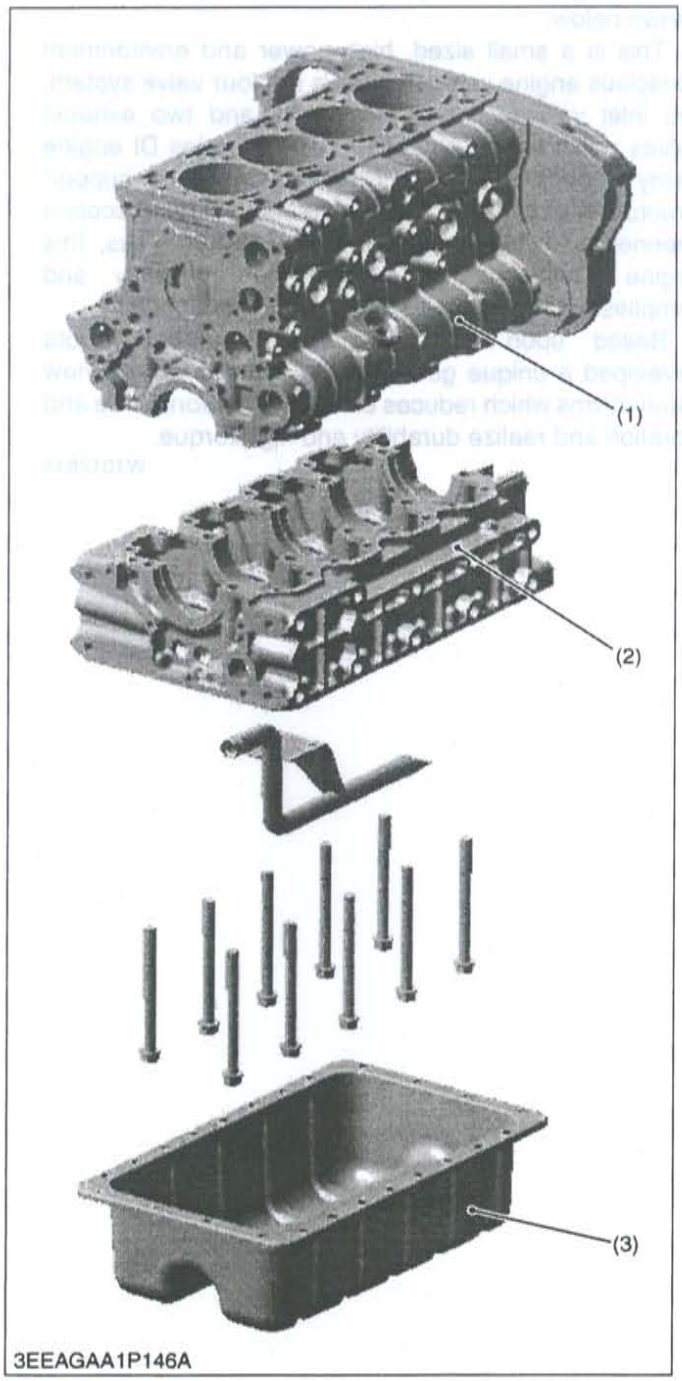
This is a small sized, high power and environment conscious engine, which employs the four valve system, two inlet valves with double ports, and two exhaust valves with the new E-CDIS. The 07 series DI engine newly adopted ladder frame crankshaft support structure, gear train located at flywheel side and coolant evenness distribution type cooling jacket. Thus, this engine achieves high combustion efficiency and complies with various regulations of exhaust gas.

Based upon the conventional model, Kubota developed a unique governor system and various new mechanisms which reduces exhaust emission, noise and vibration and realize durability and high torque.

W1012645

2. ENGINE BODY

[1] CYLINDER BLOCK



3EEAGAA1P146A

The 07 series DI engine employs ladder frame structure type crankcases - the crankcase 1 (1) with combustion part and the crankcase 2 (2) which supports the crankcase 1 (1).

The following benefits are in the ladder frame structure.

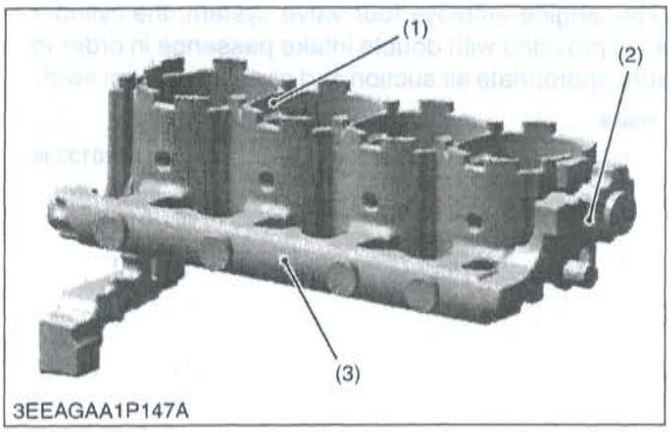
1. Minimizing parts.
2. Noise reduction.
3. Reduction of loss and dispersion on friction thanks to accuracy of axial concentricity.

The cylinder is a linerless type which enables good cooling operation, less strain and good abrasion resistance.

(1) Crankcase 1
(2) Crankcase 2
(3) Oil Pan

W1012790

[2] COOLING JACKET



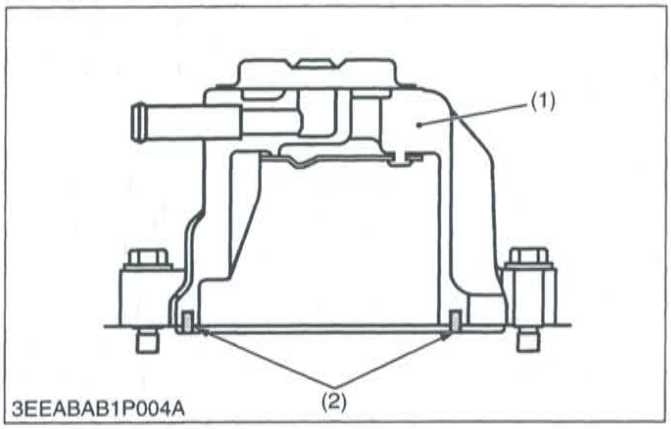
3EEAGAA1P147A

The 07 series DI engine employs coolant evenness distribution type cooling jacket inside crankcase 1. The coolant is evenly supplied to each cylinder through the main gallery in the jacket mold core.

(1) Coolant Passage between Cylinder
(2) Jacket Mold Core
(3) Main Gallery

W1013000

[3] HALF-FLOATING HEAD COVER



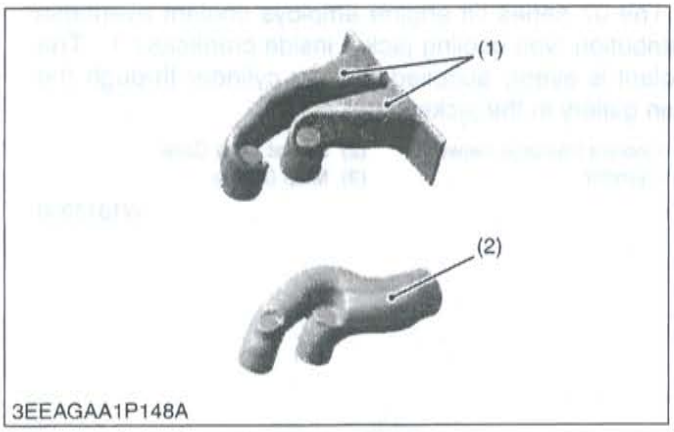
3EEABAB1P004A

The rubber packing is fitted in to maintain the head cover 0.5 mm (0.02 in.) or so off the cylinder head. This arrangement helps reduce noise coming from the cylinder head.

(1) Cylinder Head Cover
(2) Rubber Packing

W1013327

[4] CYLINDER HEAD



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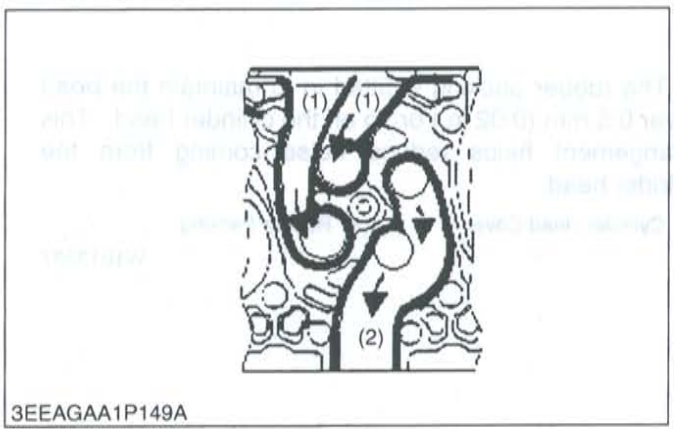


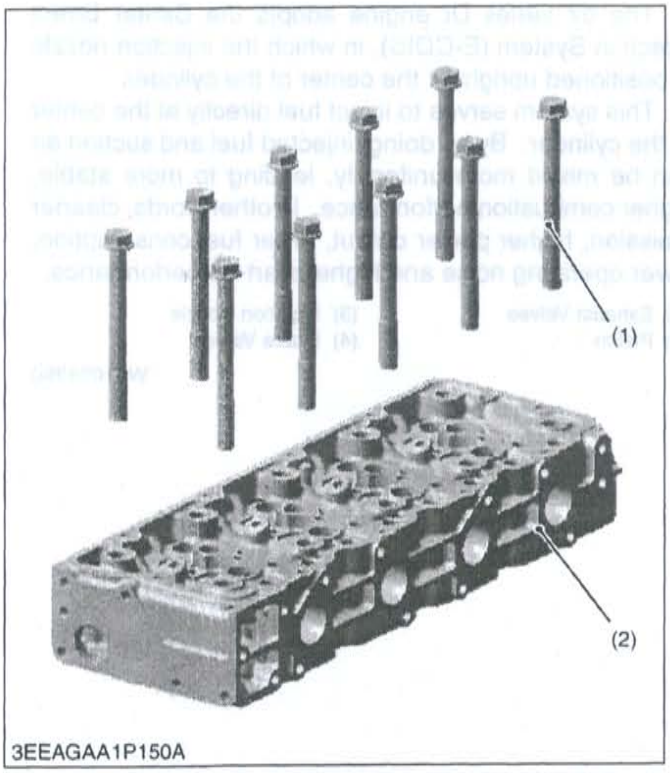
3EEAGAA1P149A

This engine employs four valve system, the cylinder head is provided with double intake passenge in order to ensure appropriate air suction and give an optimum swirl.

(1) Intake (2) Exhaust

W1013336

[5] 4 SCREWS PER EACH CYLINDER ASSEMBLING STRUCTURE



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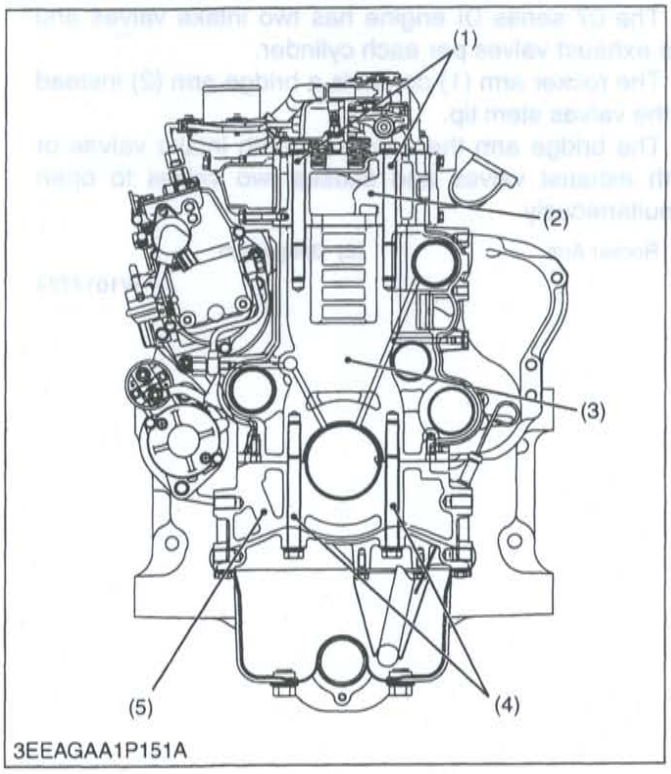


3EEAGAA1P151A

The 07 series DI engine employs 4 screws per each cylinder assembling structure.

The cylinder head (2) and the crankcase 2 (5) are assembled from the top and bottom to the crankcase 1 (3) with each of 10 screws.

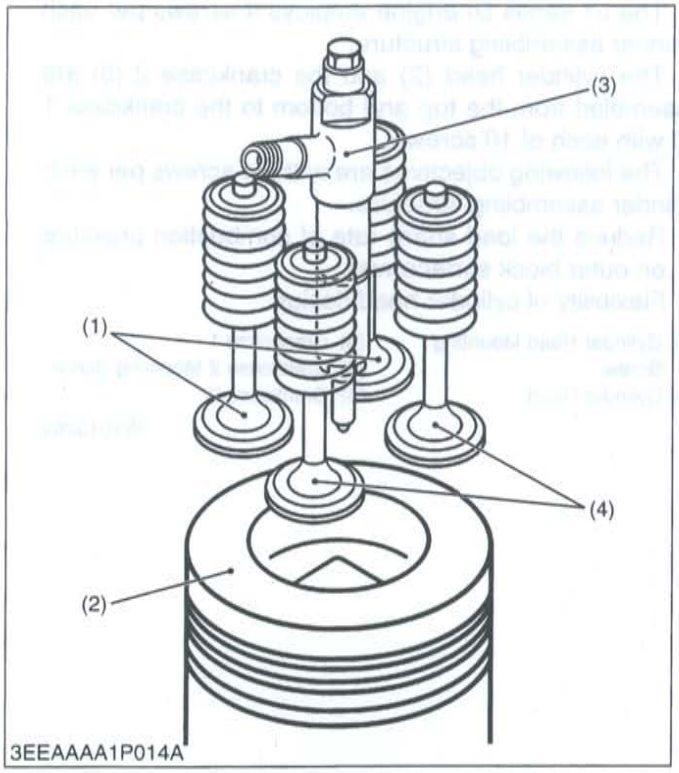
The following objectives are in the 4 screws per each cylinder assembling structure.

1. Reduce the load share rate of combustion pressure on outer block surface wall.
2. Flexibility of cylinder head design.

(1) Cylinder Head Mounting Screw
(2) Cylinder Head
(3) Crankcase 1
(4) Crankcase 2 Mounting Screw
(5) Crankcase 2

W1013265

[6] CENTER DIRECT INJECTION SYSTEM (E-CDIS)



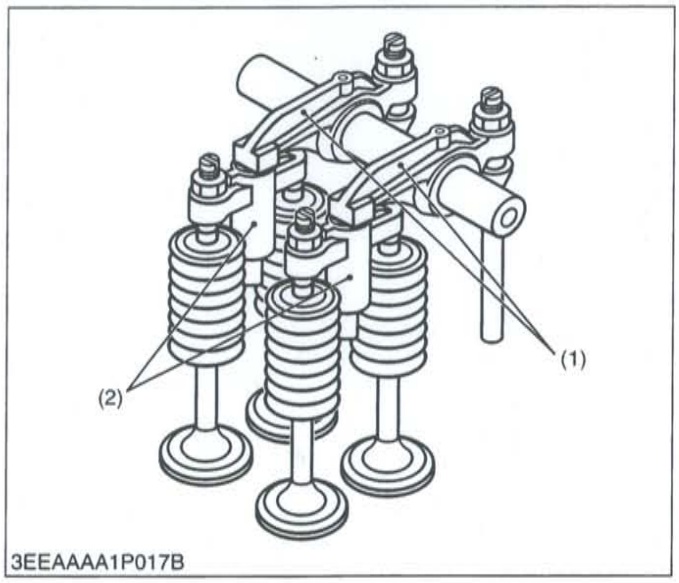
3EEAAAA1P014A

The 07 series DI engine adopts the Center Direct Injection System (E-CDIS), in which the injection nozzle is positioned upright at the center of the cylinder.

This system serves to inject fuel directly at the center of the cylinder. By so doing, injected fuel and suction air can be mixed more uniformly, leading to more stable, higher combustion performance. In other words, cleaner emission, higher power output, lower fuel consumption, lower operating noise and higher start-up performance.

(1) Exhaust Valves
(2) Piston
(3) Injection Nozzle
(4) Intake Valves

W11094950



3EEAAAA1P017B

The 07 series DI engine has two intake valves and two exhaust valves per each cylinder.

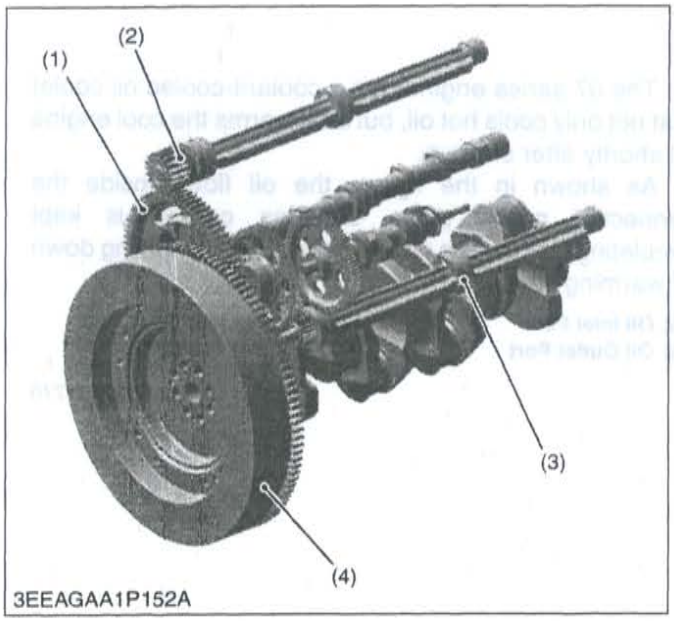
The rocker arm (1) contacts a bridge arm (2) instead of the valves stem tip.

The bridge arm then contacts both intake valves or both exhaust valves and causes two valves to open simultaneously.

(1) Rocker Arm
(2) Bridge Arm

W1014724

[7] GEAR TRAIN CONFIGURATION



3EEAGAA1P152A

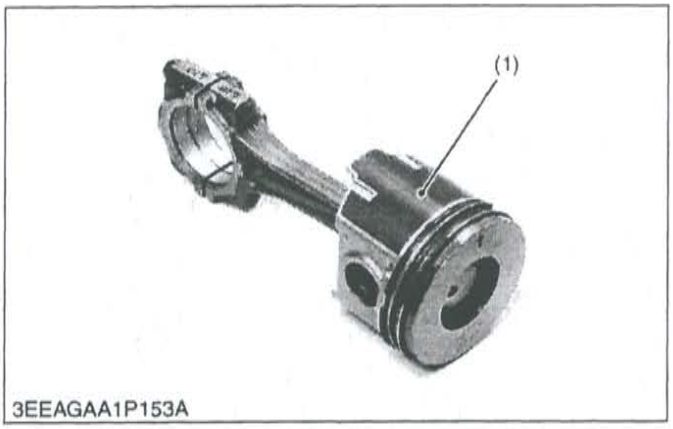
The 07 series DI engine employs gear train located at flywheel side. The following benefits are in the rear gear train configuration.

1. Flexibility of auxiliary parts arrangement.
2. Reduction of gear chattering noise from crankshaft of torsional and bending vibration.

(1) Rear Gear Train
(2) Balancer Shaft 1
(3) Balancer Shaft 2
(4) Flywheel

W1013611

[8] PISTON



3EEAGAA1P153A

Piston's skirt is coated with molybdenum disulfide★, which reduces the piston slap noise and thus the entire operating noise.

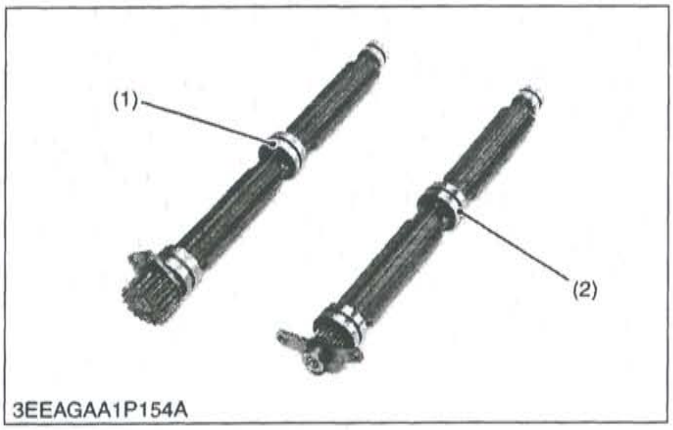
★Molybdenum disulfide (MoS_2)

The molybdenum disulfied serves as a solid lubricant, like a Graphite or Teflon. This material helps resist metal wears even with little lube oil.

(1) Molybdenum Disulfide

W1015665

[9] BUILT-IN DYNAMIC BALANCER



3EEAGAA1P154A

Engine are sure to vibrate by piston's reciprocation. Theoretically, three-cylinder engines are much less prone to cause vibration than four-cylinder ones (second inertia, etc.). However, any engine has many moving parts in addition to its pistons and cannot be completely free from vibration.

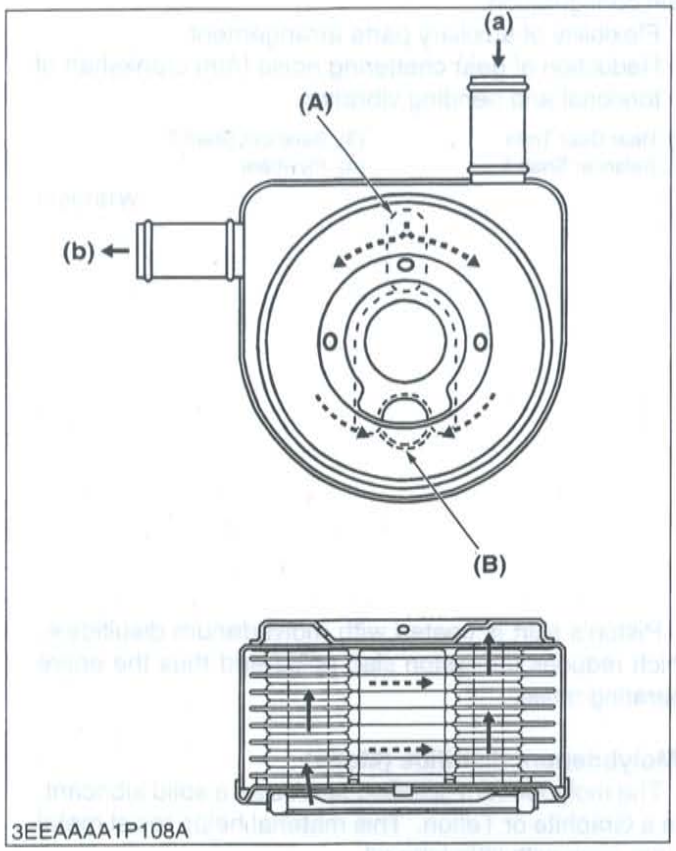
The four cylinder engine is fitted with balance weight on crankcase to absorb the second inertia mentioned above and reduce vibration.

(1) Balancer Shaft 1
(2) Balancer Shaft 2

W1013617

3. LUBRICATING SYSTEM

[1] OIL COOLER



3EEAAAA1P108A

The 07 series engine has a coolant-cooled oil cooler that not only cools hot oil, but also warms the cool engine oil shortly after start up.

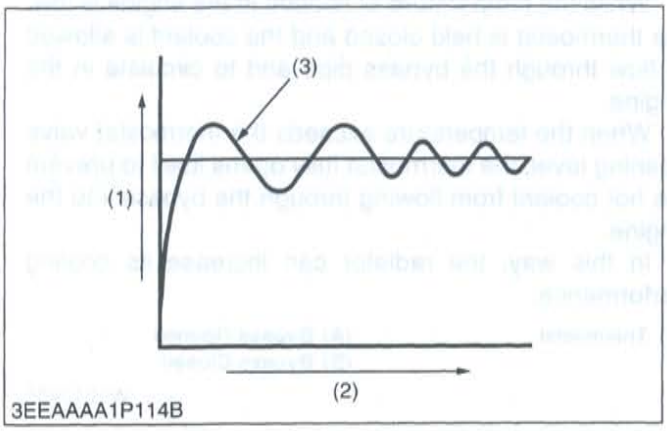
As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down or warming the oil.

(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

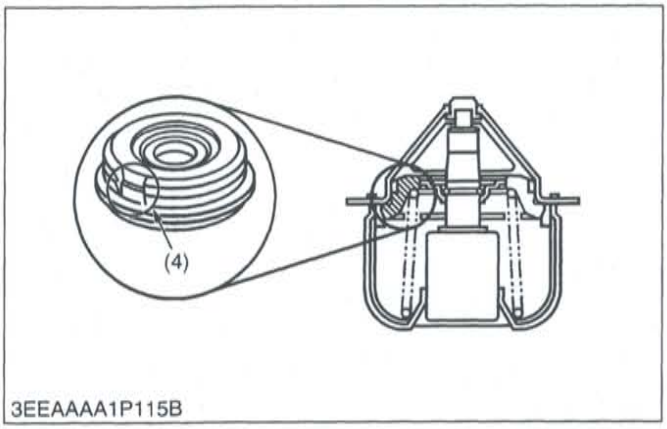
W10344770

4. COOLING SYSTEM

[1] THERMOSTAT



3EEAAAA1P114B



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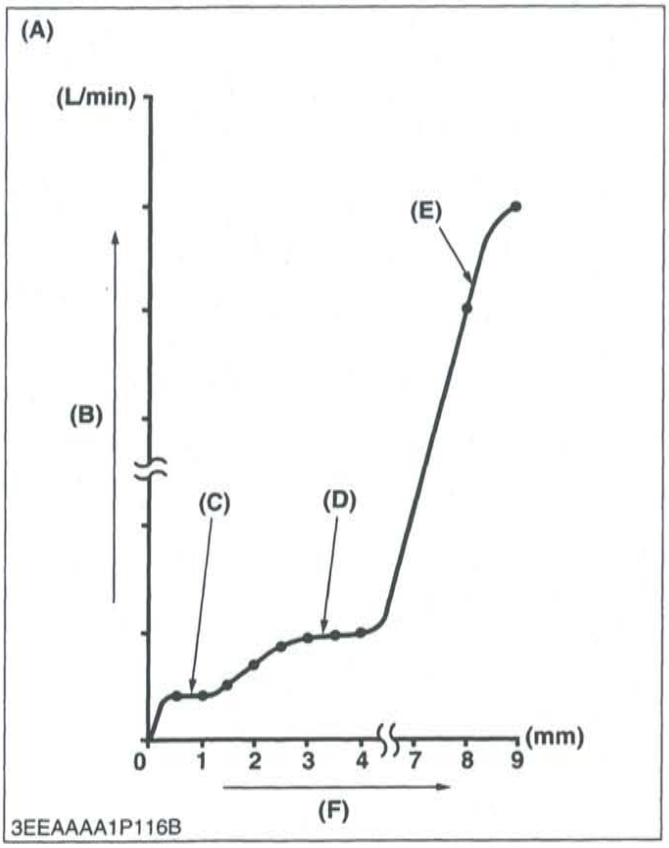


3EEAAAA1P116B

Conventional thermostatically-controlled valves (outlet water temperature control type) open against the flow of coolant. In this design, the pressure (steam pressure + water pump's discharge pressure) affects the open/close performance of such valve. In other words, the valve may be delayed in opening at a preset opening temperature opening suddenly, above the preset temperature. This is called the overshoot phenomenon.

The overshoot problem invites the undershoot phenomenon too. Too much water cooled by the radiator flows through the water passage, which suddenly closes the valve below the thermostat's preset valve closing temperature.

A repeated cycle of such overshoot and undershoot phenomena is called the water temperature hunting. This hunting problem may adversely affect the cooling system parts, and also the engine and its related components.

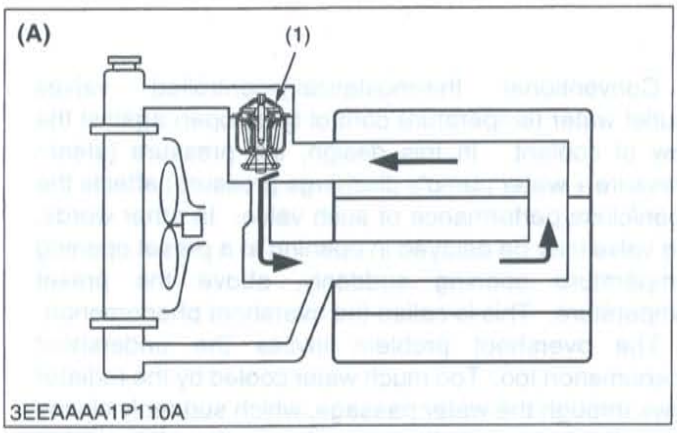
To cope with this trouble, the 07 series engine is equipped with the flow control thermostat. The valve has a notch to control the coolant flowrate smoothly in small steps.

(1) Coolant Temperature
(2) Time
(3) Overshoot
(4) Notch

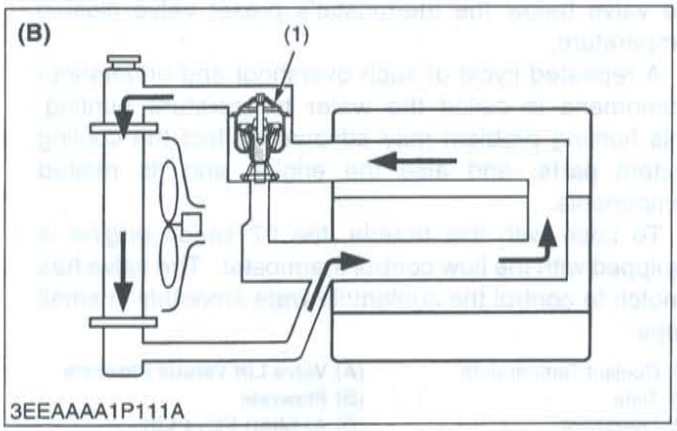
(A) Valve Lift Versus Flowrate
(B) Flowrate
(C) At Short Valve Lift
(D) At Medium Valve Lift
(E) At High Valve Lift
(F) Valve Lift

W1013684

[2] BOTTOM BYPASS SYSTEM



3EEAAAA1P110A



3EEAAAA1P111A

Bottom bypass system is introduced in the 07 series for improving the cooling performance of the radiator.

While the temperature of coolant in the engine is low, the thermostat is held closed and the coolant is allowed to flow through the bypass pipe and to circulate in the engine.

When the temperature exceeds the thermostat valve opening level, the thermostat fully opens itself to prevent the hot coolant from flowing through the bypass into the engine.

In this way, the radiator can increase its cooling performance.

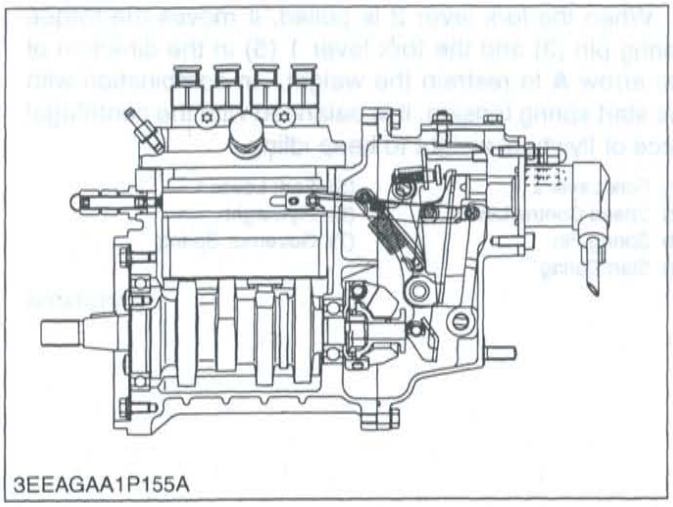
(1) Thermostat

(A) Bypass Opened
(B) Bypass Closed

W1013406

5. FUEL SYSTEM

[1] GOVERNOR



3EEAGAA1P155A

The engine employs the separated fuel injection pump in combination with Kubota's own small multi-function mechanical governor, which enables more dependability.

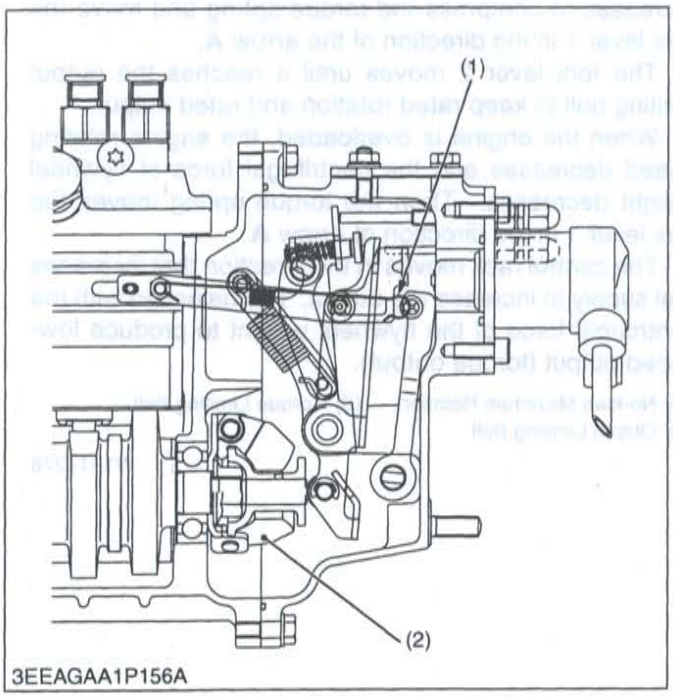
It also employs the torque limiting mechanism to control the maximum peak torque so that it complies with the regulations of exhaust gas.

This mechanism maintains engine speed at a constant level even under fluctuating loads, provides stable idling and regulates maximum engine speed by controlling the fuel injection rate.

This engine uses a mechanical governor that controls the fuel injection rate at all speed ranges (from idling to maximum speed) by utilizing the balance between the flyweight's centrifugal force and spring tension.

A governor shaft for monitoring engine speed is independent of the injection pump shaft and rotates at twice the speed of conventional types, providing better response to load fluctuation and delivering greater engine output.

W1013830



3EEAGAA1P156A

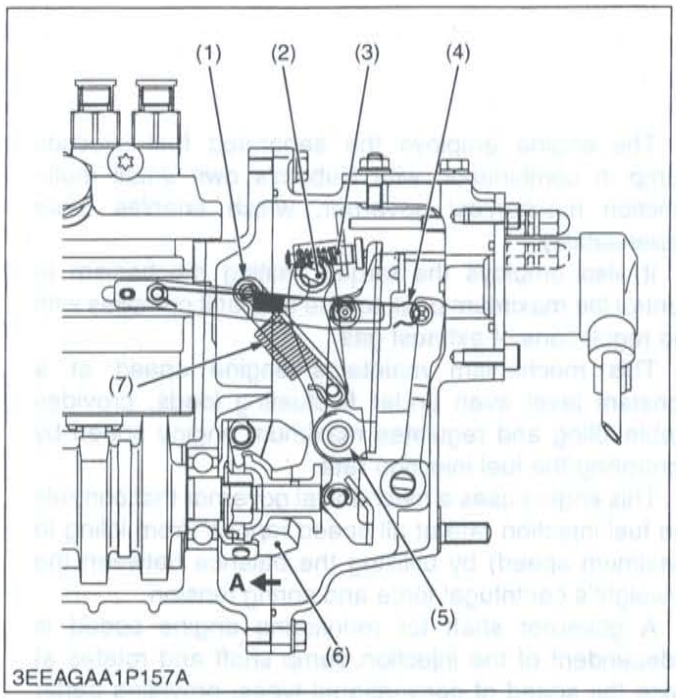
■ At Start

The stop solenoid (energized-to-run type) is powered to release the stop lever.

As no centrifugal force is applied to flyweight (2), low tension of start spring (1) permits control rack to move the starting position, supplying the amount of fuel required to start the engine.

(1) Start Spring (2) Flyweight

W1013967



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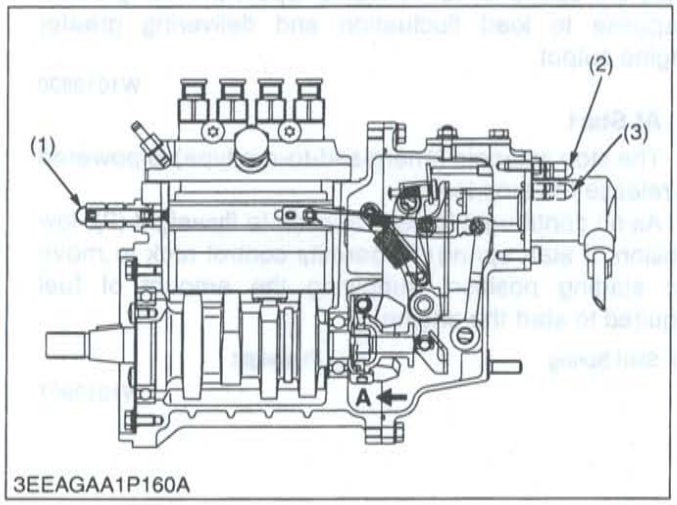


3EEAGAA1P160A

■ At Idling

Turn the speed control lever (2) clockwise to idle the engine. It tensions the governor spring (7) to pull the fork lever 2 (1).

When the fork lever 2 is pulled, it moves the torque spring pin (3) and the fork lever 1 (5) in the direction of the arrow **A** to restrain the weight. In combination with the start spring tension, it is balanced with the centrifugal force of flywheel weight to keep idling.

(1) Fork Lever 2
(2) Speed Control Lever
(3) Spring Pin
(4) Start Spring
(5) Fork Lever 1
(6) Flyweight
(7) Governor Spring

W1014034

■ At rated speed with full load and overload

As the speed control lever is changed from the middle speed to high speed, the governor spring tension increases to compress the torque spring and move the fork lever 1 in the direction of the arrow **A**.

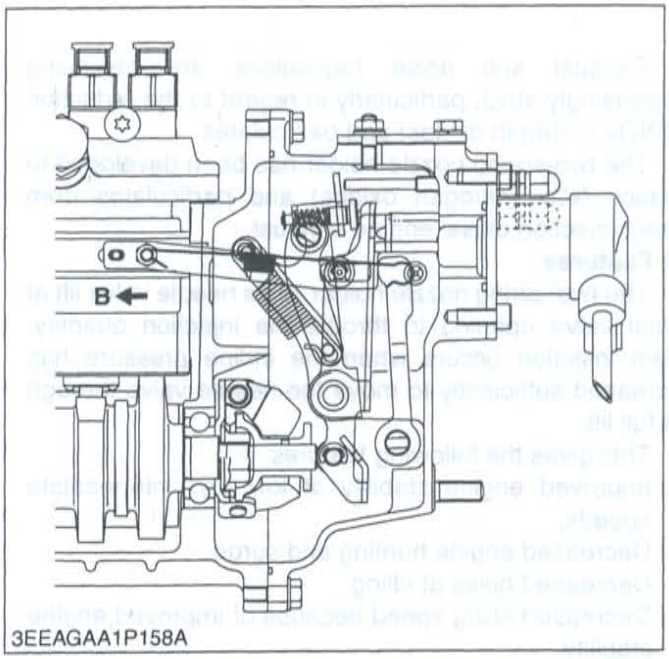
The fork lever 2 moves until it reaches the output limiting bolt to keep rated rotation and rated output.

When the engine is overloaded, the engine rotating speed decreases and the centrifugal force of flywheel weight decreases. Then the torque spring moves the fork lever 1 in the direction of arrow **A**.

The control rack moves in the direction that increases fuel supply to increase the output. It is balanced with the centrifugal force of the flywheel weight to produce low-speed output (torque output).

(1) No-load Maximum Rotation
(2) Output Limiting Bolt
(3) Torque Limiting Bolt

W1014276



3EEAGAA1P158A

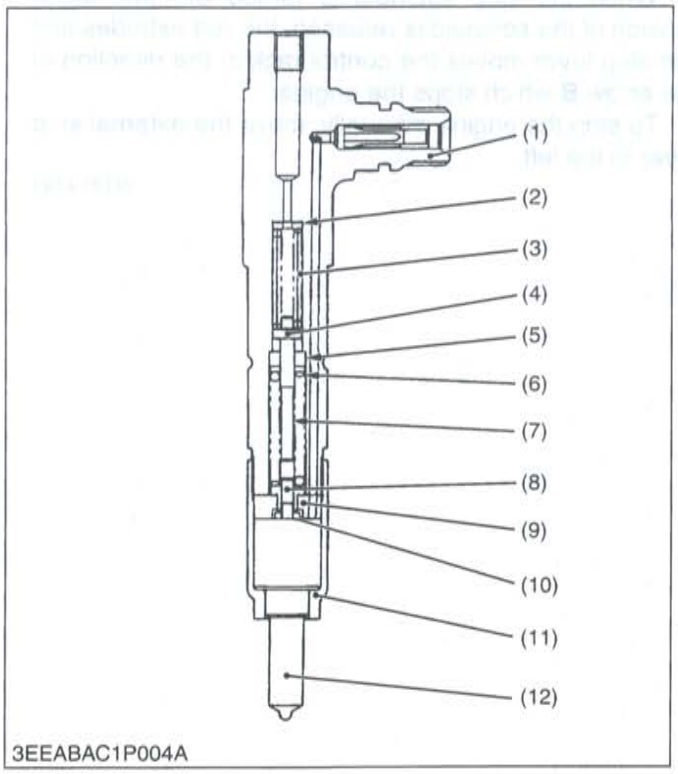
■ **To stop engine**

When the stop solenoid is turned off, the spring tension of the solenoid is released, the rod extrudes and the stop lever moves the control rack in the direction of the arrow **B** which stops the engine.

To stop the engine manually, move the external stop lever to the left.

W1014393

[2] 2 STAGE DI NOZZLE



3EEABAC1P004A

Exhaust and noise regulations are becoming increasingly strict, particularly in regard to the reduction of NOx (nitrogen oxides) and particulates.

The two-spring nozzle holder has been developed to reduce NOx (nitrogen oxides) and particulates from direct injection diesel engine exhaust.

■ **Features**

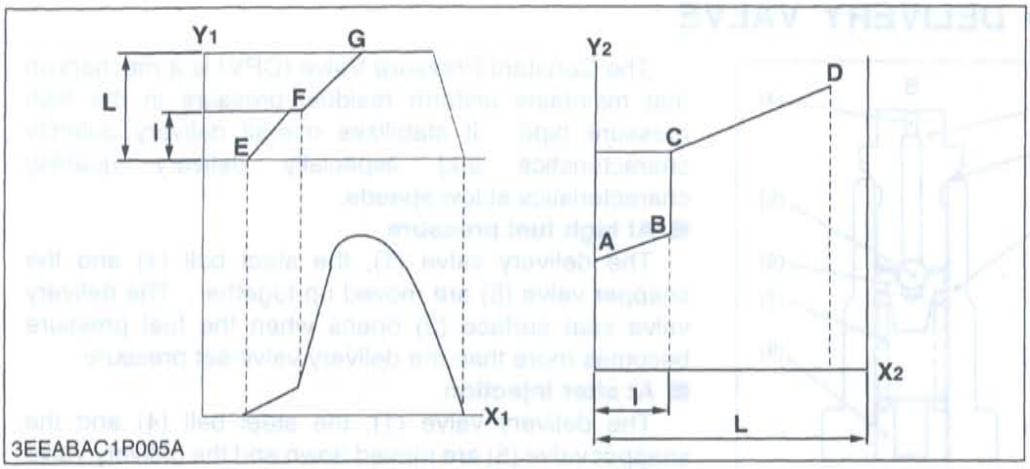
The two-spring nozzle holder limits needle valve lift at initial valve opening to throttle the injection quantity. Main injection occurs when the in-line pressure has increased sufficiently to move the needle valve through its full lift.

This gives the following features.

- Improved engine stability at low and intermediate speeds.
- Decreased engine hunting and surge.
- Decreased noise at idling.
- Decreased idling speed because of improved engine stability.
- Stabilized fuel injection characteristics from the injection pump and nozzle system, and easier matching of governor characteristics to engine demand.

(1) Nozzle Holder Body
(2) 1st Stage Injection Pressure Adjusting Shim
(3) First Spring
(4) Pressure Pin
(5) Spring Seat
(6) 2nd Stage Injection Pressure Adjusting Shim
(7) Second Spring
(8) Pre-lift Adjusting Spring Seat
(9) Chip-packing
(10) Max-lift Adjusting Washer
(11) Retaining Nut
(12) Nozzle

W1014568



3EEABAC1P005A

A-B : First Spring's Set Force
B-C-D : Combined Force of First and Second Springs
P1 : First Opening Pressure
P2 : Second Opening Pressure

L : Full Needle Valve Lift
I : Needle Valve Pre-lift

X1 : Cam Angle (°)
Y1 : Injection Rate (mm3/°)
X2 : Needle Valve Lift (mm)
Y2 : In-line Pressure

W1014795

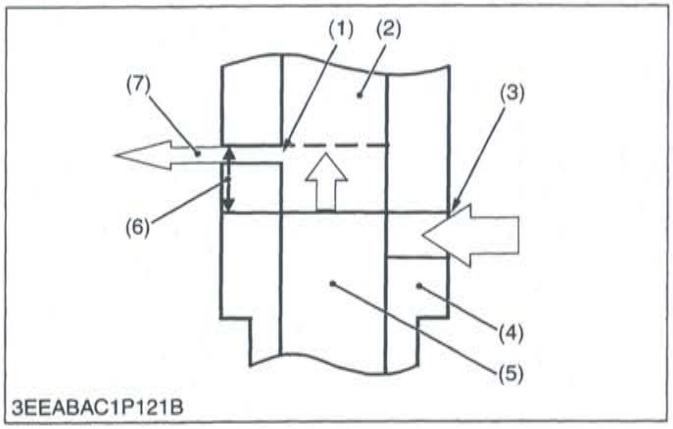
■ **First opening pressure**

The force of the high pressure fuel delivered by the injection pump acts to push the needle valve up. When this force exceeds the set force of the first spring, the nozzle's needle valve pushes the first pushrod up and the valve opens. (First opening pressure is represented by point **E** in the bottom left hand figure, and point **A** in the above figure.)

■ **Second opening pressure**

When the first pushrod has been lifted through the pre-lift, it contacts the second pushrod. As the set force of the second spring is acting on the second pushrod, the combined forces of both the first spring and the second spring then act on the needle valve, which will not lift unless these forces are overcome.

[3] INJECTION PUMP WITH F.S.P.



3EEABAC1P121B

The fuel injection pump with F.S.P. (Fine Spill Port) mechanism is equipped with two functions: speed timer function and injection rate control function.

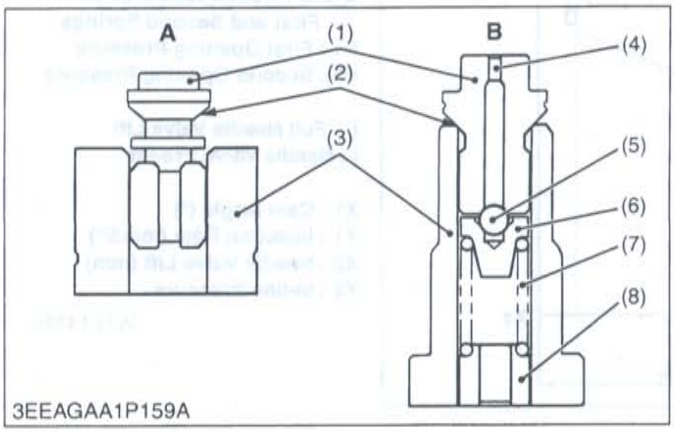
The former function works like this. As the rpm is low, the injection timing gets delayed. This helps cut down on NOx and operating noise.

The latter function serves to keep down the initial injection rate and keep up the later injection rate, which cuts down on NOx and PM as well.

(1) Fine Spill Port (F.S.P.)
(2) Plunger Chamber
(3) Main Port
(4) Cylinder
(5) Plunger
(6) F.S.P. Stroke
(7) Leaking Fuel at Initial Fuel Pressure-Feed Stage

W1014969

[4] CPV EQUIPPED DELIVERY VALVE



The Constant Pressure Valve (CPV) is a mechanism that maintains uniform residual pressure in the high pressure pipe. It stabilizes overall delivery quantity characteristics and especially delivery quantity characteristics at low speeds.

■ **At high fuel pressure**

The delivery valve (1), the steel ball (4) and the snapper valve (5) are moved up together. The delivery valve seat surface (2) opens when the fuel pressure becomes more than the delivery valve set pressure.

■ **At after injection**

The delivery valve (1), the steel ball (4) and the snapper valve (5) are moved down and the delivery valve seat surface (2) closes. The steel ball still opens on the way and the fuel returns to the injection pump side. The steel ball (4) closes when the fuel pressure becomes less than the snapper valve set pressure.

(1) Delivery Valve
(2) Seat Surface
(3) Valve Seat
(4) Orifice
(5) Steel Ball
(6) Snapper Valve
(7) Snapper Valve Spring
(8) Snapper Valve Seat

A : Current Delivery Valve
B : CPV Equipped Delivery Valve

W1015816

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	G-24
	Air in the fuel system	Vent air	G-36
	Water in the fuel system	Change fuel and repair or replace fuel system	–
	Fuel hose clogged	Clean or replace	G-24
	Fuel filter clogged	Replace	G-30
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-10
	Fuel with low cetane number	Use specified fuel	G-10
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S27
	Incorrect injection timing	Adjust	1-S18
	Fuel camshaft worn	Replace	1-S37
	Injection nozzle clogged	Repair or replace	1-S20, 27
	Injection pump malfunctioning	Repair or replace	1-S19, 39, 40, 41
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S27, 28, 29, 30, 31
	Improper valve timing	Correct or replace timing gear	1-S45
	Piston ring and cylinder worn	Replace	1-S47, 48, 65, 70
	Excessive valve clearance	Adjust	1-S14
	Stop solenoid malfunctioning	Replace	1-S34
Starter Does Not Run	Battery discharged	Charge	9-S8
	Starter malfunctioning	Repair or replace	9-S15, 39, 43
	Key switch malfunctioning	Replace	G-21
	Wiring disconnected	Connect	9-M10, 11

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Symptom	Probable Cause	Solution	Reference Page
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Replace	G-30
	Air cleaner clogged	Clean or replace	G-23
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S27
	Injection pump malfunctioning	Repair or replace	1-S19, 39, 40, 41
	Incorrect nozzle opening pressure	Repair or replace	1-S20, 27
	Injection nozzle stuck or clogged	Repair or replace	1-S20, 27
	Governor malfunctioning	Repair	1-S34, 35
Either White or Blue Exhaust Gas Is Observed	Excessive engine oil	Reduce to specified level	G-17, 18
	Piston ring and cylinder worn or stuck	Repair or replace	1-S47, 48, 65, 70
	Incorrect injection timing	Adjust	1-S18
Either Black or Dark Gray Exhaust Gas Is Observed	Overload	Reduce the load	–
	Low grade fuel used	Use specified fuel	G-10
	Fuel filter clogged	Replace	G-30
	Air cleaner clogged	Clean or replace	G-23
	Deficient nozzle injection	Repair or replace nozzle	1-S20, 27
Deficient Output	Incorrect injection timing	Adjust	1-S18
	Engine's moving parts seem to be seizing	Repair or replace	–
	Injection pump malfunctioning	Repair or replace	1-S19, 39, 40, 41
	Deficient nozzle injection	Repair or replace nozzle	1-S20, 27
	Compression leak	Check the compression pressure and repair	1-S13, 27, 28, 29, 30, 31
	Air cleaner dirty or clogged	Clean or replace	G-23
Excessive Lubricant Oil Consumption	Piston ring's gap facing the same direction	Shift ring gap direction	1-S47, 48
	Oil ring worn or stuck	Replace	1-S47, 48, 65
	Piston ring groove worn	Replace piston	1-S47, 48, 65
	Valve stem and valve guide worn	Replace	1-S31, 53
	Crankshaft bearing and crank pin bearing worn	Replace	1-S48, 49, 67, 68
	Oil leaking due to defective seals or packing	Replace	–

W1014322

Symptom	Probable Cause	Solution	Reference Page
Fuel Mixed into Lubricant Oil	Injection pump's plunger worn	Repair or replace	1-S19, 39, 40, 41
	Deficient nozzle injection	Repair or replace nozzle	1-S20, 27
	Injection pump broken	Replace	1-S19, 39, 40, 41
Water Mixed into Lubricant Oil	Head gasket defective	Replace	1-S29, 30
	Cylinder block or cylinder head flawed	Replace	1-S52
Low Oil Pressure	Engine oil insufficient	Replenish	G-17, 18
	Oil strainer clogged	Clean	1-S46
	Relief valve stuck with dirt	Clean	1-S43
	Relief valve spring weaken or broken	Replace	1-S43
	Excessive oil clearance of crankshaft bearing	Replace	1-S19, 68
	Excessive oil clearance of crankpin bearing	Replace	1-S48, 67
	Excessive oil clearance of rocker arm	Replace	1-S28, 55
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-10
	Oil pump defective	Replace	1-S15, 70, 71
High Oil Pressure	Different type of oil	Use specified type of oil	G-10
	Relief valve defective	Replace	1-S43
Engine Overheated	Engine oil insufficient	Replenish	G-17, 18
	Fan belt broken or elongated	Replace or adjust	G-24
	Coolant insufficient	Replenish	G-17, 33
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	G-33
	Coolant flow route corroded	Clean or replace	G-33
	Radiator cap defective	Replace	1-S16
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S29, 30
	Incorrect injection timing	Adjust	1-S18
	Unsuitable fuel used	Use specified fuel	G-10
Battery Quickly Discharged	Battery electrolyte insufficient	Replenish distilled water and charge	9-S8
	Alternator belt slips	Adjust belt tension or replace	G-24
	Wiring disconnected	Connect	9-M10, 11
	Rectifier defective	Replace	9-S17, 39, 46
	Alternator defective	Replace	9-S17, 39
	Battery defective	Replace	9-S8

W1014322

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Compression Pressure		3.92 MPa / 250 min^{-1} (rpm) 40.0 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)	2.90 MPa / 250 min^{-1} (rpm) 29.6 kgf/cm^2 / 250 min^{-1} (rpm) 421 psi / 250 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less
Valve Clearance (Cold)		0.13 to 0.17 mm 0.0051 to 0.0067 in.	–
Top Clearance		0.60 to 0.80 mm 0.0236 to 0.0315 in.	–
Cylinder Head Surface	Flatness	–	0.05 mm 0.0020 in.
Valve Recessing (Intake and Exhaust)		0.65 to 0.85 mm 0.0256 to 0.0335 in.	1.2 mm 0.0472 in.
Valve Stem to Valve Guide (Intake and Exhaust)	Clearance	0.055 to 0.085 mm 0.0022 to 0.0033 in.	0.1 mm 0.0039 in.
Valve Stem	O.D.	6.960 to 6.975 mm 0.2740 to 0.2746 in.	–
Valve Guide	I.D.	7.030 to 7.045 mm 0.2768 to 0.2774 in.	–
Valve Face (Intake and Exhaust)	Angle	0.785 rad 45 °	–
Valve Seat (Intake and Exhaust)	Angle	0.785 rad 45 °	–
	Width	3.3 to 3.6 mm 0.1299 to 0.1417 in.	–
Intake Valve Timing	Open	0.24 rad (14 °) before T.D.C.	–
	Close	0.70 rad (40 °) after B.D.C.	–
Exhaust Valve Timing	Open	0.87 rad (50 °) before B.D.C.	–
	Close	0.24 rad (14 °) after T.D.C.	–
Valve Spring (Intake and Exhaust)	Tilt	–	1.0 mm 0.039 in.
	Free Length	35.1 to 35.6 mm 1.3819 to 1.4016 in.	34.6 mm 1.3622 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Valve Spring (Intake and Exhaust)	Setting Load / Setting Length	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.256 lbs / 1.2401 in.	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbs / 1.2401 in.
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.0006 to 0.0018 in.	0.15 mm 0.0059 in.
Rocker Arm Shaft	O.D.	14.973 to 14.984 mm 0.5895 to 0.5899 in.	–
Rocker Arm	I.D.	15.000 to 15.018 mm 0.5906 to 0.5913 in.	–
Bridge Arm and Bridge Arm Shaft	Oil Clearance	0.018 to 0.042 mm 0.0007 to 0.0017 in.	0.15 mm 0.0059 in.
Bridge Arm Shaft	O.D.	9.023 to 9.032 mm 0.3552 to 0.3556 in.	–
Bridge Arm	I.D.	9.050 to 9.065 mm 0.3563 to 0.3569 in.	–
Push Rod	Alignment	–	0.25 mm 0.0098 in.
Tappet to Tappet Bore	Oil Clearance	0.020 to 0.050 mm 0.0008 to 0.0020 in.	0.07 mm 0.0028 in.
Tappet	O.D.	9.965 to 9.980 mm 0.3923 to 0.3929 in.	–
Tappet Bore	I.D.	10.000 to 10.015 mm 0.3937 to 0.3929 in.	–
Timing Gear			
Crank Gear to Cam Gear	Backlash	0.041 to 0.139 mm 0.0016 to 0.0055 in.	0.22 mm 0.0087 in.
Cam Gear to Balancer 1 Gear	Backlash	0.041 to 0.134 mm 0.0016 to 0.0053 in.	0.22 mm 0.0087 in.
Cam Gear to Idle Gear	Backlash	0.041 to 0.134 mm 0.0016 to 0.0053 in.	0.22 mm 0.0087 in.
Idle Gear to Injection Pump Gear	Backlash	0.041 to 0.134 mm 0.0016 to 0.0053 in.	0.22 mm 0.0087 in.
Idle Gear to Balancer 2 Gear	Backlash	0.041 to 0.129 mm 0.0016 to 0.0051 in.	0.22 mm 0.0087 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Idle Gear	Side Clearance	0.15 to 0.25 mm 0.0059 to 0.0098 in.	0.9 mm 0.0354 in.
Idle Gear Shaft to Idle Gear Bushing	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.10 mm 0.0039 in.
Idle Gear Shaft	O.D.	34.959 to 34.975 mm 1.3763 to 1.3770 in.	–
Idle Gear Bushing	I.D.	35.025 to 35.050 mm 1.3789 to 1.3799 in.	–
Camshaft	Side Clearance	–	0.1 mm 0.0039 in.
Camshaft	Alignment	–	0.01 mm 0.00039 in.
Cam Height	Intake	37.50 mm 1.4764 in.	37.00 mm 1.4567 in.
	Exhaust	37.90 mm 1.4921 in.	37.40 mm 1.4724 in.
Camshaft	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.15 mm 0.0059 in.
Camshaft Journal 1	O.D.	34.034 to 34.050 mm 1.3399 to 1.3406 in.	–
Camshaft Block Bore 1	I.D.	35.000 to 35.025 mm 1.3780 to 1.3789 in.	–
Camshaft Journal 2	O.D.	43.934 to 43.950 mm 1.7297 to 1.7303 in.	–
Camshaft Block Bore 2	I.D.	44.000 to 44.025 mm 1.7323 to 1.7333 in.	–
Balancer Shaft			
Balancer Shaft 1	Side Clearance	0.070 to 0.220 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Balancer Shaft 2	Side Clearance	0.070 to 0.320 mm 0.0028 to 0.0126 in.	0.3 mm 0.0118 in.
Balancer Shaft 1, 2	Alignment	–	0.02 mm 0.0008 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Balancer Shaft 1 Journal	Oil Clearance	0.060 to 0.146 mm 0.0024 to 0.0057 in.	0.2 mm 0.0079 in.
Balancer Shaft 1 Journal	O.D.	48.934 to 48.950 mm 1.9265 to 1.9272 in.	–
Balancer Shaft 1 Bearing	I.D.	49.010 to 49.080 mm 1.9295 to 1.9323 in.	–
Balancer Shaft 2 Journal	Oil Clearance	0.050 to 0.136 mm 0.0020 to 0.0054 in.	0.2 mm 0.0079 in.
Balancer Shaft 2 Journal	O.D.	48.934 to 48.950 mm 1.9265 to 1.9272 in.	–
Balancer Shaft 2 Bearing	I.D.	49.000 to 49.070 mm 1.9291 to 1.9319 in.	–
Piston Pin Bore	I.D.	28.000 to 28.013 mm 1.1024 to 1.1029 in.	28.05 mm 1.1043 in.
Piston Pin to Small End Bushing	Oil Clearance	0.020 to 0.040 mm 0.0008 to 0.0016 in.	0.15 mm 0.0059 in.
Piston Pin	O.D.	28.006 to 28.011 mm 1.1026 to 1.1028 in.	–
Small End Bushing	I.D.	28.031 to 28.046 mm 1.1036 to 1.1042 in.	–
Connecting Rod	Alignment	–	0.05 mm 0.0020 in.
Piston Ring Gap	Top Ring	0.25 to 0.40 mm 0.0098 to 0.0157 in.	1.25 mm 0.0492 in.
	Second Ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
	Oil Ring	0.25 to 0.45 mm 0.0098 to 0.0177 in.	1.25 mm 0.0492 in.
Piston Ring to Piston Ring Groove Top Ring	Clearance	0.050 to 0.090 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
Second Ring	Clearance	0.090 to 0.120 mm 0.0035 to 0.0047 in.	0.20 mm 0.0079 in.
Oil Ring	Clearance	0.020 to 0.060 mm 0.0008 to 0.0023 in.	0.15 mm 0.0059 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Crankshaft	Side Clearance	0.15 to 0.35 mm 0.0059 to 0.0138 in.	0.50 mm 0.0197 in.
Crankshaft	Alignment	–	0.02 mm 0.00079 in.
Crank Pin to Crank Pin Bearing	Oil Clearance	0.017 to 0.048 mm 0.0007 to 0.0019 in.	0.20 mm 0.0079 in.
Crank Pin	O.D.	49.980 to 49.991 mm 1.9677 to 1.9682 in.	–
Crankshaft Journal to Crankshaft Bearing	Oil Clearance	0.030 to 0.073 mm 0.0012 to 0.0029 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	79.977 to 79.990 mm 3.1487 to 3.1492 in.	–
Cylinder Bore	I.D.	94.000 to 94.022 mm 3.7008 to 3.7017 in.	94.15 mm 3.7067 in.
Cylinder Bore (Oversize)	I.D.	94.500 to 94.522 mm 3.7205 to 3.7213 in.	94.65 mm 3.7264 in.

W10138740

LUBRICATING SYSTEM

Engine Oil Pressure	At Idle Speed	–	49 kPa 0.5 kgf/cm^2 7 psi
	At Rated Speed	196 to 392 kPa 2.0 to 4.0 kgf/cm^2 28 to 57 psi	147.1 kPa 1.5 kgf/cm^2 21.3 psi
Engine Oil Pressure Switch	Working Pressure	39.2 to 58.8 kPa 0.4 to 0.6 kgf/cm^2 5.6 to 8.4 psi	–
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.09 mm 0.0012 to 0.0035 in.	0.3 mm 0.0118 in.
Outer Rotor to Pump Body	Clearance	0.100 to 0.184 mm 0.0039 to 0.0072 in.	0.3 mm 0.0118 in.
Rotor to Cover	Clearance	0.025 to 0.075 mm 0.0010 to 0.0030 in.	0.225 mm 0.0089 in.
Relief Valve	Working Pressure	885 kPa 9.04 kgf/cm^2 129 psi	–

W10139730

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan/Air-conditioner Belt	Tension	10.0 to 12.0 mm / 98 N 0.394 to 0.472 in. / 98 N (10 kgf, 22 lbs)	–
Alternator Belt	Tension	10.0 to 12.0 mm / 98 N 0.394 to 0.472 in. / 98 N (10 kgf, 22 lbs)	–
Radiator Cap	Air Leakage	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm^2 13 → 9 psi	–
Radiator	Water Tightness	Water tightness at specified pressure 137 kPa 1.4 kgf/cm^2 20 psi	–
Thermostat	Valve Opening Temperature	74.5 to 78.5 °C 166.1 to 173.3 °F	–
	Valve Opening Temperature (Opened Completely)	90 °C 194 °F	–

W10135990

FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Timing	V3007-DI-E2 (M5040)	0.035 to 0.070 rad (2.0 to 4.0 °) before T.D.C.	–
	V3307-DI-E2 (M6040)	0.044 to 0.078 rad (2.5 to 4.5 °) before T.D.C.	
	V3307-DI-E2-1 (M7040)	0.061 to 0.096 rad (3.5 to 5.5 °) before T.D.C.	
Pump Element	Fuel Tightness	–	18.63 MPa 190 kgf/cm^2 2702 psi
Delivery Valve	Fuel Tightness	10 seconds 18.63 → 17.65 MPa 190 → 180 kgf/cm^2 2702 → 2560 psi	5 seconds 18.63 → 17.65 MPa 190 → 180 kgf/cm^2 2702 → 2560 psi
Fuel Injection Nozzle	Injection Pressure (1st stage)	18.63 to 19.61 MPa 190 to 200 kgf/cm^2 2702 to 2845 psi	–
	Injection Pressure (2nd stage)	23.54 to 24.52 MPa 240 to 250 kgf/cm^2 3414 to 3556 psi	–
	Valve Seat Tightness	When the pressure is 16.67 MPa (170 kgf/cm^2, 2418 psi), the valve seat must be fuel tightness.	–

W10139730

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G.GENERAL" section.)

Item	N·m	kgf·m	ft-lbs
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Oil cooler pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Starter's **B** terminal mounting nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7
Front frame mounting screw (M14, 9T, UBS)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Power steering pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Glow lead mounting nut	1.0 to 1.8	0.10 to 0.18	0.74 to 1.33
Glow plug	7.65 to 9.32	0.78 to 0.95	5.64 to 6.87
Cylinder head cover screw	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
Injection pipe retaining nut	22.6 to 36.3	2.3 to 3.7	16.7 to 26.8
Oil switch taper screw	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pump unit mounting nut	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Nozzle holder clamp screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
Overflow pipe assembly retaining screw	9.8 to 11.3	1.0 to 1.15	7.23 to 8.32
Rocker arm bracket screw	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
*Cylinder head mounting screw	186.3 to 196.1	19.0 to 20.0	137.4 to 144.6
*Lubricating oil pipe mounting screw	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Governor housing mounting screw	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
Lock nut	2.8 to 4.0	0.29 to 0.41	2.1 to 3.0
Injection pump assembly mounting screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
Injection pump assembly mounting nut	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2
Injection pump gear mounting nut (left-handed screw)	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
Governor weight mounting nut	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5
Fuel camshaft stopper mounting screw	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
Fuel camshaft bearing stopper mounting screw	3.8 to 4.2	0.39 to 0.43	2.8 to 3.1
*Crankshaft screw	255.0 to 274.6	26.0 to 28.0	188.1 to 202.5
Oil cooler joint screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Front cover mounting screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
Relief valve retaining screw	68.6 to 78.4	7.0 to 8.0	50.6 to 57.9
*Flywheel screw	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
Flywheel housing mounting screw	103.0 to 117.7	10.5 to 12.0	76.0 to 86.8
Camshaft set screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
Idle gear mounting screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3

■ **NOTE**

- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**

W1012736

Item	N·m	kgf·m	ft-lbs
Balancer shaft set screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
*Connecting rod screw	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
*Crankcase 2 mounting screw	137.3 to 147.1	14.0 to 15.0	101.3 to 108.5
Crankcase 2 flange screw	49.0 to 55.9	5.0 to 5.7	36.1 to 41.2
Oil pump cover screw	7.84 to 9.31	0.80 to 0.95	5.78 to 6.87

■ **NOTE**

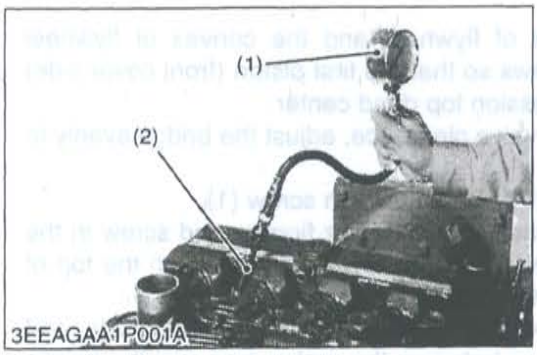
- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

1. After warming up the engine, shut it down and remove the air cleaner, the muffler, breather tube, glow lead and all glow plugs.
2. Install a compression tester (1) (Code No: 07909-30208) and glow plug adaptor for 07 series diesel engines (2) to glow plug hole. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
3. After making sure that the stop lever is set at the stop position (Non-injection), run the engine at 200 to 300 min^{-1} (rpm) with the starter.
4. Read the maximum pressure. Measure the pressure more than twice.

■ **NOTE**

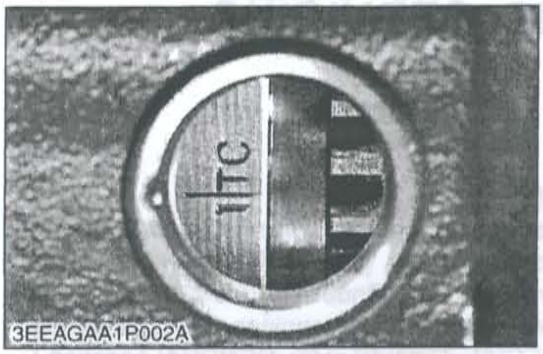
- **Check the compression pressure with the specified valve clearance.**
- **Always use a fully charged battery for performing this test.**
- **Variances in cylinder compression values should be under 10 %.**

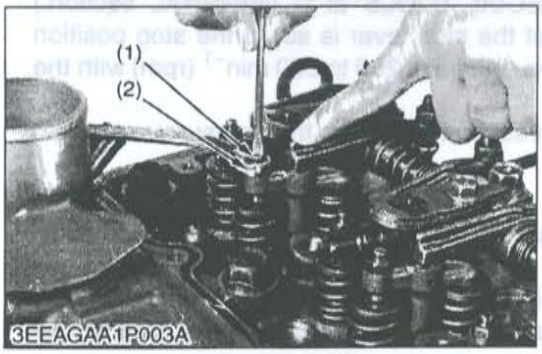
Compression pressure	Factory spec.	3.92 MPa / 250 min^{-1} (rpm) 40.0 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)
	Allowable limit	2.90 MPa / 250 min^{-1} (rpm) 29.6 kgf/cm^2 / 250 min^{-1} (rpm) 421 psi / 250 min^{-1} (rpm)

Tightening torque	Glow lead mounting nut	1.0 to 1.8 N·m 0.10 to 0.18 kgf·m 0.74 to 1.33 ft-lbs
	Glow plug	7.65 to 9.32 N·m 0.78 to 0.95 kgf·m 5.64 to 6.87 ft-lbs

(1) Compression Tester (2) Glow Plug Adaptor

W1048776





Checking Valve Clearance

■ **IMPORTANT**

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

1. Remove the high pressure pipes, glow lead, glow plugs and the cylinder head cover.
2. Align the 1TC mark of flywheel and the convex of flywheel housing timing windows so that the first piston (front cover side) comes to the compression top dead center.
3. Before adjusting the valve clearance, adjust the bridge evenly to the valve stem.
4. Loosen the lock nut (2) and adjust with screw (1).
5. Slightly push the rocker arm with your fingers and screw in the adjusting screw slowly until you feel the screw touch the top of valve stem, then tighten the lock nut.
6. Loosen the lock nut (4) of adjusting screw (3) (push rod side) and insert the feeler gauge between the rocker arm and the bridge head. Set the adjusting screw to the specified value, then tighten the lock nut.

Valve clearance	Factory spec.	0.13 to 0.17 mm 0.0051 to 0.0067 in.

■ **NOTE**

- **After adjusting, tighten the lock nut (4) securely.**

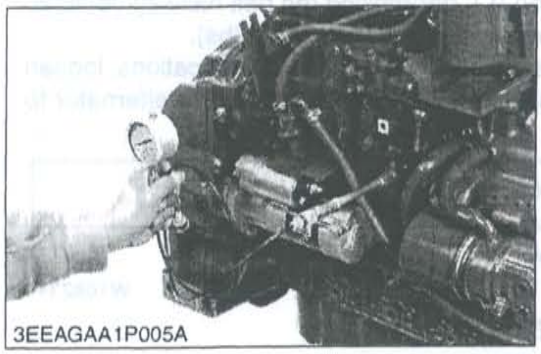
Valve arrangement Adjustment cylinder Location of piston		IN.	EX
When No.1 piston is at compression top dead center	1st	☆	☆
	2nd	☆	
	3rd		☆
	4th		
When No.1 piston is at overlap position	1st		
	2nd		☆
	3rd	☆	
	4th	☆	☆

Tightening torque	Cylinder head cover screw	6.9 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.32 ft-lbs
	Injection pipe retaining nut	22.6 to 36.3 N·m 2.3 to 3.7 kgf·m 16.7 to 26.8 ft-lbs

(1) Adjusting Screw
(2) Lock Nut
(3) Adjusting Screw
(4) Lock Nut

W1047000

(2) Lubricating System


3EEAGAA1P005A

Engine Oil Pressure

1. Remove the oil switch and set a pressure tester (Code No. 07916-32032).
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

(When reassembling)

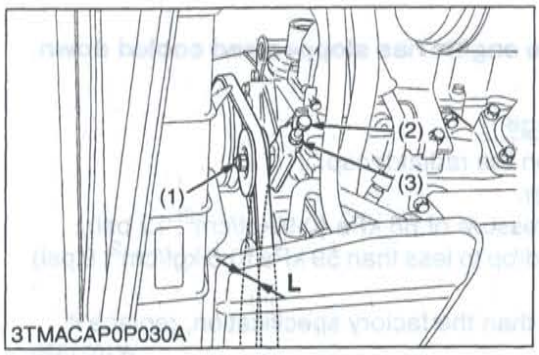
- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

Engine oil pressure	At idle speed	Allowable limit	49 kPa 0.5 kgf/cm^2 7 psi
	At rated speed	Factory spec.	196 to 392 kPa 2.0 to 4.0 kgf/cm^2 28 to 57 psi
		Allowable limit	147.1 kPa 1.5 kgf/cm^2 21.3 psi

Tightening torque	Oil switch taper screw	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 ft-lbs

W10349520

(3) Cooling System



3TMACAP0P030A

Fan/Air-conditioner Belt Tension

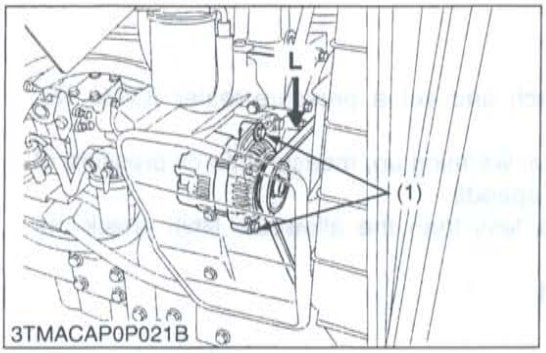
1. Measure the deflection (**L**), depressing the belt halfway between the pulleys at specified force 98 N (10 kgf, 22 lbs).
2. If the measurement is not within the factory specifications, loosen the tension pulley nut (1) and lock nut (3). Using the tension adjusting screw (2), relocate the tension pulley to adjust.

Deflection (L)	Factory spec.	10 to 12 mm 0.394 to 0.472 in.

(1) Tension Pulley Nut
(2) Tension Adjusting Screw
(3) Lock Nut

L : Deflection

W1021011



3TMACAP0P021B

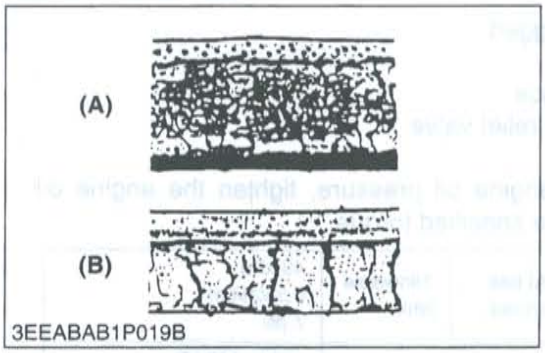
Alternator Belt Tension

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

Deflection (**L**)	Factory spec.	10 to 12 mm 0.394 to 0.472 in.

(1) Alternator Mounting Screw **L : Deflection**

W1082347



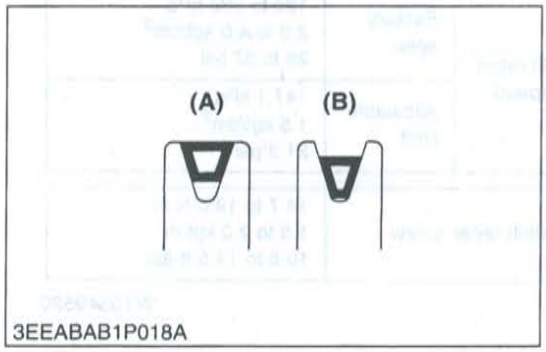
3EEABAB1P019B

Belt Damage and Wear

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

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

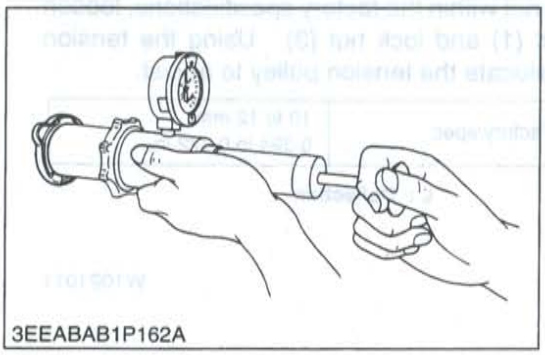
W1021108



3EEABAB1P018A

CAUTION

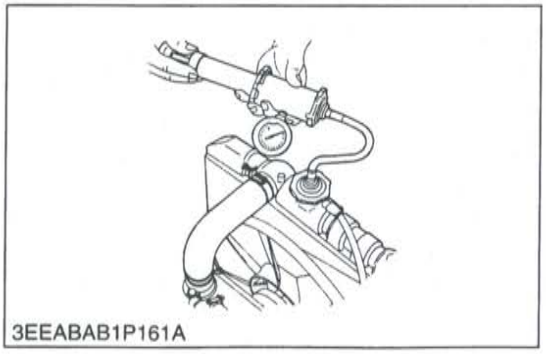
- **When removing the radiator cap, wait at least ten minutes after the engine has stopped and cooled down. Otherwise, hot water may gush out, scalding nearby people.**


3EEABAB1P162A

Radiator Cap Air Leakage

1. Set a radiator tester on the radiator cap.
2. Attach a radiator tester.
   Apply the specified pressure of 88 kPa (0.9 kgf/cm^2, 13 psi).
3. Check if the pressure drop to less than 59 kPa (0.6 kgf/cm^2, 9 psi) in 10 seconds.
4. If the pressure is less than the factory specification, replace it.

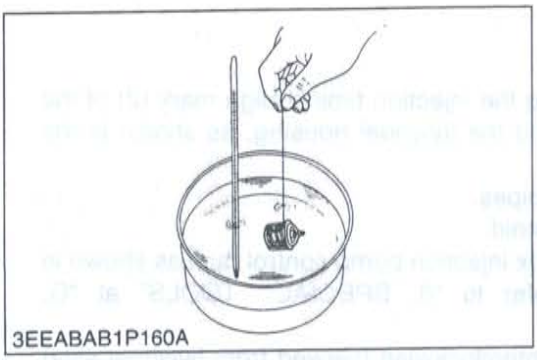
W1021320


3EEABAB1P161A

Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Attach a radiator tester.
   Increase water pressure to the specified pressure of 137 kPa (1.4 kgf/cm^2, 20 psi).
3. Check the radiator for water leaks.
4. When water leakage is excessive, replace the radiator. If water leakage is caused by a small pinhole, correct the radiator with radiator sealant.

W1072497


3EEABAB1P160A

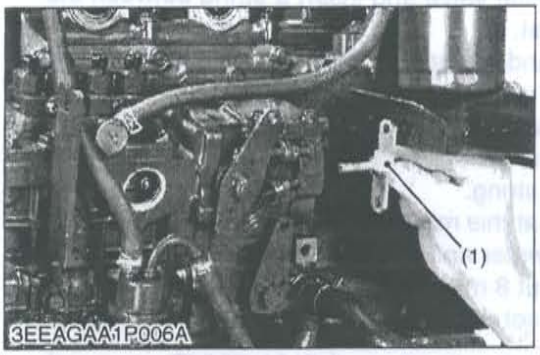
Thermostat Valve Opening Temperature

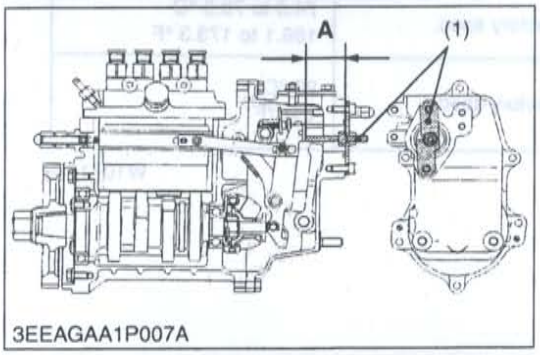
1. Push down the thermostat valve and insert a string between the valve and the valve seat.
2. Place the thermostat and a thermostat in a container with water and gradually heat the water
3. Hold the string to suspend the thermostat in the water. When the water temperature rises, the thermostat valve will open, allowing it to fall down from the string.
   Read the temperature at this moment on the thermometer.
4. Continue heating the water and read the temperature when the valve has risen by about 8 mm (0.315 in.).
5. If the measurement is not acceptable, replace the thermostat.

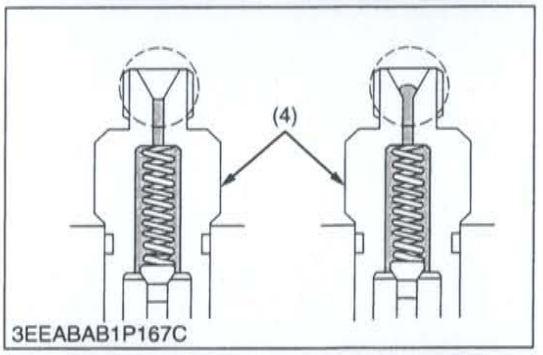
Thermostat's valve opening temperature	Factory spec.	74.5 to 78.5 °C 166.1 to 173.3 °F
Temperature at which thermostat completely opens	Factory spec.	90 °C 194 °F

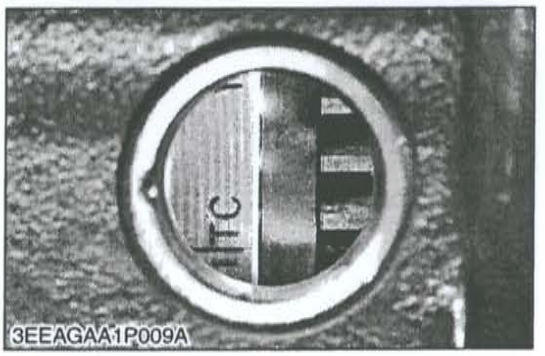
W1071639

(4) Fuel System









Injection Timing

1. Make sure of matching the injection timing align mark (2) of the injection pump unit and the flywheel housing, as shown in the photo.
2. Remove the injection pipes.
3. Remove the stop solenoid.
4. Set special tool (1) to fix injection pump control rack as shown in the illustration. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
5. Turn the flywheel counterclockwise (viewed from flywheel side) until the fuel fills up to the hole of the delivery valve holder (4) for No.1 cylinder.
6. After the fuel fills up to the hole of the delivery valve holder for No.1 cylinder, turn back (clockwise) the flywheel around 1.57 rad (90 °).
7. Turn the flywheel counterclockwise to set at around 0.26 rad (15 °) before T.D.C..
8. Slowly turn the flywheel counterclockwise and stop turning when the fuel begins to come up, to get the present injection timing.
9. Check to see the degree on flywheel.
   The flywheel has mark "1TC" and "10" for the crank angle before the top dead center of No.1 piston.
10. If the injection timing is not within the specification, rotate the injection pump unit to adjust the injection timing.

■ **IMPORTANT**

- **When installing the injection pump unit to the engine body, follow the correct procedure.**
  See the "Injection Pump Unit".

V3007-DI-E2 (M5040)

Injection timing	Factory spec.	0.035 to 0.070 rad (2.0 ° to 4.0 °) before T.D.C.

V3307-DI-E2 (M6040)

Injection timing	Factory spec.	0.044 to 0.078 rad (2.5 ° to 4.5 °) before T.D.C.

V3307-DI-E2-1 (M7040)

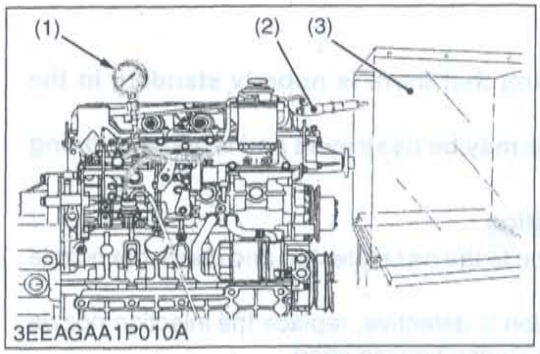
Injection timing	Factory spec.	0.061 to 0.096 rad (3.5 ° to 5.5 °) before T.D.C.

Tightening torque	Injection pipe retaining nut	22.6 to 36.3 N·m 2.3 to 3.7 kgf·m 16.7 to 26.8 ft-lbs
	Injection pump unit mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs

(1) Special Tool
(2) Injection Timing Align Mark
(3) Injection Pump Unit Mounting Nut
(4) Delivery Valve Holder

(a) Injection Timing Advanced
(b) Injection Timing Retarded
A : 35.9 to 36.1 mm (1.41 to 1.42 in.)

W1036105



Fuel Tightness of Pump Element

1. Remove the engine stop solenoid.
2. Remove the injection pipes.
3. Install the injection pump pressure tester to the injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1). (Refer to the figure.)
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.

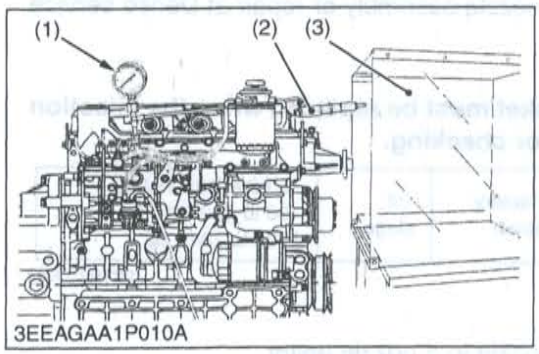
Fuel tightness of pump element	Allowable limit	18.63 MPa 190 kgf/cm^2 2702 psi

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

W1017430



Fuel Tightness of Delivery Valve

1. Remove the engine stop solenoid.
2. Remove the injection pipes.
3. Install a pressure tester to the fuel injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1).
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. 18.63 MPa (190 kgf/cm^2, 2702 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 18.63 to 17.65 MPa (from 190 to 180 kgf/cm^2, from 2702 to 2560 psi).
8. Measure the time needed to decrease the pressure from 18.63 to 17.65 MPa (from 190 to 180 kgf/cm^2, from 2702 to 2560 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 18.63 → 17.65 MPa 190 → 180 kgf/cm^2 2702 → 2560 psi
	Allowable limit	5 seconds 18.63 → 17.65 MPa 190 → 180 kgf/cm^2 2702 → 2560 psi

■ **NOTE**

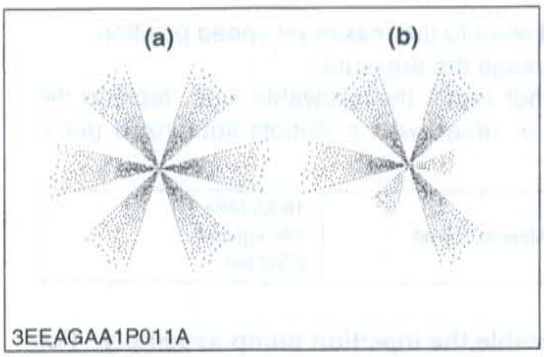
- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

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

W1017786

⚠ CAUTION

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



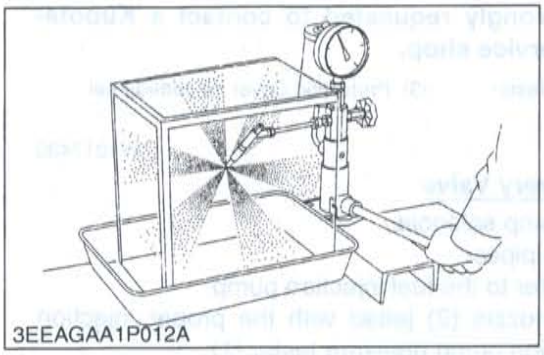
3EEAGAA1P011A

Nozzle Spraying Condition

1. Set the injection nozzle to the nozzle tester, and check the nozzle spraying condition.
2. If the spraying condition is defective, replace the injection nozzle assembly or repair at Denso service shop.

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

W10371670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Checking Nozzle Injection Pressure

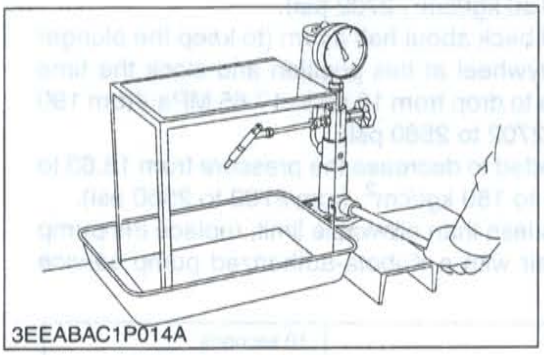
1. Attach the injection nozzle to the nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the injection nozzle assembly or repair at Denso service shop.

■ **NOTE**

- **Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.**

Injection pressure	Factory spec.	1st stage	18.63 to 19.61 MPa 190 to 200 kgf/cm^2 2702 to 2845 psi

W1037280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Valve Seat Tightness

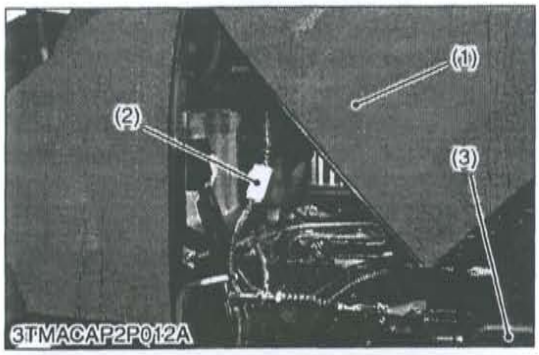
1. Attach the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 16.67 MPa (170 kgf/cm^2, 2418 psi) for 10 seconds.
3. If any fuel leak is found, replace the injection nozzle assembly or repair at Denso service shop.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa 170 kgf/cm^2 2418 psi

W10374150

[2] PREPARATION

(1) Separating Front Axle and Front Frame as a Unit



Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1054682

Bonnet

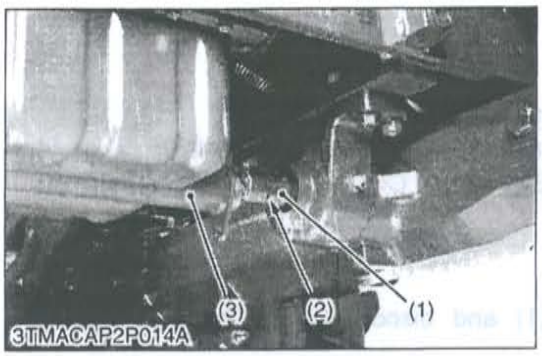
1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connectors (2) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1) and side cover (3) (R.H) (L.H.).

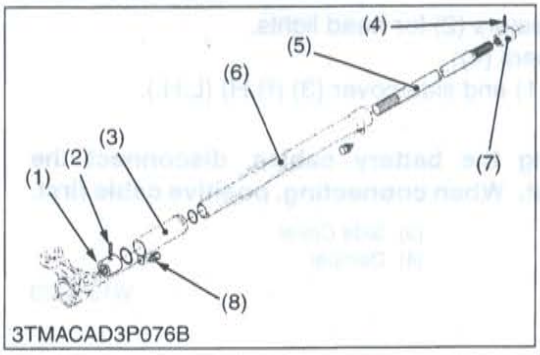
■ **IMPORTANT**

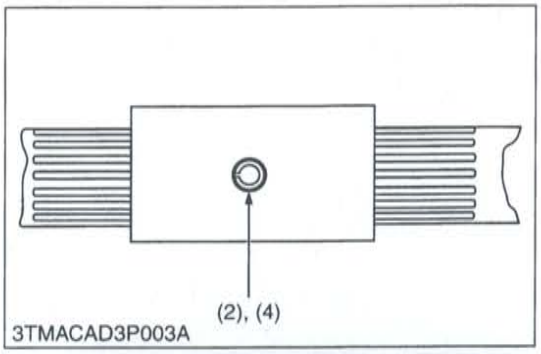
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

(1) Bonnet
(2) Connector
(3) Side Cover
(4) Damper

W1054723







Propeller Shaft (4WD Model)

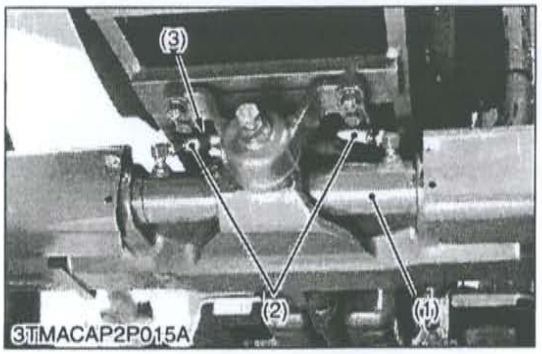
1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1054851



Power Steering Hose

1. Disconnect both power steering hoses (2) from power steering cylinder (1).

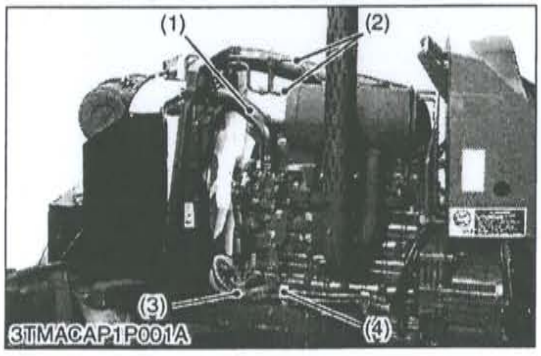
(When reassembling)

- Connect the power steering hose with blue tape (3) to the R.H..

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Power Steering Cylinder
(2) Power Steering Hose
(3) Blue Tape

W1055187



Radiator Hose and Oil Cooler Pipe

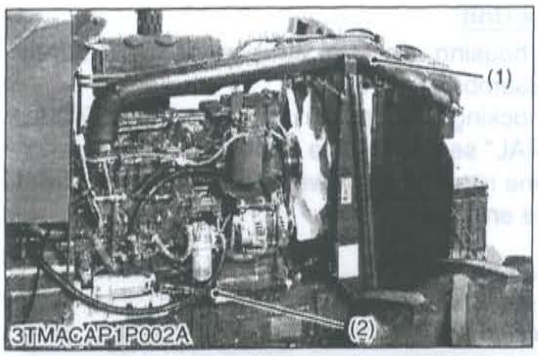
1. Disconnect the radiator hoses (1) and (3).
2. Disconnect the oil cooler pipe retaining nuts (2).
3. Remove the power steering hose clamp (4).

(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Radiator Hose
(2) Oil Cooler Pipe Retaining Nut
(3) Radiator Hose
(4) Clamp

W1055318



Air Cleaner Hose and Battery Cable

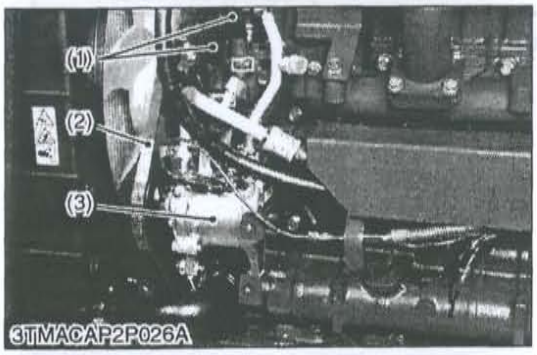
1. Disconnect the air cleaner hose (1).
2. Disconnect the battery cable (2) from the starter terminal **B**.

(When reassembling)

Tightening torque	Starter's **B** terminal mounting nut	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 ft-lbs

(1) Air Cleaner Hose (2) Battery Cable

W1055587



Condenser and Compressor (CABIN Model)

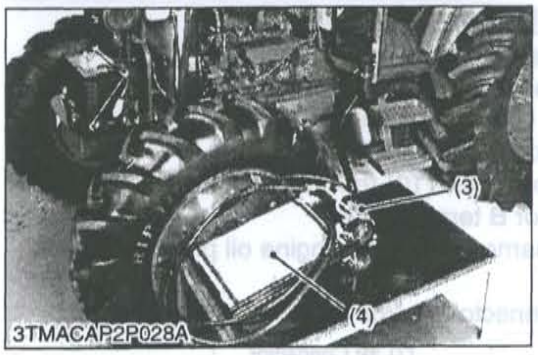
1. Remove the air conditioner belt (2).
2. Remove the compressor (3) and condenser (4) without removing the air conditioner hoses.
3. Disconnect the heater hoses (1).

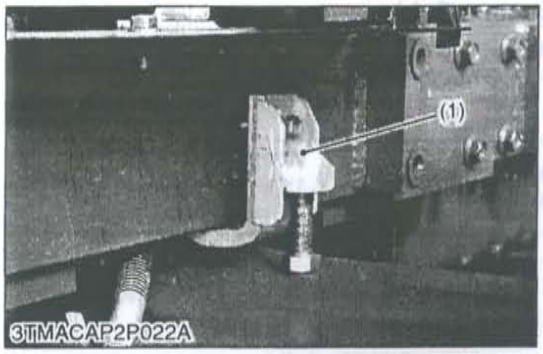
(When reassembling)

- Take care not to damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the air condenser belt tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)

(1) Heater Hose (3) Compressor
(2) Belt (4) Condenser

W1056102





Front Axle Support as a Unit

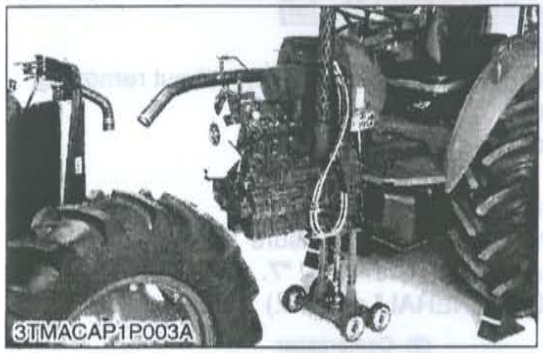
1. Make sure the clutch housing case and front frame are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOL" at "G. GENERAL" section) to the front axle bracket.
3. Remove the front frame mounting screws and separate the front axle as a unit from the engine.

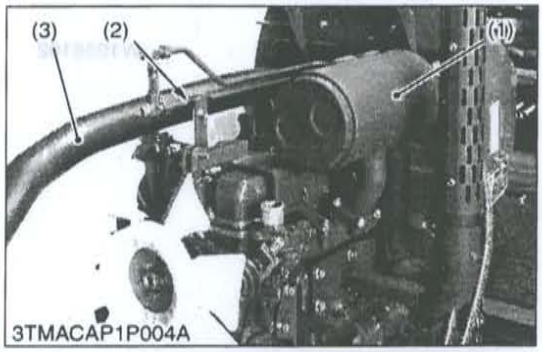
(When reassembling)

Tightening torque	Front frame mounting screw (M14, 9T, UBS)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

(1) Front Axle Rocking Restrictor

W1063409



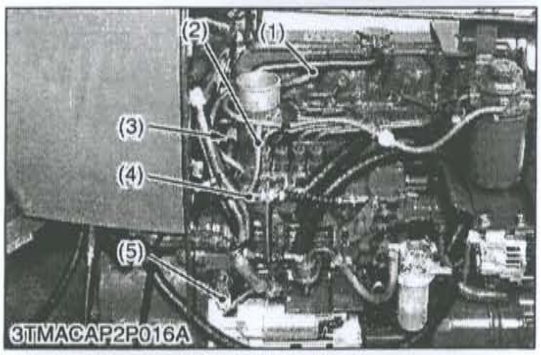


Muffler, Air Cleaner Hose and Pipe Clamp

1. Remove the muffler (1) and air cleaner hose (3).
2. Remove the pipe clamp (2).

(1) Muffler
(2) Pipe Clamp
(3) Air Cleaner Hose

W1057619

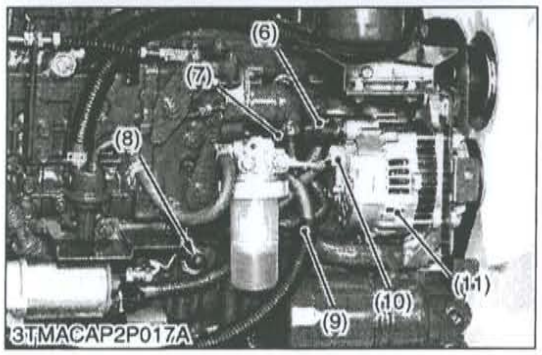


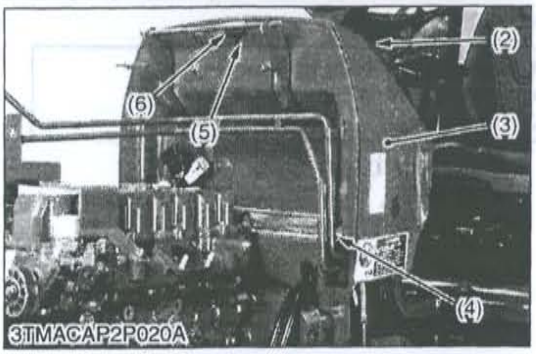
Accelerator Wire, Fuel Hose and Wire Harness

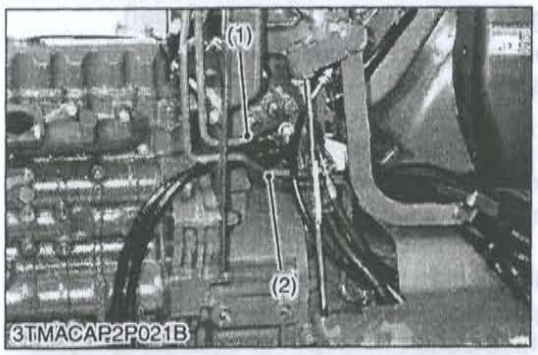
1. Disconnect the accelerator wire (4) and fuel hose (2).
2. Disconnect the wire harness from water temperature sensor (3), engine speed sensor (5) and glow plug (1).
3. Disconnect the fuel hose (9) from fuel filter.
4. Disconnect the **2P** connector (10) from alternator (11) and wire harness from alternator **B** terminal (6).
5. Disconnect the wire harness from the engine oil pressure switch (8).
6. Disconnect the **3P** connector (7) from engine stop solenoid.

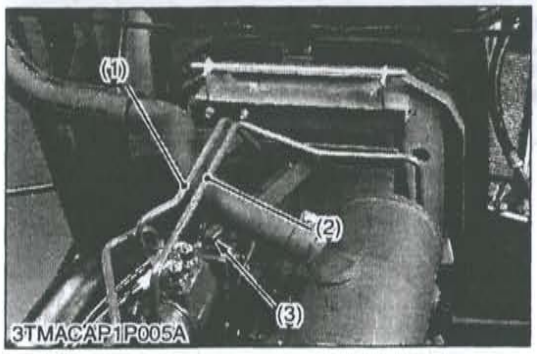
(1) Glow Plug
(2) Fuel Hose
(3) Water Temperature Sensor
(4) Accelerator Wire
(5) Engine Speed Sensor
(6) Alternator **B** Terminal
(7) **3P** Connector
(8) Engine Oil Pressure Switch
(9) Fuel Hose
(10) **2P** Connector
(11) Alternator

W1057829









Steering Support Under Cover and Rear Bonnet

1. Remove the steering support under cover (1).
2. Loosen the rear bonnet mounting screws (4).
3. Remove the seal (6) and panel guide mounting screw (5).
4. Disconnect the wire harness and remove the panel guide (2) and rear bonnet (3).

(1) Steering Support Under Cover
(2) Panel Guide
(3) Rear Bonnet
(4) Screw
(5) Screw
(6) Seal

W1057994

Oil Cooler Pipe and Clamp

1. Disconnect the oil cooler pipe 1 (1) and oil cooler pipe 2 (2).

(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Oil Cooler Pipe 1
(2) Oil Cooler Pipe 2

W1058314

Power Steering Pipe and Oil Cooler Pipe (CABIN Model)

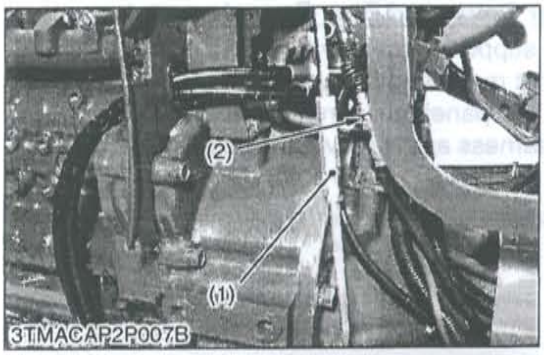
1. Remove the power steering pipe (1).
2. Remove the oil cooler pipe (2).
3. Remove the steering joint shaft (3).

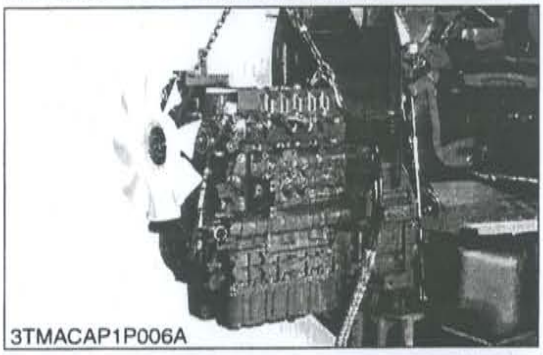
(When reassembling)

Tightening torque	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Power Steering Pipe
(2) Oil Cooler Pipe
(3) Steering Joint Shaft

W1058442





Separating Engine from Clutch Housing (ROPS Model)

1. Hoist the engine with a the hoist and chain.
2. Disconnect the brake rod (1) (R.H., L.H.).
3. Disconnect the clutch cable (2).
4. Remove the steering support mounting screws.
5. Remove the engine mounting screws and nuts and separate the engine from clutch housing.

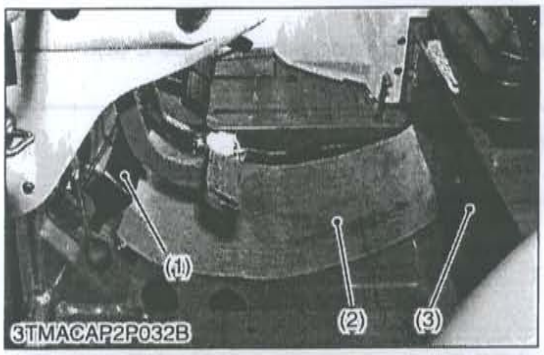
(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs

(1) Brake Rod (2) Clutch Cable

W1059769



Separating Engine from Clutch Housing (CABIN Model)

1. Remove the floor cover and duct retainer (1).
2. Remove the seat under cover (3).
3. Remove the duct (2).
4. Hoist the engine with a the hoist and chain.
5. Remove the engine mounting screws and nuts and separate the engine from clutch housing.

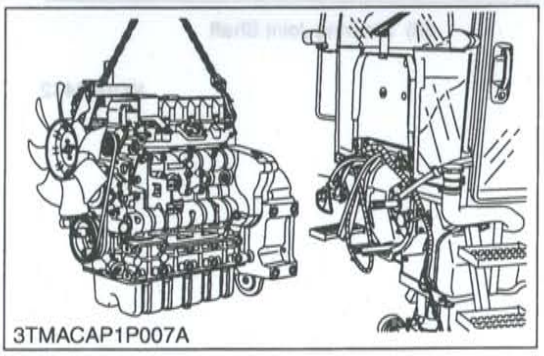
(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs

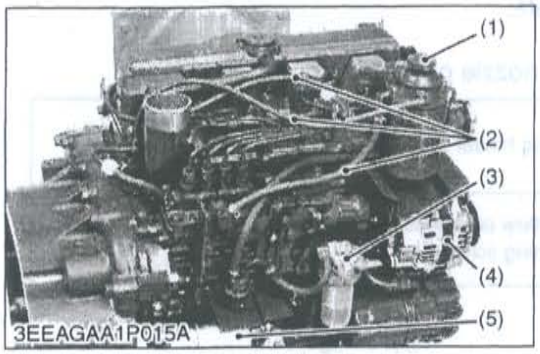
(1) Duct Retainer (3) Seat Under Cover
(2) Duct

W1061467



[3] DISASSEMBLING AND ASSEMBLING

(1) External Components



Air Cleaner, Muffler and Others

1. Remove the air cleaner, muffler, exhaust manifold, fan and fan belt.
2. Remove the fuel filter cartridge (1), fuel tubes (2), sedimenter (3), alternator (4) and starter (5).

(When reassembling)

- Check to see that there are no cracks on the belt surface.
- Mount the check valve with the ↓ mark toward the tank.

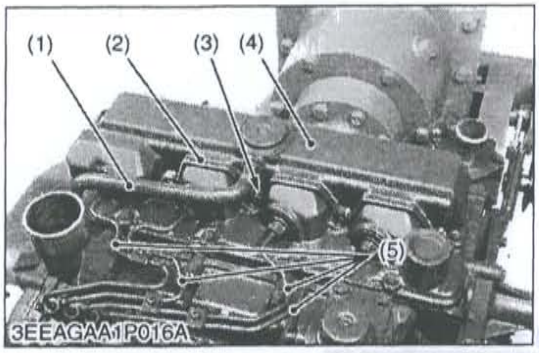
■ **IMPORTANT**

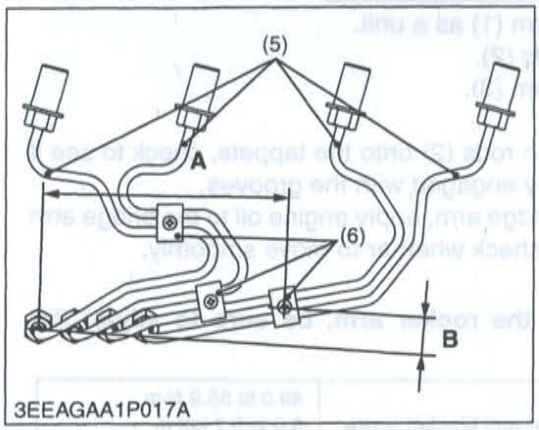
- **After reassembling the fan belt, be sure to adjust the fan belt tension.**
- **Do not confuse the direction of the fan. Attach the fan with its marking facing frontward (toward the radiator).**

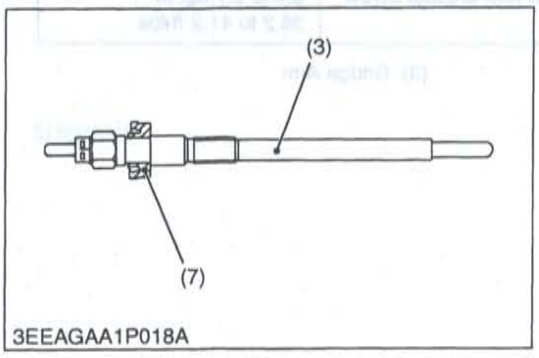
(1) Fuel Filter Cartridge
(2) Fuel Tube
(3) Sedimenter
(4) Alternator
(5) Starter

W1049622

(2) Cylinder Head and Valves







Cylinder Head Cover

1. Remove the breather hose (1).
2. Remove the glow lead (2) and the glow plugs (3).
3. Remove the injection pipes (5).
4. Remove the cylinder head cover (4).

(When reassembling)

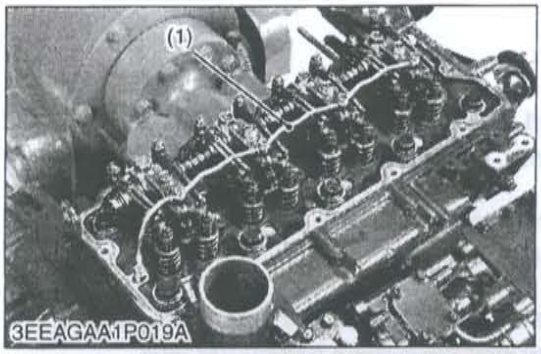
- Check to see that the cylinder head cover gasket is not detective.
- Tighten the head cover mounting screws to specified torque.
- Check the position of the injection pipe clamps (6) to reduce the vibration of the injection pipes (5). (See the figure.)
- Adjust the direction of the ditch to the terminal side when the seal (7) is installed in the glow plug (3).

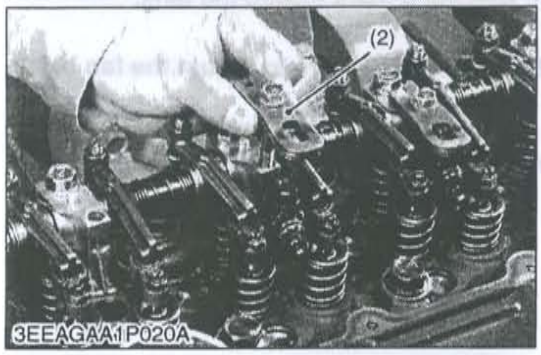
Tightening torque	Cylinder head cover screw	6.9 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.32 ft-lbs
	Injection pipe retaining nut	22.6 to 36.3 N·m 2.3 to 3.7 kgf·m 16.7 to 26.8 ft-lbs
	Glow plug	7.65 to 9.32 N·m 0.78 to 0.95 kgf·m 5.64 to 6.87 ft-lbs

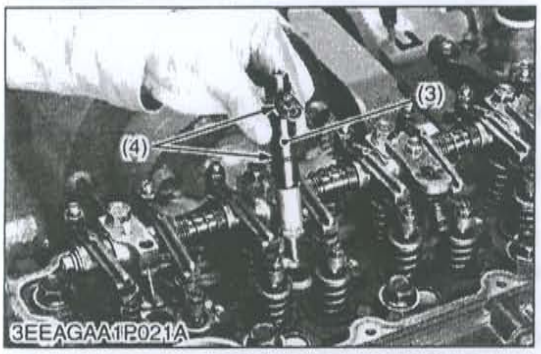
(1) Breather Hose
(2) Glow Lead
(3) Glow Plug
(4) Cylinder Head Cover
(5) Injection Pipe
(6) Injection Pipe Clamp
(7) Seal

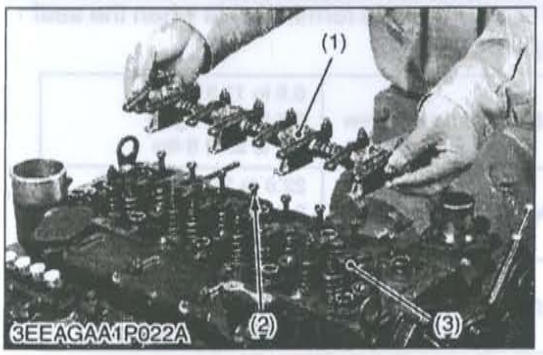
A : 164 to 168 mm (6.46 to 6.61 in.)
B : 11.5 mm (0.45 in.)

W1021753









Nozzle Holder

1. Remove the over flow pipe (1).
2. Remove the nozzle holder clamps (2), nozzle holder assembly (3) and nozzle gaskets.

(When reassembling)

- Be sure to place the nozzle gaskets and the O-rings (4).

Tightening torque	Nozzle holder clamp screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
	Overflow pipe assembly retaining screw	9.8 to 11.3 N·m 1.0 to 1.15 kgf·m 7.23 to 8.32 ft-lbs

(1) Overflow Pipe
(2) Nozzle Holder Clamps
(3) Nozzle Holder Assembly
(4) O-ring

W1049737

Rocker Arm, Push Rod and Bridge Arm

1. Remove the rocker arm (1) as a unit.
2. Remove the push rods (2).
3. Remove the bridge arm (3).

(When reassembling)

- When putting the push rods (2) onto the tappets, check to see if their ends are properly engaged with the grooves.
- When installing the bridge arm, apply engine oil to the bridge arm shaft sufficiently and check whether to move smoothly.

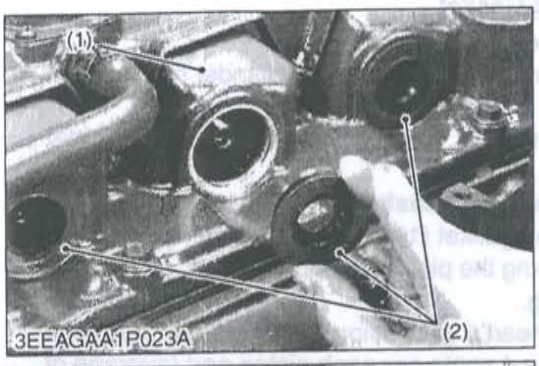
■ **IMPORTANT**

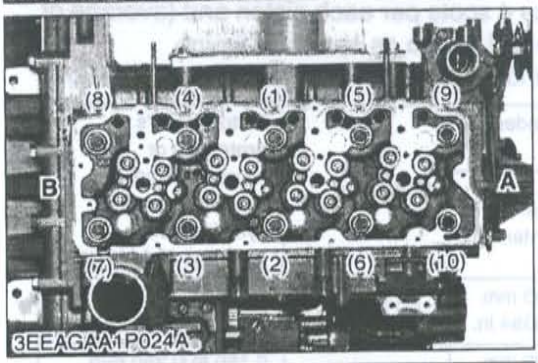
- **After reassembling the rocker arm, be sure to adjust the valve clearance.**

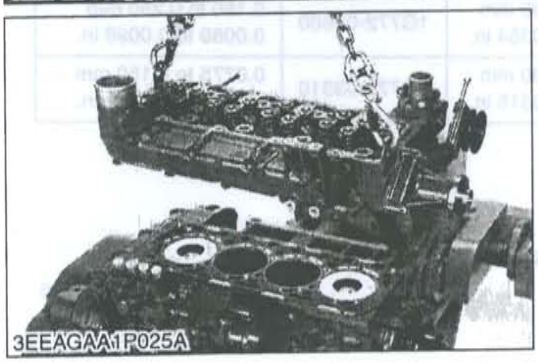
Tightening torque	Rocker arm bracket screw	49.0 to 55.9 N·m 5.0 to 5.7 kgf·m 36.2 to 41.2 ft-lbs

(1) Rocker Arm
(2) Push Rod
(3) Bridge Arm

W1050212







Injection Nozzle Oil Seal (if necessary)

1. Remove the injection nozzle oil seal (2) from cylinder head cover (1).

(When reassembling)

- When installing the injection nozzle oil seal, use new one.

(1) Cylinder Head Cover (2) Injection Nozzle Oil Seal

W1054100

Cylinder Head

1. Remove the cylinder head screw in the order of (10) to (1), and remove the cylinder head.
2. Remove the cylinder head gasket.

(When reassembling)

- Replace the head gasket with a new one.
- When mounting the gasket, set it to the knock pin hole. Take care not to mount it reversely.
- The cylinder head should be free of scratches and dust.
- Take care for handling the gasket not to damage it.
- Install the cylinder head.
- Tighten the cylinder head screw gradually in the order of (1) to (10) after applying engine oil.
- Be sure to adjust the valve clearance. See the "Valve Clearance".
- It is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

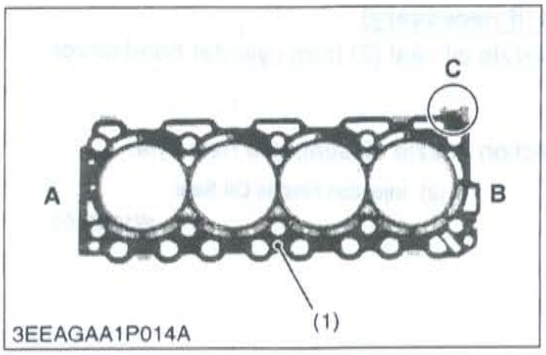
■ **IMPORTANT**

- **When replacing a piston, piston pin bush, connecting rod or crankpin bearing, select the cylinder head gasket thickness to meet with the top clearance refer to the "Selecting Cylinder Head Gasket".**

Tightening torque	Cylinder head mounting screw	186.3 to 196.1 N·m 19.0 to 20.0 kgf·m 137.4 to 144.6 ft-lbs

A : Front Cover Side **B : Flywheel Housing Side**

W1170923



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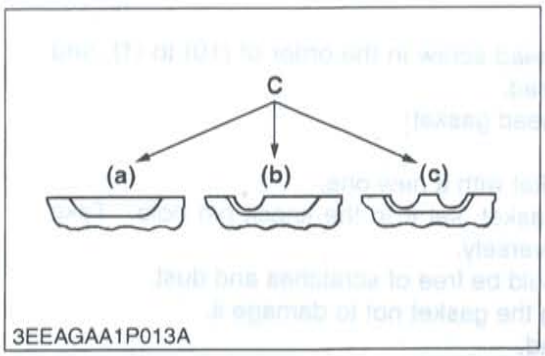

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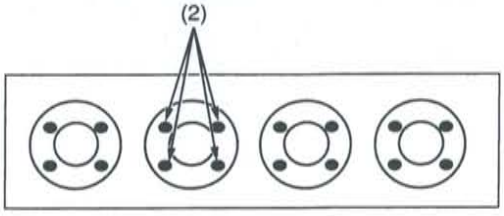

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Selecting Cylinder Head Gasket

■ Replacing the Cylinder Head Gasket

1. Make sure to note the notch **(a)**, **(b)** or **(c)** of cylinder head gasket (1) in advance.
2. Replace the same notch **(a)**, **(b)** or **(c)** as the original cylinder head gasket (1).

■ Selecting the Cylinder Head Gasket

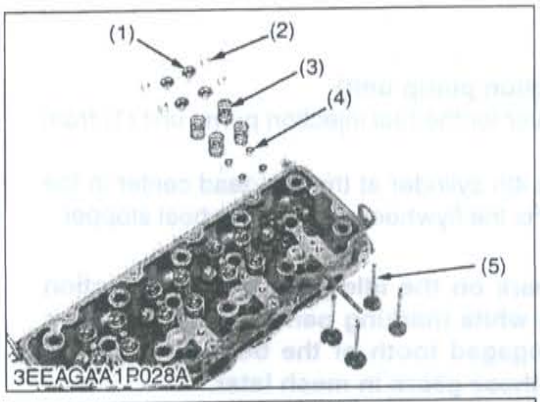
- Select the cylinder head gasket (1) thickness to meet with the top clearance when replacing the piston, piston pin bush, connecting rod or crankpin bearing.

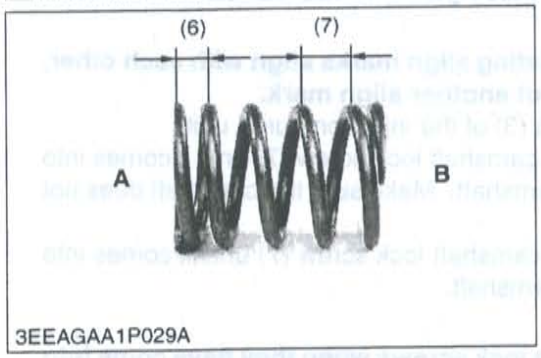
1. Measure the piston head's protrusion or recessing from the crankcase cylinder face 4 spots per each piston and (average of four pistons) using the dial gauge as shown in figure.
2. Select the suitable cylinder head gasket refer to the table below.

Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Part Code	Piston Head's protrusion or recessing from the level of crankcase cylinder face. (average of 4 pistons)
	Before tightening	After tightening		
Without notch **(a)**	1.10 mm 0.0433 in.	1.00 mm 0.0394 in.	1G772-03610	0.250 to 0.3425 mm 0.0098 to 0.0135 in.
1 notch **(b)**	1.00 mm 0.0394 in.	0.90 mm 0.0354 in.	1G772-03600	0.150 to 0.250 mm 0.0059 to 0.0098 in.
2 notches **(c)**	0.90 mm 0.0354 in.	0.80 mm 0.0315 in.	1G772-03310	0.0775 to 0.150 mm 0.0031 to 0.0059 in.

(1) Cylinder Head Gasket
(2) Measuring Point
A : Front Cover Side
B : Flywheel Housing Side
C : Notch of Cylinder Head Gasket
(a) Without Notch
(b) 1 Notch
(c) 2 Notches

W1022965





Valve

1. Remove the valve spring collets (2) after compressing the valve spring (3) with the valve spring retainer (1).

(When reassembling)

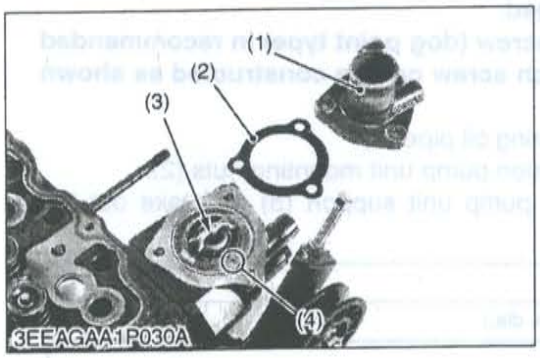
- Install the valve spring with its small-pitch end downward (at the cylinder head side).
- Wash the valve stem and valve guide hole, and apply engine oil sufficiently.
- After installing the valve spring collets (2), lightly tap the stem to assure proper fit with a plastic hammer.

(1) Valve Spring Retainer
(2) Valve Spring Collet
(3) Valve Spring
(4) Valve Stem Seal
(5) Valve
(6) Smaller Pitch
(7) Large Pitch

A : Cylinder Head Side
B : Valve Spring Retainer Side

W1053044

(3) Thermostat



Thermostat Assembly

1. Remove the thermostat cover mounting screws, and remove the thermostat cover (1).
2. Remove the thermostat assembly (3).

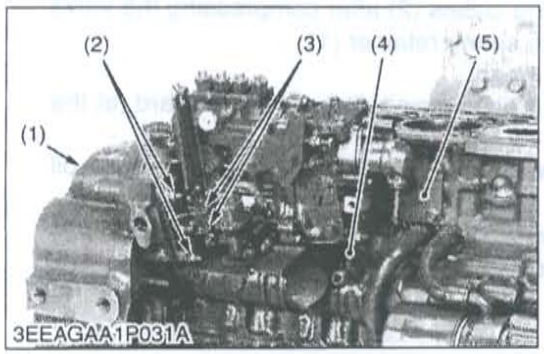
(When reassembling)

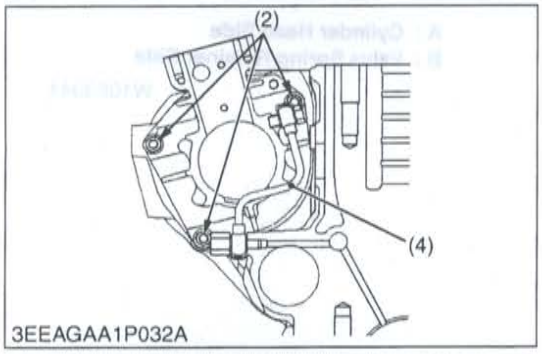
- Apply a liquid gasket (Three Bond 1217D or equivalent) only at the thermostat cover side of the gasket (2).
- Attach the thermostat with its hole (4) facing toward the front cover side.

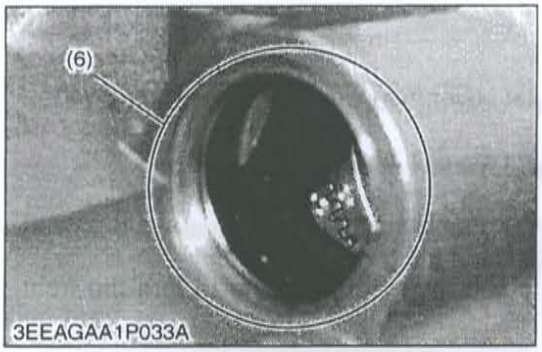
(1) Thermostat Cover
(2) Thermostat Cover Gasket
(3) Thermostat Assembly
(4) Hole

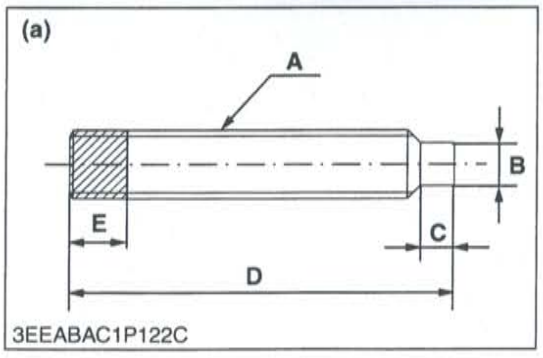
W1072747

(4) Injection Pump Unit









Injection Pump Unit

(Removing the fuel injection pump unit)

1. Detach the window cover for the fuel injection pump unit (1) from the flywheel housing.
2. Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper.

■ **IMPORTANT**

- **Look for the align mark on the idle gear and the injection pump gear. Using a white marking pen or the like, put an align mark on the engaged tooth of the both gears. This helps to reassemble these gears in mesh later.**

■ **NOTE**

- **When the already existing align marks align with each other, there is no need to put another align mark.**

3. Unscrew the two plugs (3) of the injection pump unit.
4. Tighten the upper fuel camshaft lock screw (7) until it comes into contact with the fuel camshaft. Make sure the camshaft does not move any longer.
5. Tighten the lower fuel camshaft lock screw (7) until it comes into contact with the fuel camshaft.

■ **NOTE**

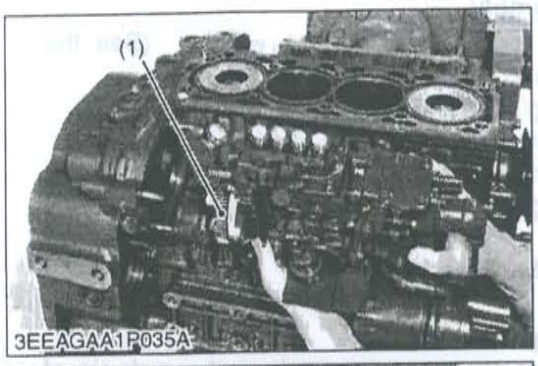
- **Never overtighten the lock screws when they have come into contact with the camshaft. Otherwise the injection pump itself may get damaged.**
- **Use of a socket set screw (dog point type) in recommended for best results. Such screw can be constructed as shown in figure (a).**

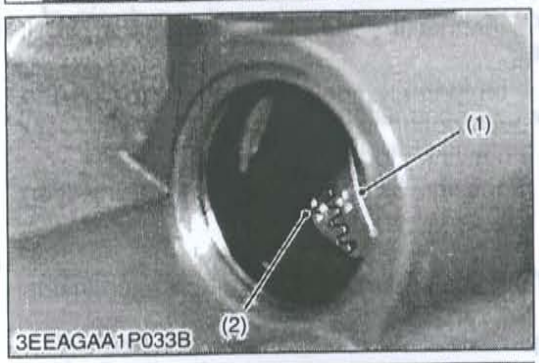
6. Disconnect the lubricating oil pipe (4).
7. Loosen the three injection pump unit mounting nuts (2).
8. Remove the injection pump unit support (5) and take out the injection pump unit.

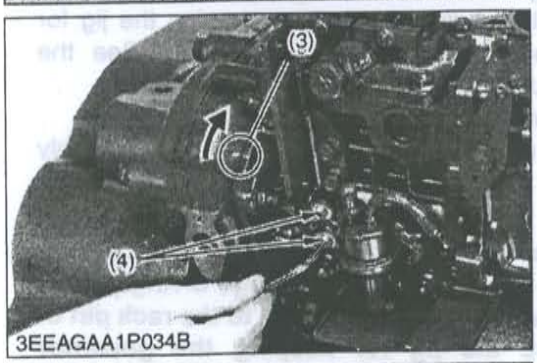
A	M8 × Pitch 1.25
B	5 mm dia. (0.197 in. dia.)
C	4 mm (0.157 in.)
D	45 mm (1.772 in.)
E	10 mm (0.39 in.) : Conspicuously Painted

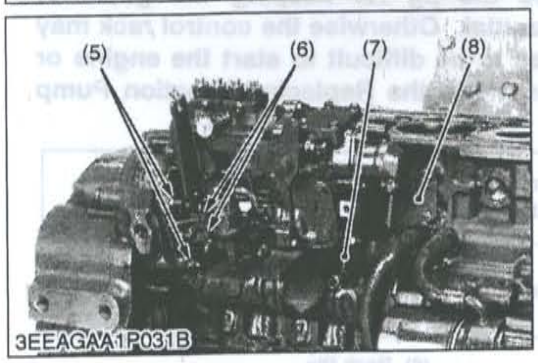
(1) Window Cover
(2) Injection Pump Unit Mounting Nut
(3) Plug
(4) Lubricating Oil Pipe
(5) Injection Pump Unit Support
(6) Window for Injection Pump Gear
(7) Fuel Camshaft Lock Screw (Socket Set Screw Dog Point Type)

W1175054









Injection Pump Unit (Continued)

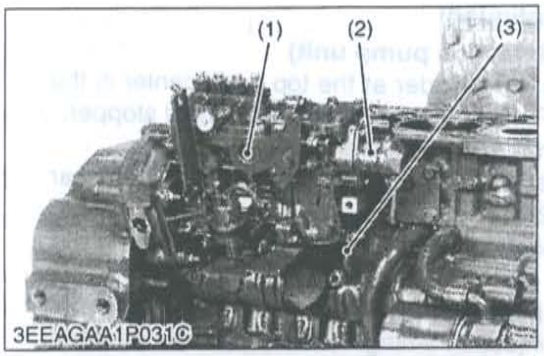
(Reassembling the fuel injection pump unit)

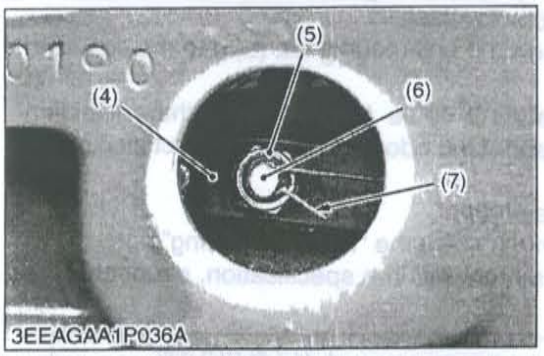
1. Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper.
2. Install the injection pump unit to the crankcase 1.
3. Make sure of aligning the align marks of the injection pump gear (1) and the idle gear (2).
4. Take off the fuel camshaft lock screws (4) and tighten the plugs (6) for plugging.
5. Moving the injection pump unit clockwise (viewed from front cover side), align the injection timing marks (3) on the injection pump unit and on the crankcase 1.
6. Tighten the injection pump unit mounting nut (5) to the specified torque.
7. Reconnect the lubricating oil pipe (7) and place the injection pump unit support (8) and the window cover of the injection pump unit.
8. Remove the flywheel stopper.
9. Check the injection timing. (See the "Injection Timing".)
10. If the injection timing is not within the specification, repeat (4) to (9) again.

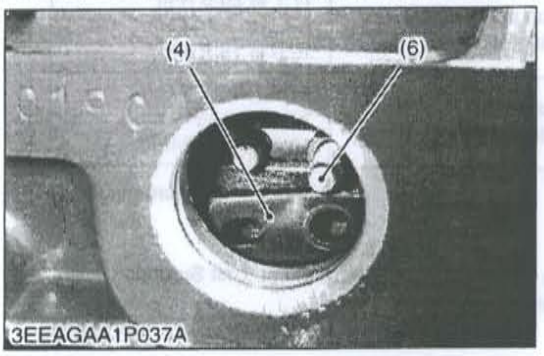
Tightening torque	Injection pump unit mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Lubricating oil pipe mounting screw	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 ft-lbs

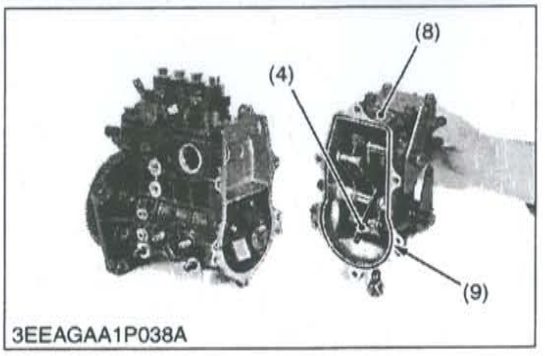
(1) Injection Pump Gear
(2) Idle Gear
(3) Align Mark
(4) Fuel Camshaft Lock Screw (Socket Set Screw Dog Point Type)
(5) Injection Pump Unit Mounting Nut
(6) Plug
(7) Lubricating Oil Pipe
(8) Injection Pump Unit Support

W1176586









Governor Housing Assembly

1. Remove the injection pump unit from the engine. (See the "Injection Pump Unit".)
2. Remove the lubricating oil pipe (3).
3. Remove the stop solenoid (2).
4. Detach the sight cover (1) from the injection pump unit.
5. Unhook the start spring (7) from the rack pin (6) of injection pump assembly.
6. Remove the lock nut (5).

■ **NOTE**

- **Be careful not to drop the nut inside.**

7. Slide off the governor connecting rod (4) from the rack pin of injection pump assembly.
8. For convenient sake, temporarily hook the start spring on the rack pin hole of the governor connecting rod.
9. Remove the governor housing mounting screws.
10. Detach the governor housing assembly (8) from the injection pump unit.

(When reassembling)

- When reassembling the inside parts, put the oil on each inside part slightly.
- After sliding on the governor connecting rod to the rack pin, tighten the nut with the specified torque with using the jig for keeping the governor connecting rod horizontal. (See the Replacing Injection Pump Assembly.)
- After tightening the nut, hook the start spring on the rack pin.
- Check the movement of control rack of injection pump assembly by the stop lever.

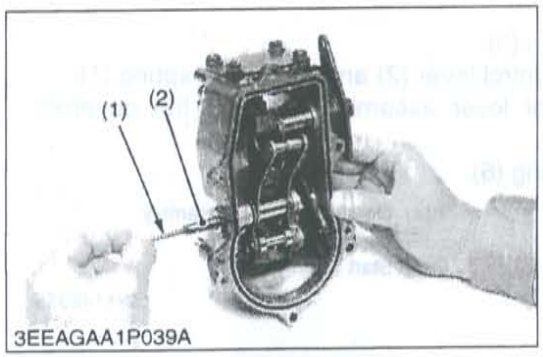
■ **NOTE**

- **When installing the governor housing assembly to the injection pump unit, be careful not to damage O-ring (9).**
- **When linking the governor connecting rod to the rack pin of injection pump, use the jig for keeping the governor connecting rod horizontal. Otherwise the control rack may be stuck, and causes to be difficult to start the engine or hunting of governor. (See the Replacing Injection Pump Assembly.)**

Tightening torque	Governor housing mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.23 to 8.32 ft-lbs
	Lock nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 3.0 ft-lbs

(1) Sight Cover
(2) Stop Solenoid
(3) Lubricating Oil Pipe
(4) Governor Connecting Rod
(5) Lock Nut
(6) Rack Pin
(7) Start Spring
(8) Governor Housing Assembly
(9) O-ring

W1137126



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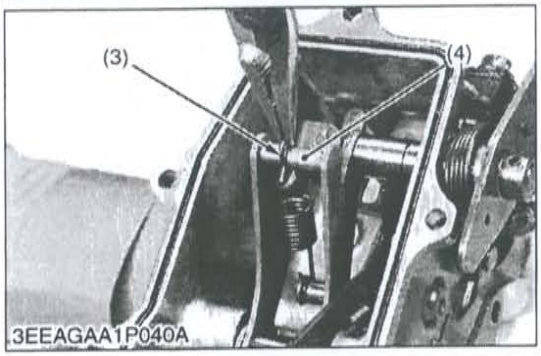

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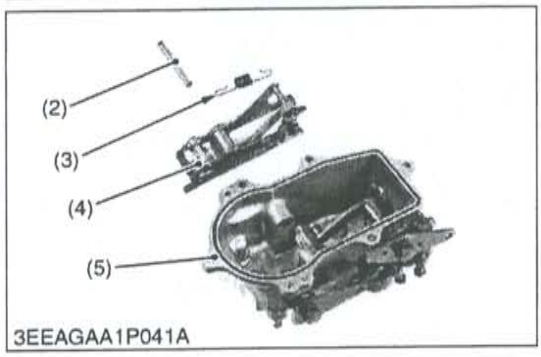

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Governor Fork Lever Assembly

1. Pull off the governor fork lever shaft (2) with the extra bolt (Dia : 4 mm, Pitch : 0.7 mm, Length : more than 25 mm) (1).
2. Unhook the governor spring (3) at the governor fork lever (4) side.
3. Remove the governor fork lever assembly from the governor housing (5).

(When reassembling)

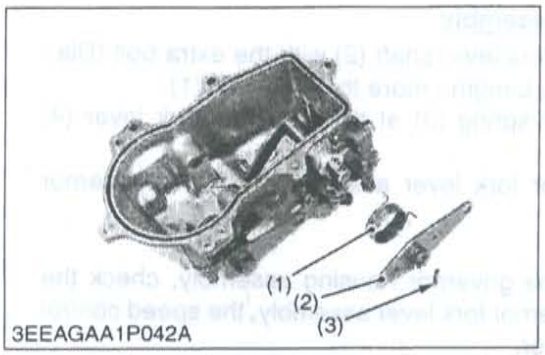
- After reassembling the governor housing assembly, check the movement of the governor fork lever assembly, the speed control lever and the stop lever.

■ **NOTE**

- **When assembling the inside parts, put the oil on each inside part slightly.**
- **Be careful not to deform the start spring.**

(1) Extra Bolt (Dia : 4 mm, Pitch : 0.7 mm, Length : more than 25 mm)
(2) Governor Fork Lever Shaft
(3) Governor Spring
(4) Governor Fork Lever
(5) Governor Housing

W1139749



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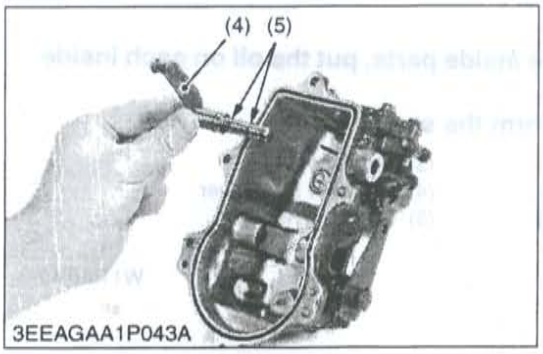
Governor Lever

1. Remove the spring pin (3).
2. Remove the speed control lever (2) and the return spring (1).
3. Remove the governor lever assembly (4) from the governor housing.
4. Remove the start spring (6).

(1) Return Spring
(2) Speed Control Lever
(3) Spring Pin
(4) Governor Lever Assembly
(5) O-ring
(6) Start Spring

W1142375



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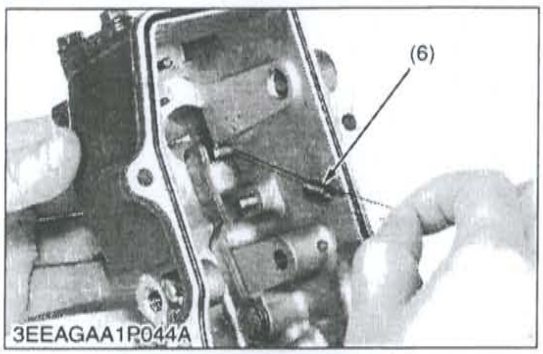

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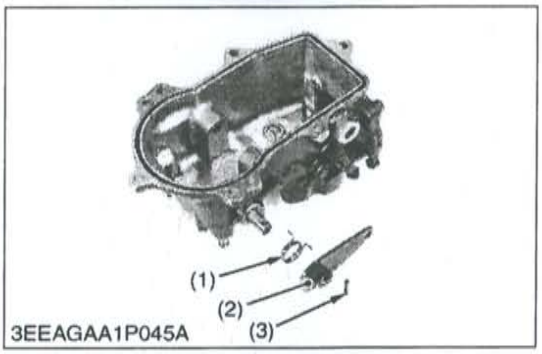

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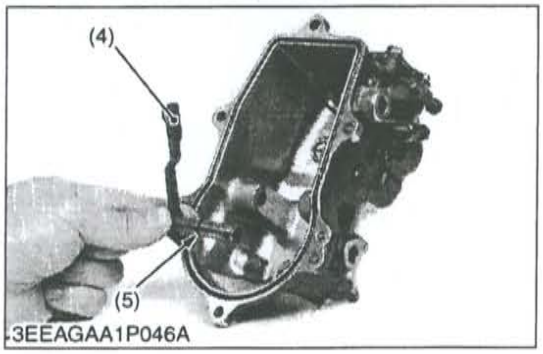
Stop Lever

1. Remove the spring pin (3).
2. Remove the stop lever (2) and the return spring (1).
3. Remove the stop lever shaft (4).

(1) Return Spring
(2) Stop Lever
(3) Spring Pin
(4) Stop Lever Shaft
(5) O-ring

W1143531



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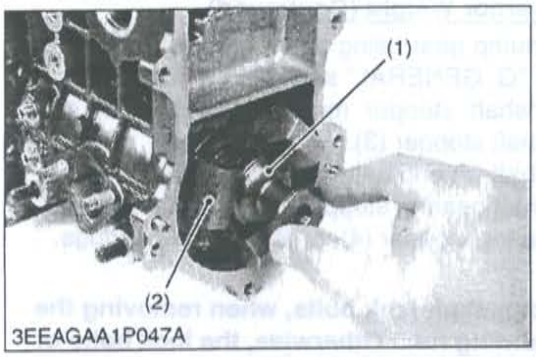

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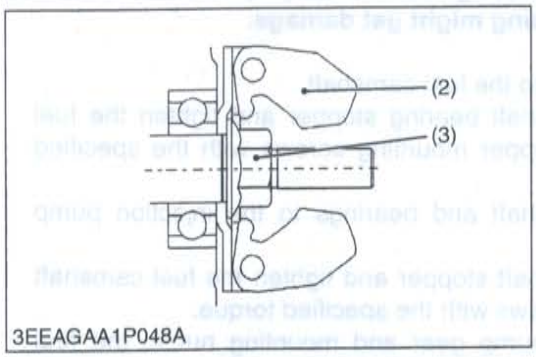

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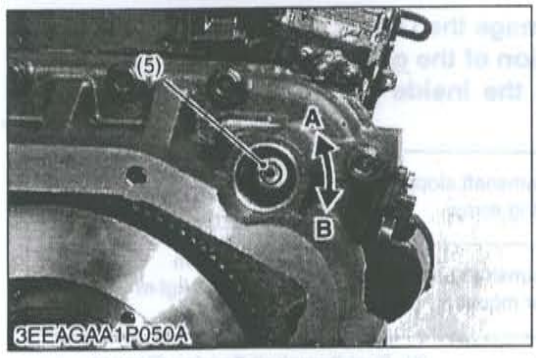

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Fuel Camshaft and Governor Weight

1. Separate the governor housing assembly from the injection pump unit. (See the "Injection Pump Unit".)
2. Remove the governor sleeve (1).
3. Remove the injection pump assembly (4).
4. Remove the fuel camshaft lock screws.
5. Install the injection pump unit to the crankcase 1 again and temporarily tighten unit.
6. Fix the flywheel with the flywheel stopper and loosen the injection pump gear mounting nut (5).
7. Remove the governor weight mounting nut (3) and the governor weight (2).
8. Separate the injection pump unit from the crankcase 1.

■ **NOTE**

- **Do not use the fuel camshaft lock screws, when removing the governor weight mounting nut. Otherwise, the lock screws or injection pump housing might get damage.**

■ **IMPORTANT**

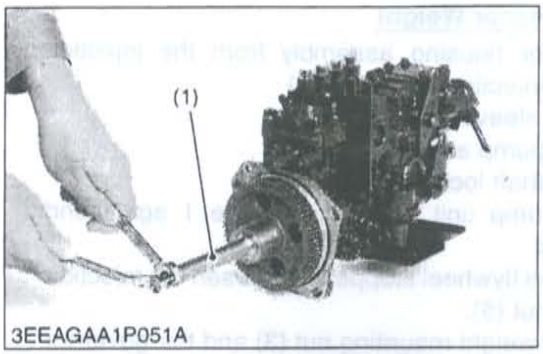
- **This injection pump gear mounting nut (3) has left-handed screw. To loose this nut, rotate clockwise (viewed from flywheel side).**

Tightening torque	Injection pump assembly mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
	Injection pump assembly mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Injection pump gear mounting nut (left-handed screw)	137.3 to 156.9 N·m 14.0 to 16.0 kgf·m 101.3 to 115.7 ft-lbs
	Governor weight mounting nut	62.8 to 72.6 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs

(1) Governor Sleeve
(2) Governor Weight
(3) Governor Weight Mounting Nut
(4) Injection Pump Assembly
(5) Injection Pump Gear Mounting Nut

A : To Tighten
B : To Loosen

W1144178



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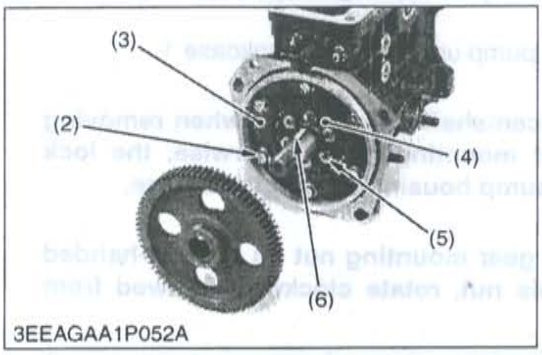

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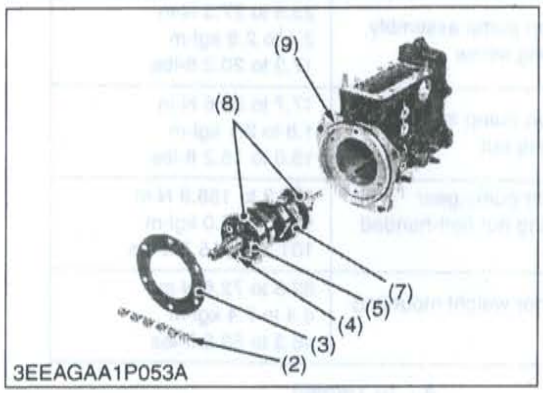

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Fuel Camshaft and Governor Weight (Continued)

1. Pull out the injection pump gear using gear puller. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. Loosen the fuel camshaft stopper mounting screws (2) and remove the fuel camshaft stopper (3).
3. Pull out the fuel camshaft (7) and bearings (8) together.
4. Loosen the fuel camshaft bearing stopper mounting screws (5).
5. After removing the bearing stopper (4), press out the bearings.

■ **NOTE**

- **Do not use the fuel camshaft lock bolts, when removing the governor weight mounting nut. Otherwise, the lock bolts or injection pump housing might get damage.**

(When reassembling)

- Press the bearings into the fuel camshaft.
- Attach the fuel camshaft bearing stopper and tighten the fuel camshaft bearing stopper mounting screws with the specified torque.
- Install the fuel camshaft and bearings to the injection pump housing.
- Attach the fuel camshaft stopper and tighten the fuel camshaft stopper mounting screws with the specified torque.
- Install the injection pump gear and mounting nut to the fuel camshaft and temporarily tighten nut.
- Install the injection pump unit to the crankcase 1 and temporarily tighten unit.
- Fix the flywheel with the flywheel stopper. Then tighten the injection pump gear mounting nut and the governor weight mounting nut with specified torque.
- Install the injection pump assembly to the injection pump housing.
- Install the governor sleeve to the fuel camshaft.
- Check the movement of the governor sleeve.

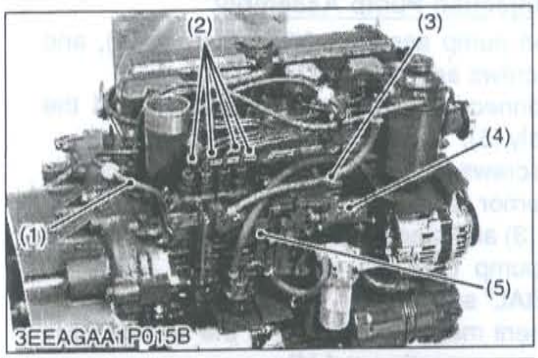
■ **NOTE**

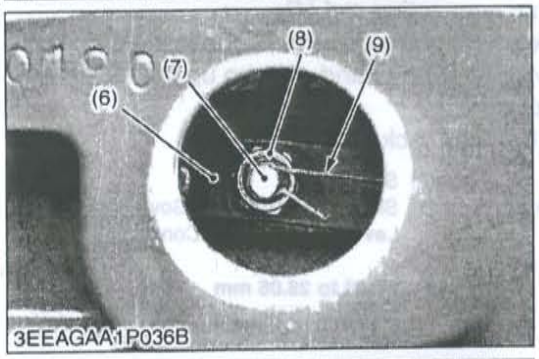
- **Be careful not to damage the O-ring.**
- **Be careful the direction of the governor sleeve.**
- **When reassembling the inside parts, put the oil on each inside part slightly.**

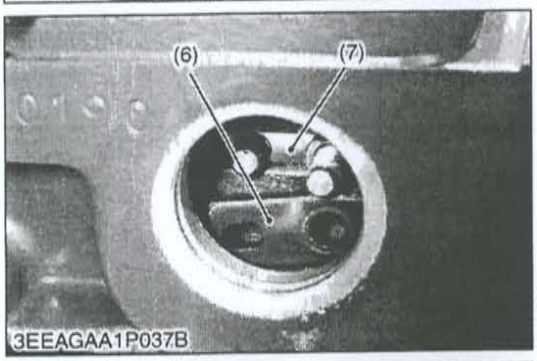
Tightening torque	Fuel camshaft stopper mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.23 to 8.32 ft-lbs
	Fuel camshaft bearing stopper mounting screw	3.8 to 4.2 N·m 0.39 to 0.43 kgf·m 2.8 to 3.1 ft-lbs

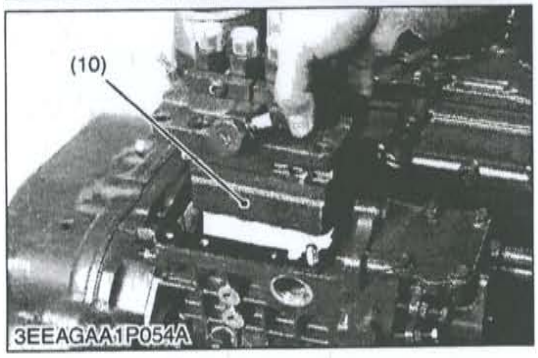
(1) Injection Pump Gear Puller
(2) Fuel Camshaft Stopper Mounting Screw
(3) Fuel Camshaft Stopper
(4) Fuel Camshaft Bearing Stopper
(5) Fuel Camshaft Bearing Stopper Mounting Screw
(6) Key Way of Fuel Camshaft
(7) Fuel Camshaft
(8) Bearing
(9) O-ring

W1029456









Replacing Injection Pump Assembly (If necessary)

- **The injection pump can be replaced with the crankshaft in whatever position.**

1. Disconnect all injection pipes (2).
2. Disconnect the fuel hose (3) and fuel overflow pipe (1).
3. Disconnect the connector from the stop solenoid (4). Then remove the stop solenoid.
4. Detach the sight cover (5) from the injection pump unit.
5. Unhook the start spring (9), and remove the lock nut (8).
6. Slide off the governor connecting rod (6) from the rack pin of injection pump assembly (7).
7. Remove the injection pump mounting screws and nuts, and take out the injection pump assembly (10).

■ **NOTE**

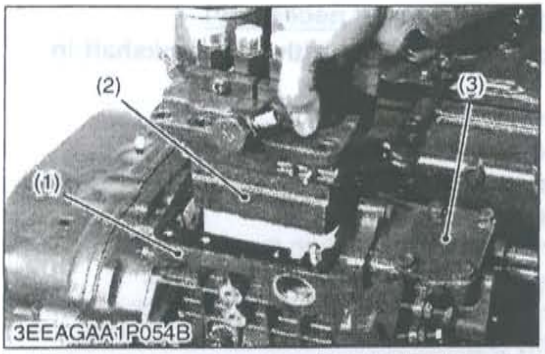
- **Be careful not to drop the lock nut (8).**
- **Be careful not to deform the start spring (9).**
- **When taking out the injection pump assembly, be careful not to hit it against the governor connecting rod (6).**

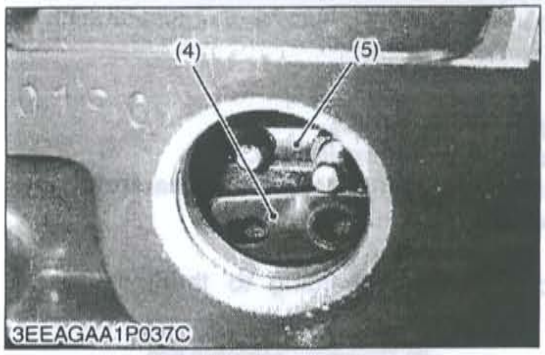
(When reassembling)

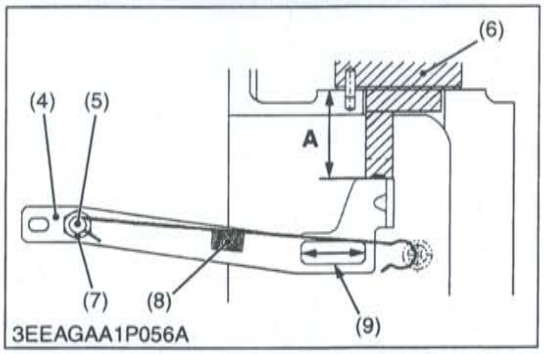
- Install the new injection pump according to the installing procedure.

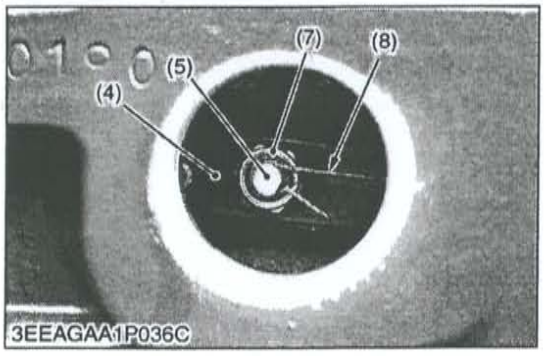
(1) Fuel Overflow Pipe
(2) Injection Pipe
(3) Fuel Hose
(4) Stop Solenoid
(5) Sight Cover
(6) Governor Connecting Rod
(7) Rack Pin
(8) Lock Nut
(9) Start Spring
(10) Injection Pump Assembly

W1182379









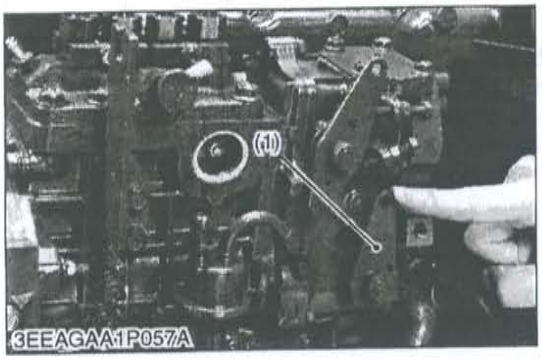
Installing Procedure of Injection Pump Assembly

1. Install the fuel injection pump assembly (2) in its unit (1), and tighten the mounting screws and nuts.
2. Hook the governor connecting rod (4) to the rack pin of the injection pump assembly (5).
3. Tighten the mounting screws and nuts with the specified torque, not to slide off the governor connecting rod (4) from the rack pin.
4. Remove the top cover (3) and place the service jig (6) to the hole of the fuel injection pump unit (1). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
5. Make sure the permanent magnet at the tip of the service jig is attracted to the governor connecting rod (4).
6. Slightly tighten the lock nut (7) of the governor connecting rod (4).
7. Holding down the service jig (6) by hand, tighten up the lock nut (7) to the specified torque.
8. Hook the start spring (8) to the rack pin (5).

(1) Fuel Injection Pump Unit
(2) Fuel Injection Pump Assembly
(3) Top Cover
(4) Governor Connecting Rod
(5) Rack Pin
(6) Service Jig
(7) Lock Nut
(8) Start Spring
(9) Sliding Point between Governor Fork Lever and Governor Connecting Rod

A : 27.95 to 28.05 mm (1.100 to 1.104 in.)

W1069371



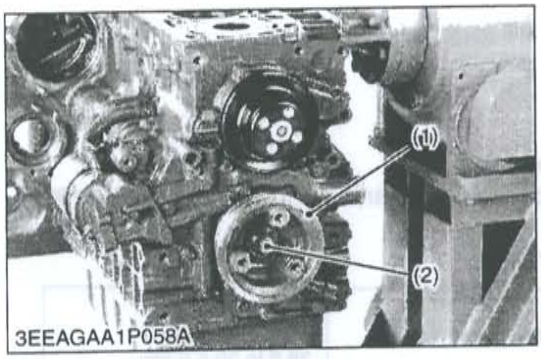
Installing Procedure of Injection Pump Assembly (Continued)

1. Move the stop lever (1) and visually check to see if the fuel injection pump control rack comes smoothly back to the start position by the counter force of the start spring.
2. If the control rack fails to move back smoothly, remove the start spring and the lock nut, take the above steps from 2 of the former page again.
3. Finally fit the sight cover and the stop solenoid back into place.

Tightening torque	Lock nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 3.0 ft-lbs
	Injection pump assembly mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
	Injection pump assembly mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs

(1) Stop Lever

W1069772



Fan Drive Pulley

1. Set the stopper to the flywheel.
2. Remove the crankshaft screw (2).
3. Draw out the fan drive pulley (1).

(When reassembling)

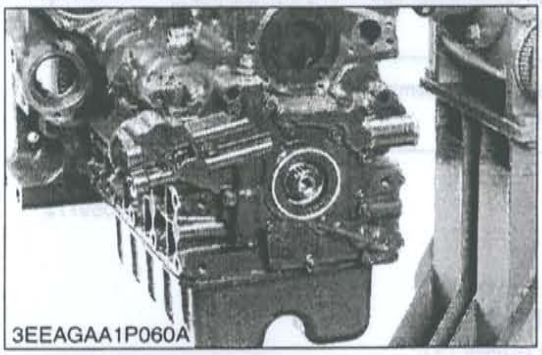
- Tighten the crankshaft screw to specified torque after applying engine oil.

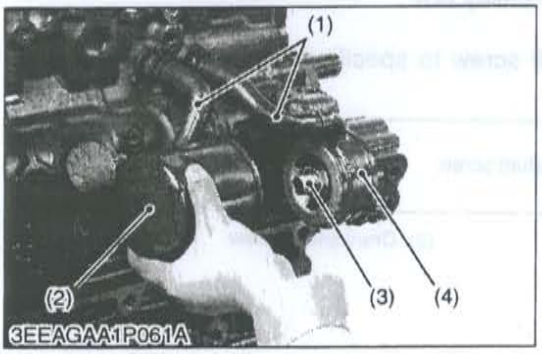
Tightening torque	Crankshaft screw	255.0 to 274.6 N·m 26.0 to 28.0 kgf·m 188.1 to 202.5 ft-lbs

(1) Fan Drive Pulley (2) Crankshaft Screw

W1185033

(5) Water Pump and Oil Cooler





Water Pump (if necessary)

1. Remove the water pump (1).

(When reassembling)

- When mounting the water pump, use the new water pump gasket.

(1) Water Pump

W1187742

Oil Cooler

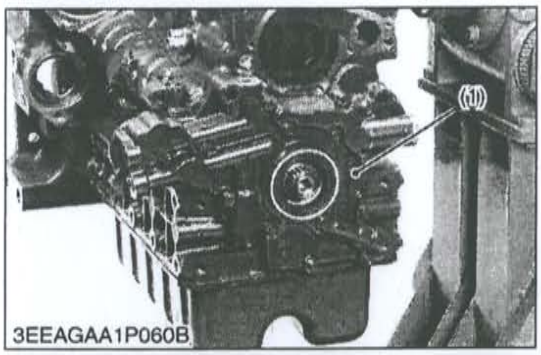
1. Remove the water pipe (1).
2. Remove the oil filter cartridge (2) and the oil cooler joint screw (3).
3. Remove the oil cooler (4).

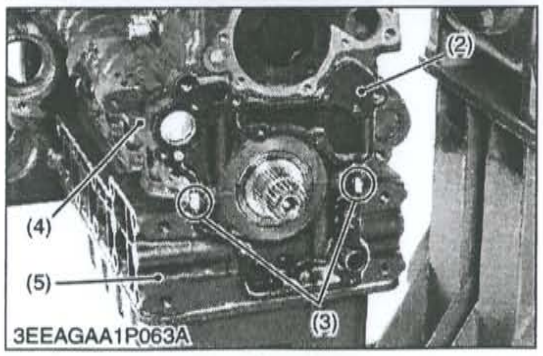
Tightening torque	Oil cooler joint screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

(1) Water Pipe
(2) Oil Filter Cartridge
(3) Oil Cooler Joint Screw
(4) Oil Cooler

W1032266

(6) Front Cover





Front Cover

1. Remove the front cover.

(When reassembling)

- Confirm that the front cover gasket set in position.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

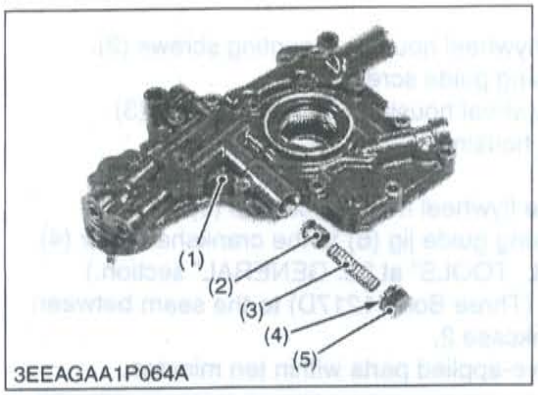
■ **NOTE**

- **Assemble the adhesive-applied parts within ten minutes.**
- **Apply a liquid gasket (Three Bond 1217D) to the seam between crankcase 1 (4) and crankcase 2 (5).**

Tightening torque	Front cover mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs

(1) Front Cover
(2) Front Cover Gasket
(3) Liquid Gasket
(4) Crankcase 1
(5) Crankcase 2

W1189218



Relief Valve

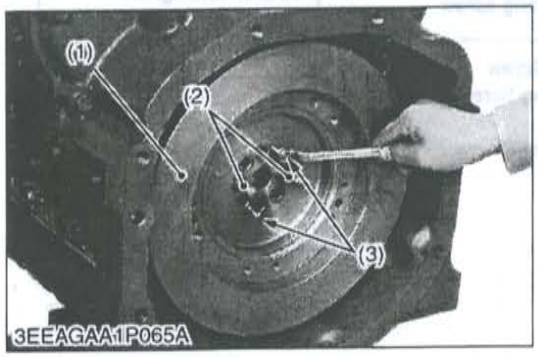
1. Remove the relief valve retaining screw (5).
2. Remove the relief valve (2), the spring (3) and the packing (4).

Tightening torque	Relief valve retaining screw	68.6 to 78.4 N·m 7.0 to 8.0 kgf·m 50.6 to 57.9 ft-lbs

(1) Front Cover
(2) Relief Valve
(3) Spring
(4) Packing
(5) Relief Valve Retaining Screw

W1081251

(7) Flywheel and Timing Gears



Flywheel

1. Install the stopper to the flywheel (1) so that the flywheel does not turn.

■ **NOTE**

- **Do not use an impact wrench. Serious damage will occur.**
- **There is one positioning pin in the crankshaft gear and it is installed in the flywheel.**

2. Detach the flywheel screws and set the flywheel guide screws (2).
3. Remove the flywheel using jack-up screws (3).

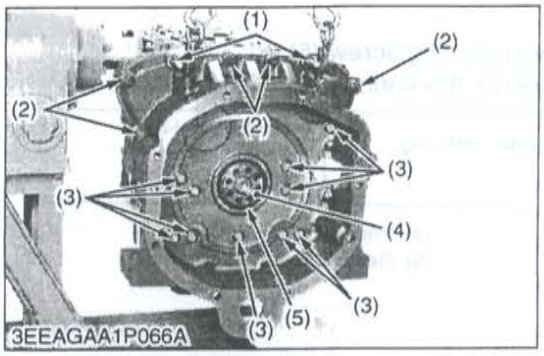
(When reassembling)

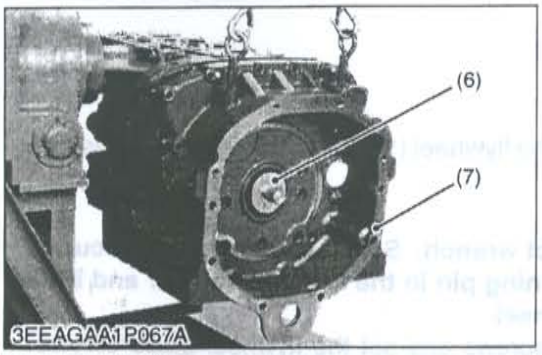
- Apply engine oil to the flywheel screws.
- Before fitting the flywheel and the crankshaft gear together, wipe oil, dust and other foreign substances off their mating faces.
- The flywheel and the crankshaft gear are fitting together in just one position. Make sure they are tightly fit and drive the screws.

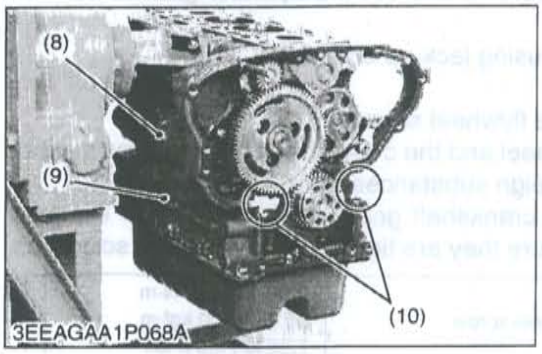
Tightening torque	Flywheel screw	98.1 to 107.9 N·m 10.0 to 11.0 kgf·m 72.3 to 79.6 ft-lbs

(1) Flywheel
(2) Flywheel Guide Screw
(3) Jack-up Screw

W1060354







Flywheel Housing

1. Remove the outside flywheel housing mounting screws (2).
2. Set the flywheel housing guide screws (1).
3. Remove the inside flywheel housing mounting screws (3).
4. Remove the flywheel housing.

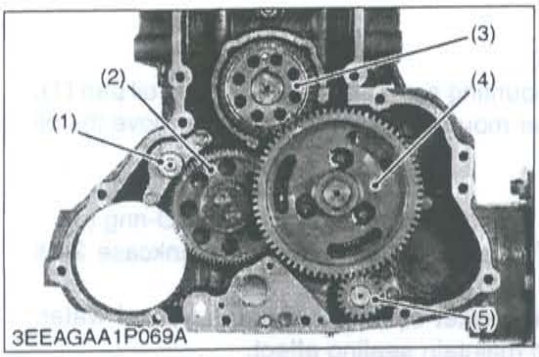
(When reassembling)

- Apply engine oil to the flywheel housing oil seal (5).
- Set the flywheel housing guide jig (6) to the crankshaft gear (4). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
- Apply a liquid gasket (Three Bond 1217D) to the seam between crankcase 1 and crankcase 2.
- Assemble the adhesive-applied parts within ten minutes.

Tightening torque	Flywheel housing mounting screw	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 ft-lbs

(1) Flywheel Housing Guide Screw
(2) Flywheel Housing Mounting Screw (Outside)
(3) Flywheel Housing Mounting Screw (Inside)
(4) Crankshaft Gear
(5) Oil Seal
(6) Jig
(7) Flywheel Housing
(8) Crankcase 1
(9) Crankcase 2
(10) Liquid Gasket

W1034007



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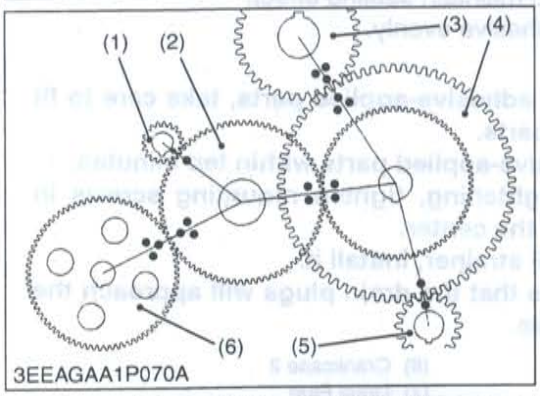

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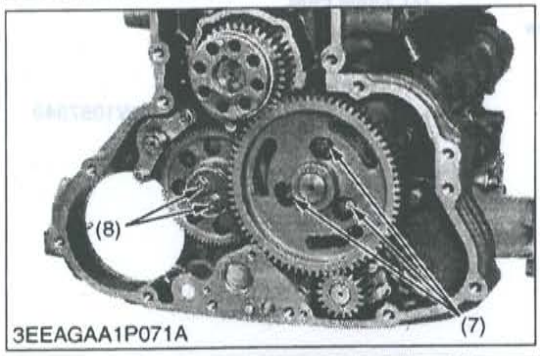

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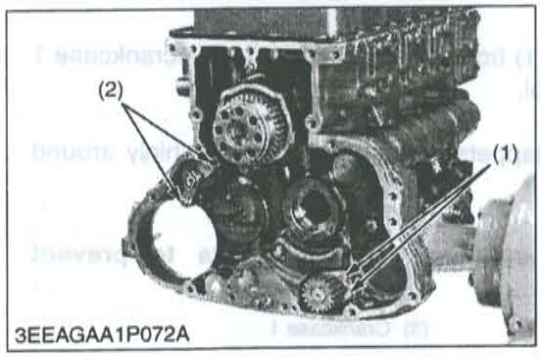

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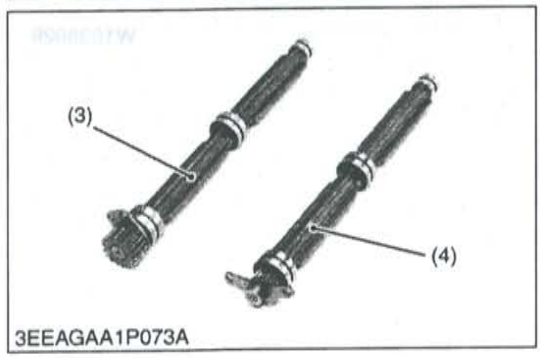

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Camshaft and Idle Gear

1. Rotate the cylinder head side of the engine crankcase to the lower side.
2. Remove three set screws of the camshaft holder (7) and draw out the camshaft.
3. Remove the idle gear mounting screws (8) and draw out the idle gear.

■ **NOTE**

- **If the cylinder head side of the engine crankcase does not become lower side, the tappets drop and become the trouble to the camshaft. The camshaft will not be able to be drawn out.**

(When reassembling)

- When installing the idle gear (2) and cam gear (4), be sure to place the 4th cylinder piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the cam gear last.
- Mount the injection pump gear (6) after installing the flywheel housing.

Tightening torque	Camshaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
	Idle gear mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs

(1) Balancer 2 Gear
(2) Idle Gear
(3) Crank Gear
(4) Cam Gear
(5) Balancer 1 Gear
(6) Injection Pump Gear
(7) Camshaft Set Screw
(8) Idle Gear Mounting Screw

W1189797

Balancer Shaft

1. Remove the balancer shaft 1 set screws (1) and draw out the balancer shaft 1 (3).
2. Remove the balancer shaft 2 set screws (2) and draw out the balancer shaft 2 (4).

(When reassembling)

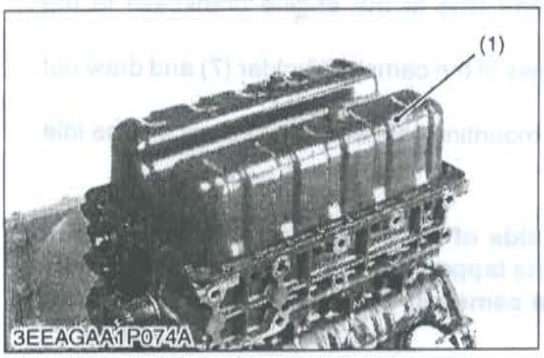
- When installing the balancer shaft 1 (3) and 2 (4), be sure to place the 4th cylinders piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the cam gear last.

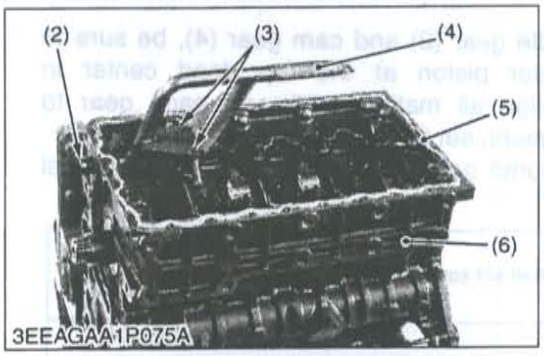
Tightening torque	Balancer shaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs

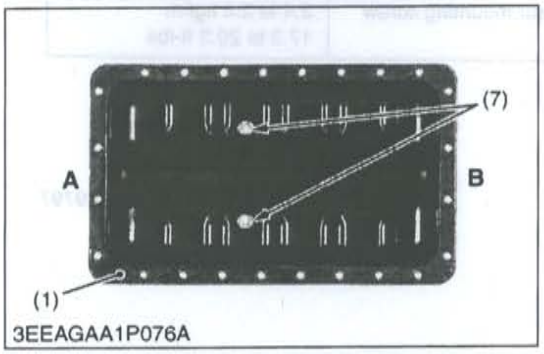
(1) Balancer Shaft 1 Set Screw
(2) Balancer Shaft 2 Set Screw
(3) Balancer Shaft 1
(4) Balancer Shaft 2

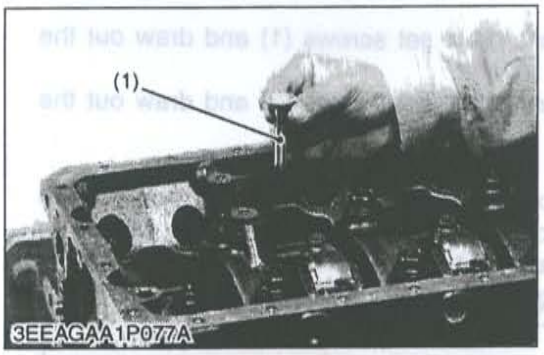
W1191037

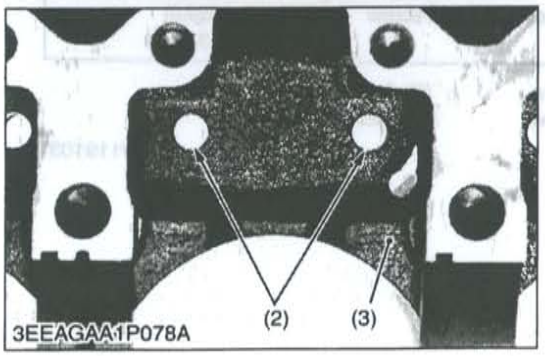
(8) Piston and Connecting Rod











Oil Pan and Oil Strainer

1. Unscrew the oil pan mounting screws and remove the oil pan (1).
2. Unscrew the oil strainer mounting screws (3), and remove the oil strainer (4).

(When reassembling)

- Install the oil strainer, using care not to damage the O-ring (2).
- Apply liquid gasket (Three Bond 1217D) to the crankcase 2 as shown in the figure.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Carefully apply the adhesive evenly.

■ **NOTE**

- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**
- **To avoid uneven tightening, tighten mounting screws in diagonal order from the center.**
- **After cleaning the oil strainer, install it.**
- **Attach the oil pan so that the drain plugs will approach the flywheel housing side.**

(1) Oil Pan
(2) O-ring
(3) Oil Strainer Mounting Screw
(4) Oil Strainer
(5) Liquid Gasket
(6) Crankcase 2
(7) Drain Plug

A : Flywheel Housing Side
B : Front Cover Side

W1057949

Tappet

1. Remove the tappets (1) from the tappet bore of the crankcase 1 (3) using magnetic tool.

(When reassembling)

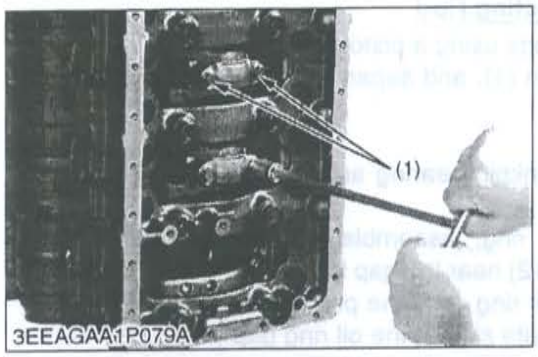
- Before installing the tappets (1), apply engine oil thinly around them.

■ **NOTE**

- **Mark the cylinder number to the tappets to prevent interchanging.**

(1) Tappet
(2) Tappet Bore
(3) Crankcase 1

W1036026



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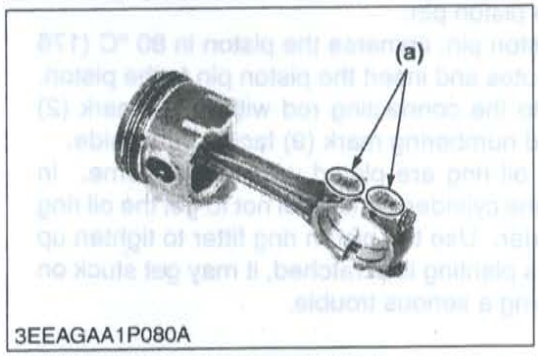

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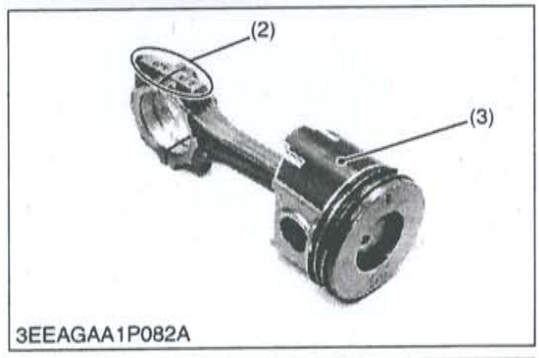

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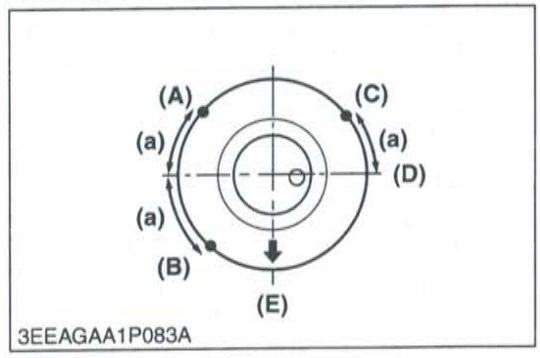

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Connecting Rod Cap

1. Remove the connecting rod screws (1) from connecting rod cap.
2. Remove the connecting rod caps.

(When reassembling)

- Align the marks **(a)** with each other. (Face the marks toward the injection pump.)
- Apply engine oil to the connecting rod screws 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 is still hard to screw in, replace it.
- When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.
- Fit the crank pin metal in place : its centrally groove side toward the connecting rod, and the non-grooved side toward the cap.

Tightening torque	Connecting rod screw	68.6 to 73.5 N·m 7.0 to 7.5 kgf·m 50.6 to 54.2 ft-lbs

(1) Connecting Rod Screw **(a) Mark**

W1058252

Piston

1. Completely clean carbon in the cylinders.
2. Turn the flywheel and set a piston to the top dead center.
3. Pull out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.

(When reassembling)

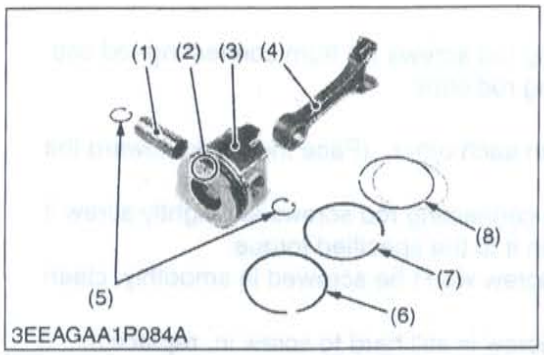
- Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.
- When inserting the piston into the cylinder, face the mark (2) on the connecting rod to the injection pump.

■ **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 position.**
- **When inserting the piston into the cylinder, place the gap of each piston ring like the figure.**
- **Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.**
- **When inserting the piston in place, be careful not to get the molybdenum disulfide coating torn off its skirt (3). This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.**

(1) Piston Ring Compressor
(2) Mark
(3) Molybdenum Disulfide Coating in piston skirt
(a) 0.79 rad (45 °)
(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(E) Injection Pump Side

W1058433



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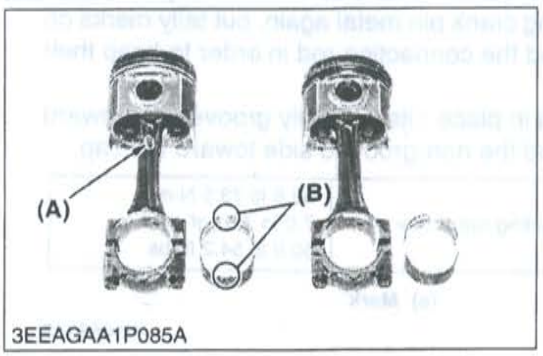

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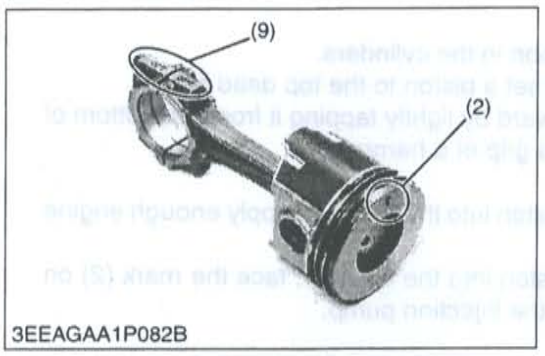

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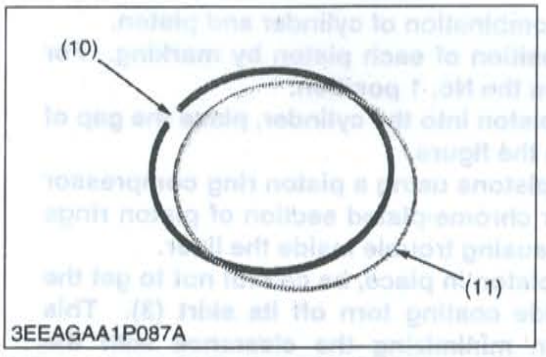

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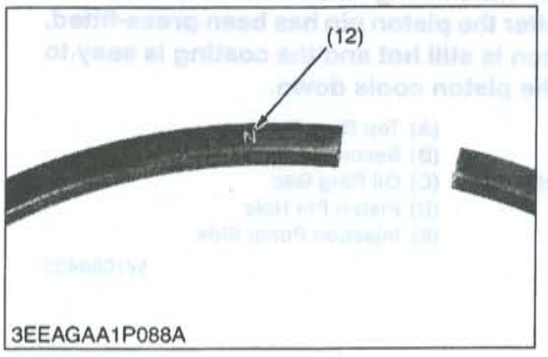

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Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (1), and separate the connecting rod (4) from the piston (3).

(When reassembling)

- Be sure to fix the crankpin bearing and the connecting rod are same I.D. colors.
- When installing the ring, assemble the rings so that the manufacture's mark (12) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (11) on the opposite side of the oil ring gap (10).
- Apply engine oil to the piston pin.
- When installing the piston pin, immerse the piston in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin to the piston.
- Assemble the piston to the connecting rod with the ↑ mark (2) and the connecting rod numbering mark (9) facing same side.
- The end faces of the oil ring are plated with hard chrome. In putting the piston into the cylinder, be careful not to get the oil ring scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring. If the ring's planting is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

■ **IMPORTANT**

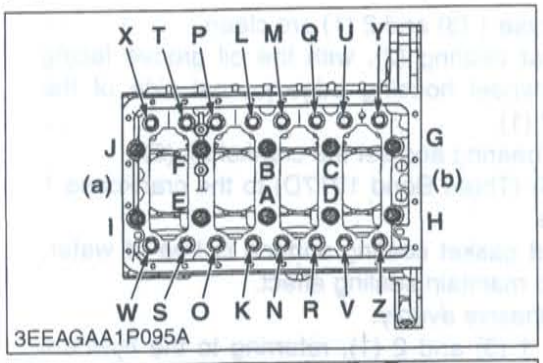
- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

(1) Piston Pin
(2) Mark (↑)
(3) Piston
(4) Connecting Rod
(5) Piston Pin Snap Pin
(6) Top Ring
(7) Second Ring
(8) Oil Ring
(9) Numbering Mark
(10) Oil Ring Gap
(11) Expander Joint
(12) Manufacture's Mark

(A) Connecting Rod ID Color : Blue or without Color
(B) Crankpin Bearing ID Color : Blue or without Color

W1059589

(9) Crankshaft and Crankcase



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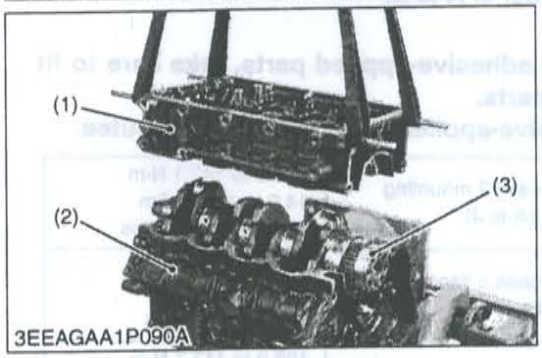

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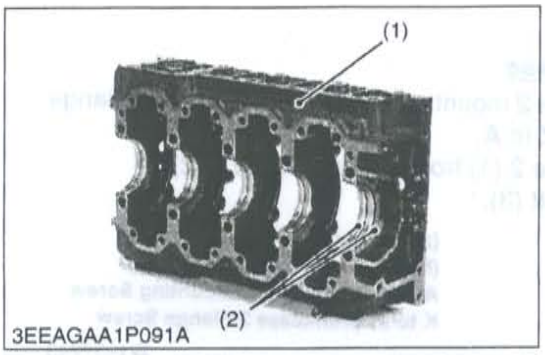
Crankshaft and Crankcase

1. Remove the crankcase 2 mounting screw and crankcase 2 flange screw in the order of **Z** to **A**.
2. Remove the crankcase 2 (1) from the crankcase 1 (2).
3. Remove the crankshaft (3).

(1) Crankcase 2
(2) Crankcase 1
(3) Crankshaft

(a) Front Cover Side
(b) Flywheel Housing Side
A to J :Crankcase 2 Mounting Screw
K to Z :Crankcase 2 Flange Screw

W1037243



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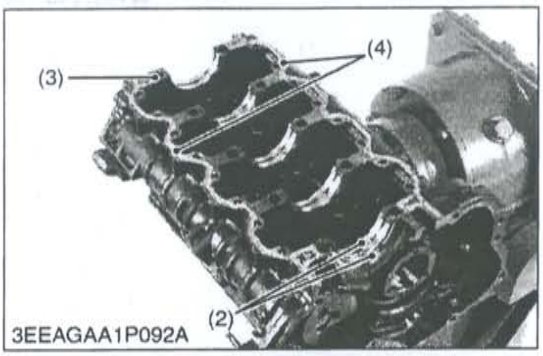

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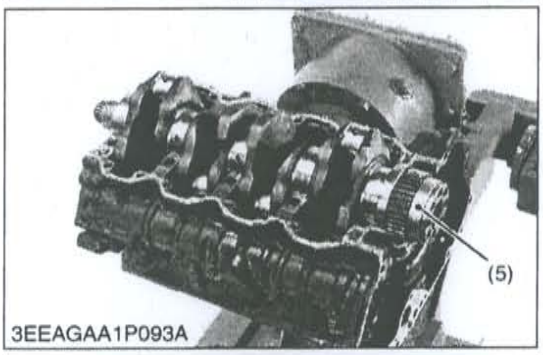

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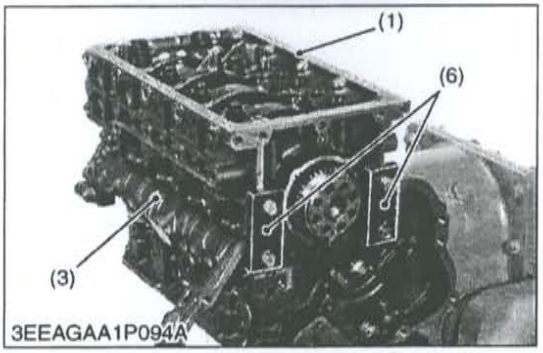

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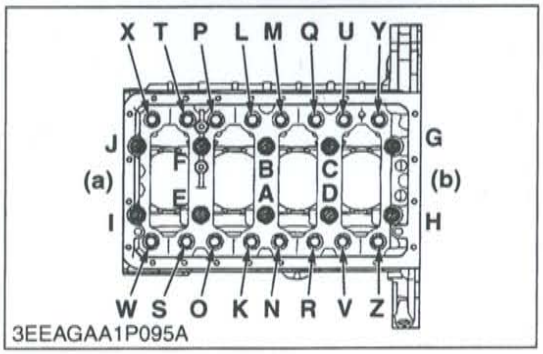

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Crankshaft and Crankcase (Continued)

(When reassembling)

- Make sure the crankcase 1 (3) and 2 (1) are clean.
- Reassemble the thrust bearing (2), with the oil groove facing outside, into both flywheel housing edge journal side of the crankcase 1 (3) and 2 (1).
- Apply oil to the thrust bearing and set the crankshaft (5).
- Apply liquid gasket (4) (Three Bond 1217D) to the crankcase 1 as shown in the figure.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Carefully apply the adhesive evenly.
- Match the crankcase 1 (3) and 2 (1), referring to the flywheel housing's contoured face.
- Tighten the crankcase 2 mounting screws (**A** to **J**) and the crankcase 2 flange screws (**K** to **Z**) loosely after applying engine oil.
- Tighten up the jig (6) to the specified torque same as the flywheel housing screw. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.) This helps to minimize the level difference between the crankcase 1 and the crankcase 2 (at the flywheel side). Possible gap must be 0.05 mm (0.0020 in.) or smaller.
- Tighten the crankcase 2 mounting screw and the crankcase 2 flange screw in the order of **A** to **Z**.

■ **NOTE**

- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**

Tightening torque	Crankcase 2 mounting screw (**A** to **J**)	137.3 to 147.1 N·m 14.0 to 15.0 kgf·m 101.3 to 108.5 ft-lbs
	Crankcase 2 flange screw (**K** to **Z**)	49.0 to 55.9 N·m 5.0 to 5.7 kgf·m 36.1 to 41.2 ft-lbs
	Flywheel housing mounting screw	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 ft-lbs

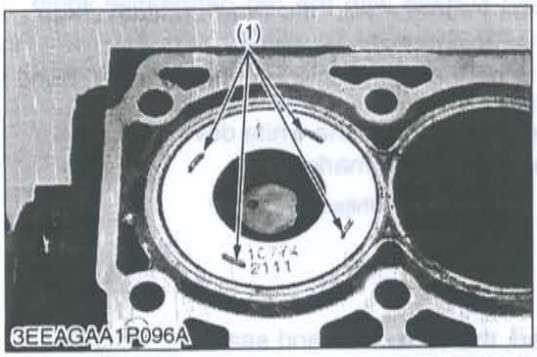
(1) Crankcase 2
(2) Thrust Bearing
(3) Crankcase 1
(4) Liquid Gasket
(5) Crankshaft
(6) Jig

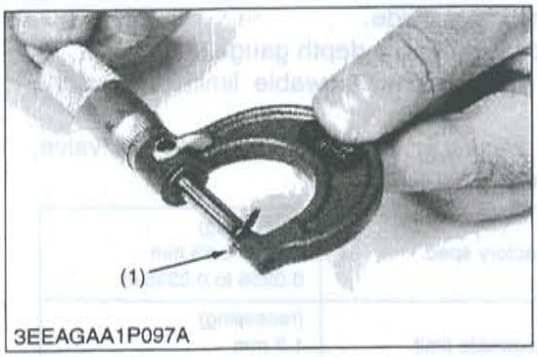
(a) Front Cover Side
(b) Flywheel Housing Side
A to J :Crankcase 2 Mounting Screw
K to Z :Crankcase 2 Flange Screw

W1037643

[4] SERVICING

(1) Cylinder Head and Valves





Top Clearance

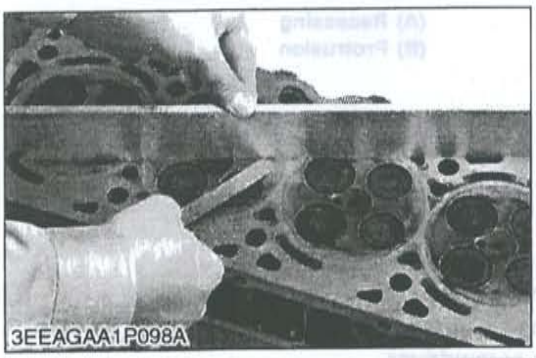
1. Remove the cylinder head (remove the cylinder head gasket completely).
2. Bring the piston to its top dead center fasten 1.5 mm dia. 5 to 7 mm long fuse wires to 3 to 4 spots on the piston top with grease so as to avoid the intake and exhaust valves and the combustion chamber ports.
3. Bring the piston to its middle position, install the cylinder head, and tighten the cylinder head screws to specification. (Head gasket must be changed to new one).
4. Turn the crank shaft until the piston exceeds its top dead center.
5. Remove the cylinder head, and measure squeezed fuse wires for thickness.
6. If the measurement is not within the specified value, check the oil clearance of the crankpin journal and the piston pin.

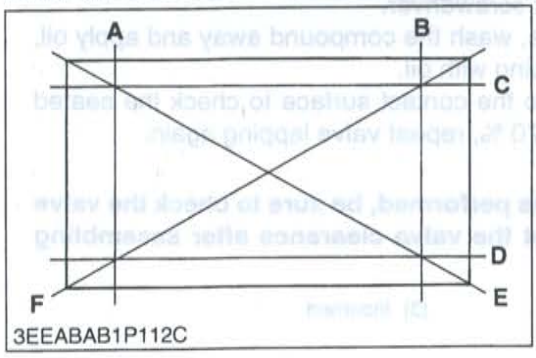
Top clearance	Factory spec.	0.60 to 0.80 mm 0.0236 to 0.0315 in.

Tightening torque	Cylinder head mounting screw	186.3 to 196.1 N·m 19.0 to 20.0 kgf·m 137.4 to 144.6 ft-lbs

(1) Fuse

W1049122





Cylinder Head Surface Flatness

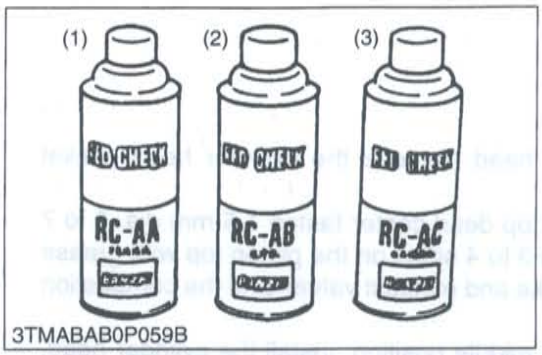
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides (**A**), (**B**), (**C**) and (**D**) and two diagonal (**E**) and (**F**) as shown in the figure. Measure the clearance with a feeler gauge.
3. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ **IMPORTANT**

- **Be sure to check the valve recessing after correcting.**

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.

W1061323



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 the cylinder head surface with the white developer (3).
6. If flawed, it can be identified as red marks.

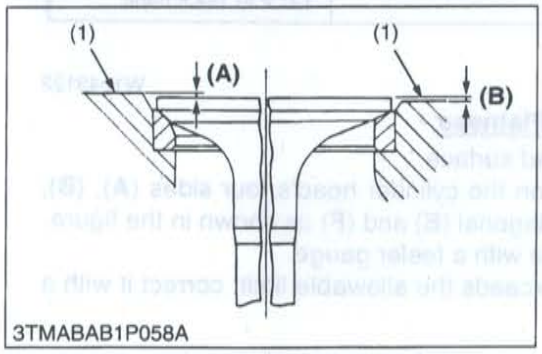
(1) Red Permeative Liquid
(2) Detergent
(3) White Developer

W1076542

Valve Recessing

1. Clean the cylinder head, the valve face and 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.
   If it still exceeds the allowable limit after replacing the valve, replace the cylinder head.

Valve recessing (Intake and exhaust)	Factory spec.	(recessing) 0.65 to 0.85 mm 0.0256 to 0.0335 in.
	Allowable limit	(recessing) 1.2 mm 0.0472 in.



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

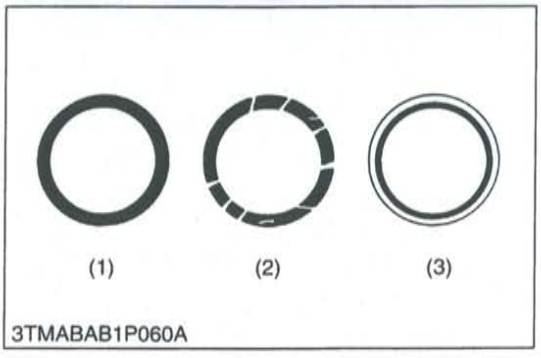
W1061543

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.

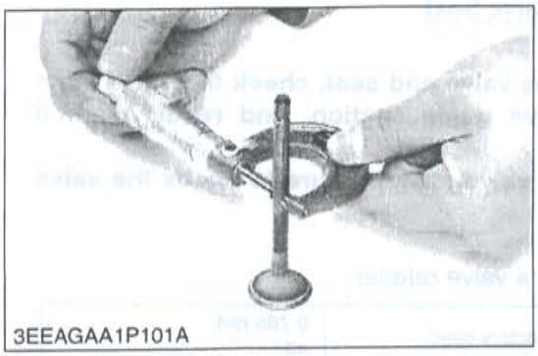
■ **IMPORTANT**

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



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

W1061709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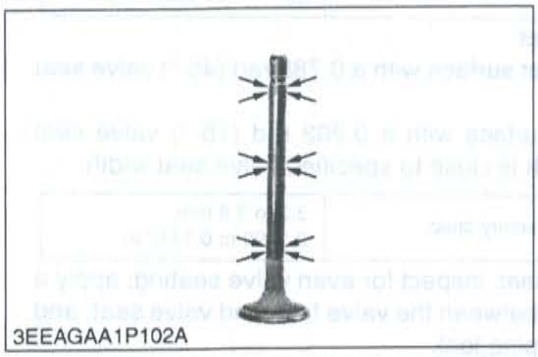
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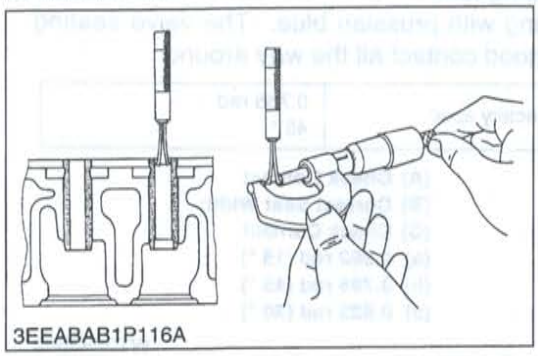
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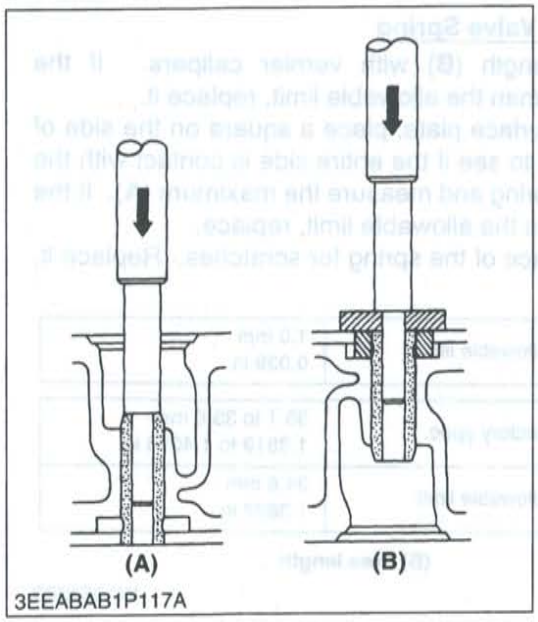

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Clearance between Valve Stem and Valve Guide

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. of the cylinder head at the most wear part as shown in the figure below 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 guide (Intake and exhaust)	Factory spec.	0.055 to 0.085 mm 0.0022 to 0.0033 in.
	Allowable limit	0.1 mm 0.0039 in.

Valve stem O.D. (Intake and exhaust)	Factory spec.	6.960 to 6.975 mm 0.2740 to 0.2746 in.
Valve guide I.D. (Intake and exhaust)	Factory spec.	7.030 to 7.045 mm 0.2768 to 0.2774 in.

W1061883

Replacing Valve Guide

(When removing)

1. Using a valve guide replacing tool, press out the used valve guide. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(When installing)

1. Clean a new valve guide, and apply engine oil to it.
2. Using a valve guide replacing tool, press in a new valve guide until it is flush with the cylinder head as shown in the figure.
3. Ream precisely the I.D. of the valve guide to the specified dimension.

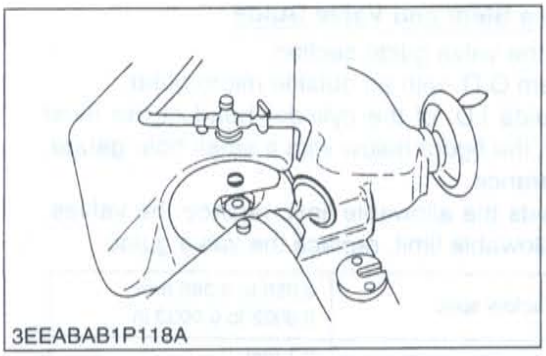
Valve guide I.D. (Intake and exhaust)	Factory spec.	7.030 to 7.045 mm 0.2768 to 0.2774 in.

■ **IMPORTANT**

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

(A) When Removing **(B) When Installing**

W1062212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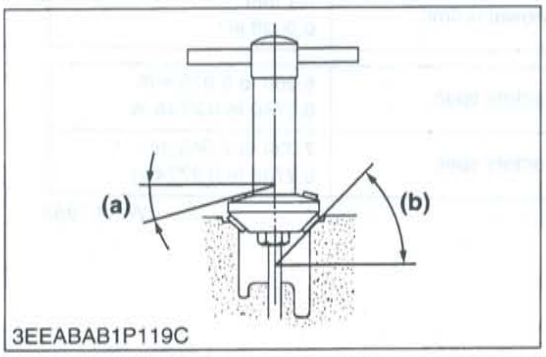

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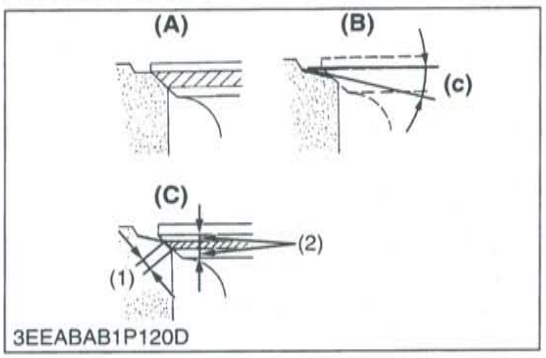

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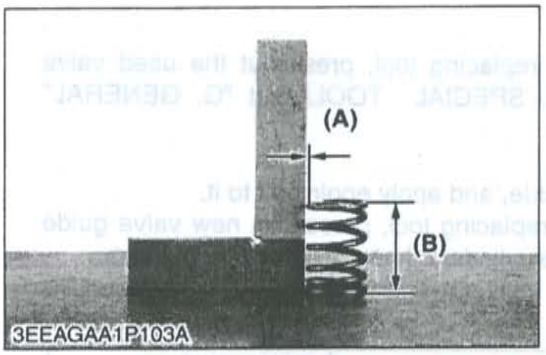

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Correcting Valve and Valve Seat

■ **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 (Intake and exhaust)	Factory spec.	0.785 rad 45 °

2) Correcting Valve Seat

1. Slightly correct the seat surface with a 0.785 rad (45 °) valve seat cutter.
2. Resurface the seat surface with a 0.262 rad (15 °) valve seat cutter so that the width is close to specified valve seat width.

Valve seat width (Intake and exhaust)	Factory spec.	3.3 to 3.6 mm 0.1299 to 0.1417 in.

3. After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.
4. Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

Valve seat angle (Intake and exhaust)	Factory spec.	0.785 rad 45 °

(1) Valve Seat Width
(2) Identical Dimensions

(A) Check Contact
(B) Correct Seat Width
(C) Check Contact
(a) 0.262 rad (15 °)
(b) 0.785 rad (45 °)
(c) 0.523 rad (30 °)

W10283500

Free Length and Tilt of Valve Spring

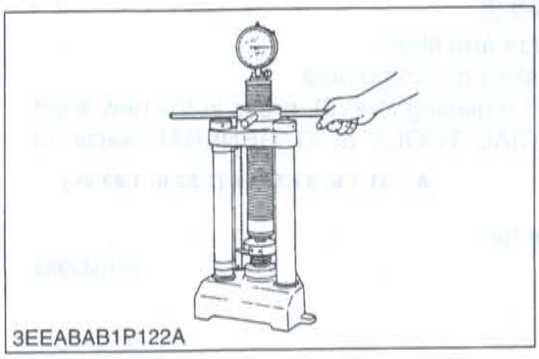
1. Measure the free length (**B**) with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the spring on a surface plate, place a square on the side of the spring, and check to see if the entire side is contact with the square. Rotate the spring and measure the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

Tilt (**A**)	Allowable limit	1.0 mm 0.039 in.

Free length (**B**)	Factory spec.	35.1 to 35.6 mm 1.3819 to 1.4016 in.
	Allowable limit	34.6 mm 1.3622 in.

(A) Tilt **(B) Free length**

W1063303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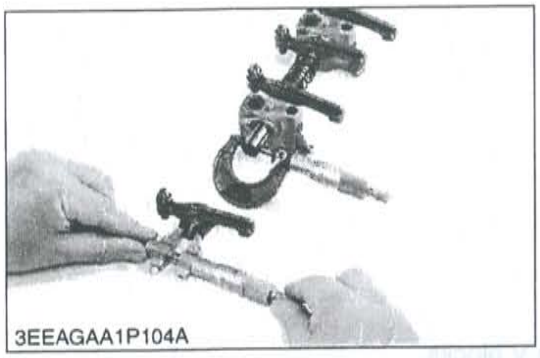
Valve Spring Setting Load

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.	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.256 lbs / 1.2401 in.
	Allowable limit	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbs / 1.2401 in.

W1063470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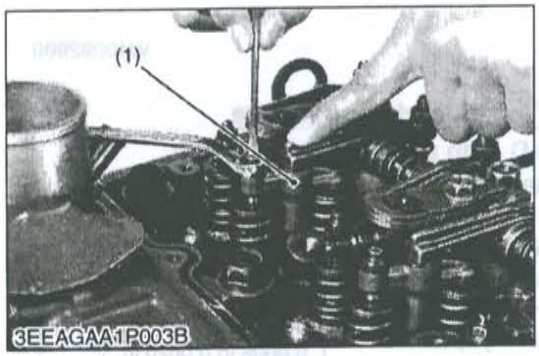
Oil Clearance between Rocker Arm Shaft and Bearing

1. Measure the rocker arm bearing I.D. with an inside micrometer.
2. Measure the rocker arm shaft O.D. with an outside micrometer, and then calculate the oil clearance.
3. If the 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 of rocker arm shaft and bearing	Factory spec.	0.016 to 0.045 mm 0.0006 to 0.0018 in.
	Allowable limit	0.15 mm 0.0059 in.
Rocker arm shaft O.D.	Factory spec.	14.973 to 14.984 mm 0.5895 to 0.5899 in.
Rocker arm I.D. for shaft	Factory spec.	15.000 to 15.018 mm 0.5906 to 0.5913 in.

W1063697



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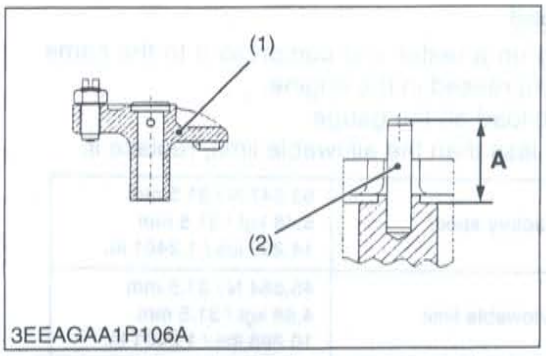
Oil Clearance between Bridge Arm and Bridge Arm Shaft

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

Oil clearance between bridge arm and bridge arm shaft	Factory spec.	0.018 to 0.042 mm 0.0007 to 0.0017 in.
	Allowable limit	0.15 mm 0.0059 in.
Bridge arm shaft O.D.	Factory spec.	9.023 to 9.032 mm 0.3552 to 0.3556 in.
Bridge arm I.D.	Factory spec.	9.050 to 9.065 mm 0.3563 to 0.3569 in.

(1) Bridge Arm

W1042581



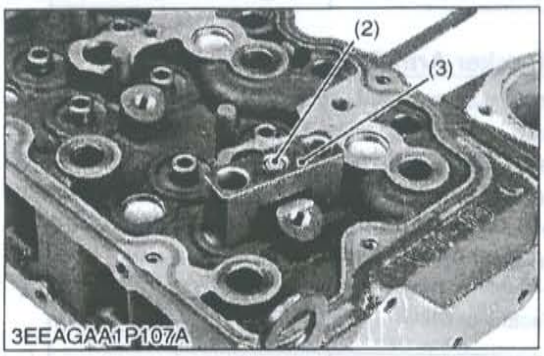
Replacing Bridge Arm Shaft

1. Remove the used bridge arm shaft.
2. Clean the bridge arm shaft mounting hole.
3. Using bridge arm shaft replacing tool (3), press in the new shaft (2). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(1) Bridge Arm
(2) Bridge Arm Shaft
(3) Bridge Arm Shaft Replacing Tool

A : 31.1 to 31.7 mm (1.22 to 1.25 in.)

W1042985



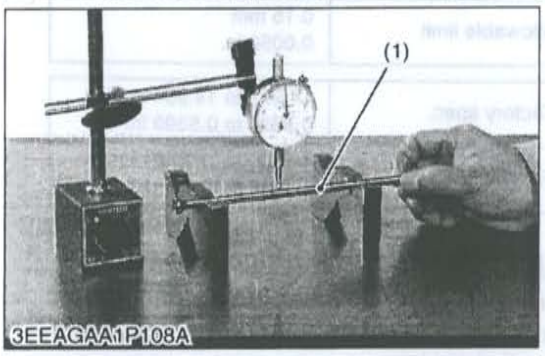
Push Rod Alignment

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.

(1) Push Rod

W10292900



Oil Clearance between Tappet and Tappet Bore

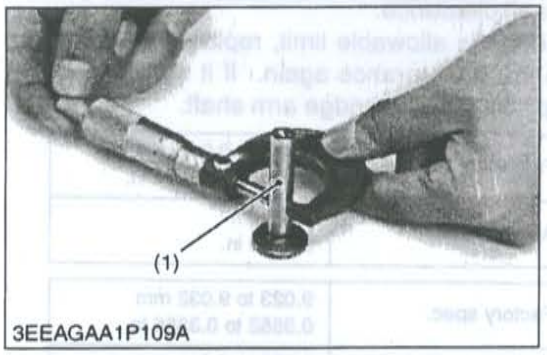
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet bore at the most wear part with a small hole gauge.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

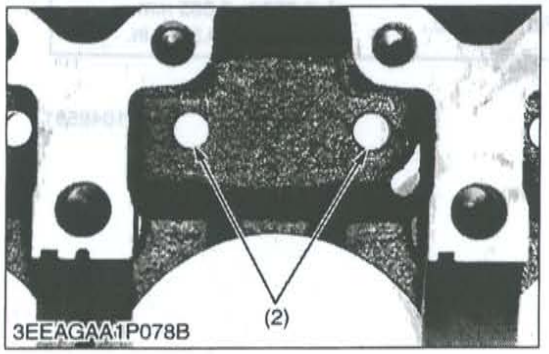
Oil clearance between tappet and tappet bore	Factory spec.	0.020 to 0.050 mm 0.0008 to 0.0020 in.
	Allowable limit	0.07 mm 0.0028 in.

Tappet O.D.	Factory spec.	9.965 to 9.980 mm 0.3923 to 0.3929 in.
Tappet bore I.D.	Factory spec.	10.000 to 10.015 mm 0.3937 to 0.3943 in.

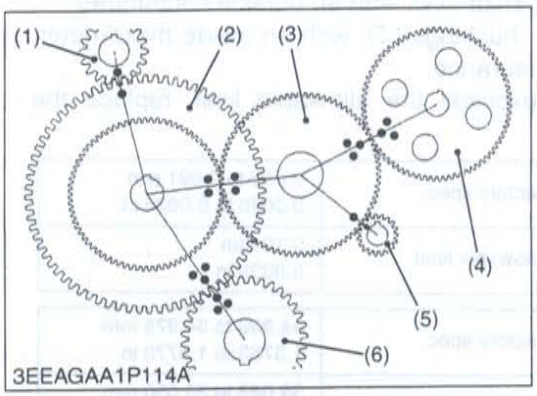
(1) Tappet (2) Tappet Bore

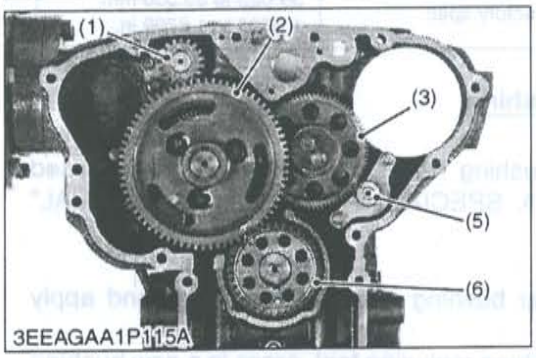
W1043774





(2) Timing Gears





Timing 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 is proper, replace the gear.

Backlash between crank gear and cam gear	Factory spec.	0.041 to 0.139 mm 0.0016 to 0.0055 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between cam gear and balancer 1 gear	Factory spec.	0.041 to 0.134 mm 0.0016 to 0.0053 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between cam gear and idle gear	Factory spec.	0.041 to 0.134 mm 0.0016 to 0.0053 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between idle gear and injection pump gear	Factory spec.	0.041 to 0.134 mm 0.0016 to 0.0053 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between idle gear and balancer 2 gear	Factory spec.	0.041 to 0.129 mm 0.0016 to 0.0051 in.
	Allowable limit	0.22 mm 0.0087 in.

(1) Balancer 1 Gear
(2) Cam Gear
(3) Idle Gear
(4) Injection Pump Gear
(5) Balancer 2 Gear
(6) Crank Gear

W1064048

Idle Gear Side Clearance

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

Side clearance of idle gear	Factory spec.	0.15 to 0.25 mm 0.0059 to 0.0098 in.
	Allowable limit	0.9 mm 0.0354 in.

(1) Idle Gear
(A) Side Clearance of Idle Gear

W1064208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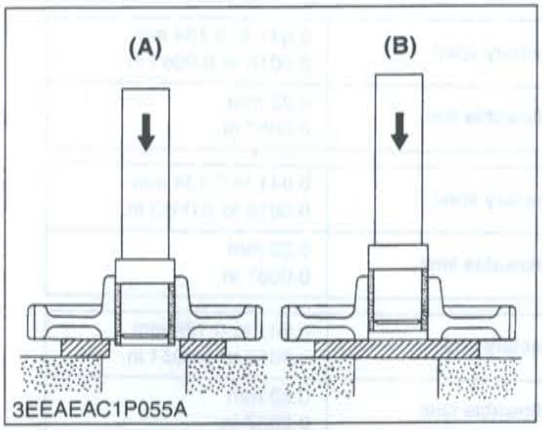
Oil Clearance between Idle Gear Shaft and Idle Gear Bushing

1. Measure the idle gear shaft O.D. with an outside micrometer.
2. Measure the idle gear bushings I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing.

Oil clearance between idle gear shaft and idle gear bushing	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0036 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear shaft O.D.	Factory spec.	34.959 to 34.975 mm 1.3763 to 1.3770 in.
Idle gear bushing I.D.	Factory spec.	35.025 to 35.050 mm 1.3789 to 1.3799 in.

W1064968



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Replacing Idle Gear Bushing

(When removing)

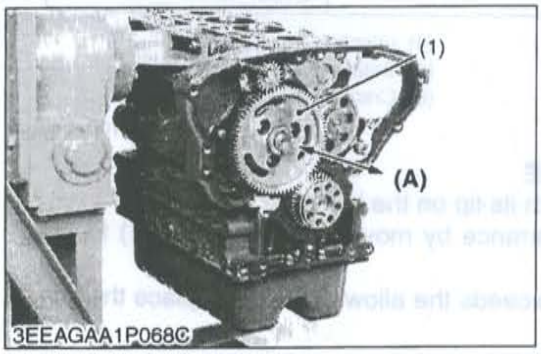
1. Using an idle gear bushing replacing tool, press out the used bushing. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(When installing)

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Using an idle gear bushing replacing tool, press in a new bushing (service parts) to the specified dimension. (See figure.)

(A) When Removing **(B) When Installing**

W10302410



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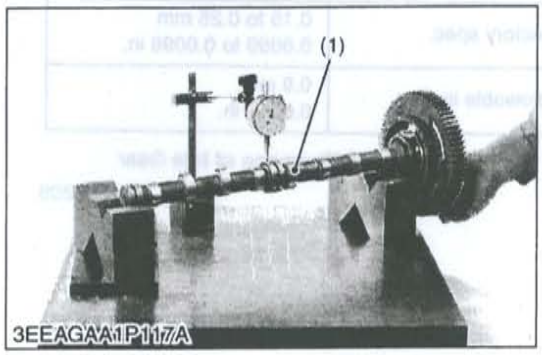
Camshaft Side Clearance

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 bearing.

Side clearance of camshaft	Allowable limit	0.1 mm 0.0039 in.

(1) Cam Gear **(A) Side Clearance of Camshaft**

W1064307



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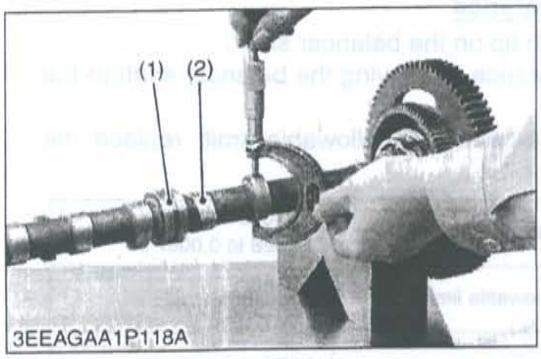
Camshaft Alignment

1. Support the camshaft (1) with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the camshaft on the V blocks and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.00039 in.

(1) Camshaft

W1064422



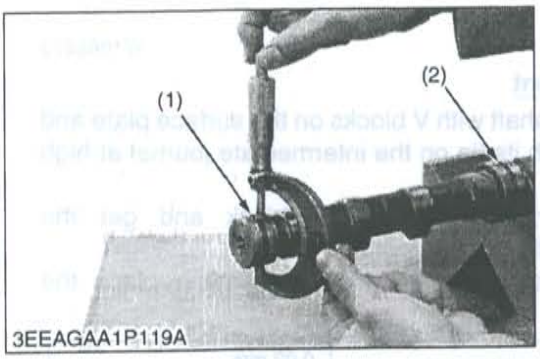
Cam Height

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.

Intake and exhaust cam height	Factory spec.	Intake valve	37.50 mm 1.4764 in.
		Exhaust valve	37.90 mm 1.4921 in.
	Allowable limit	Intake valve	37.00 mm 1.4567 in.
		Exhaust valve	37.40 mm 1.4724 in.

(1) Camshaft (2) Cam

W1064551



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 an inside micrometer.
3. If the clearance exceeds the allowable limit, replace the camshaft.

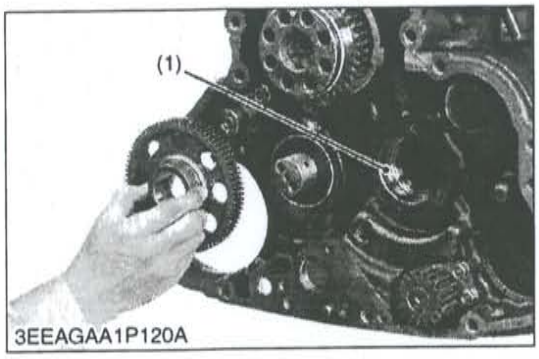
Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0036 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal 1 O.D.	Factory spec.	34.034 to 34.050 mm 1.3399 to 1.3406 in.
Camshaft block bore 1 I.D.	Factory spec.	35.000 to 35.025 mm 1.3780 to 1.3789 in.

Camshaft journal 2 O.D.	Factory spec.	43.934 to 43.950 mm 1.7297 to 1.7303 in.
Camshaft block bore 2 I.D.	Factory spec.	44.000 to 44.025 mm 1.7323 to 1.7333 in.

(1) Camshaft Journal 1 (2) Camshaft Journal 2

W1064798

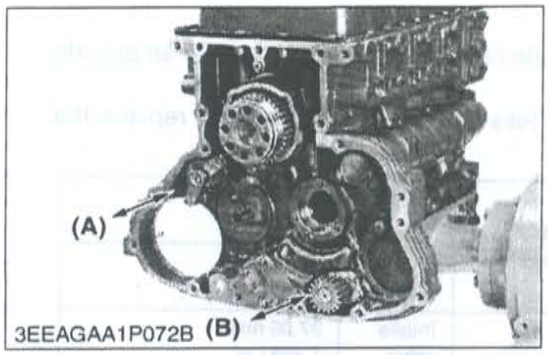


Replacing Camshaft Cover (If necessary)

1. Remove the used camshaft cover and clean the hole.
2. Install the new camshaft cover (1) until bumping using camshaft cover replacing tool. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(1) Camshaft Cover

W1048526



Balancer Shaft Side Clearance

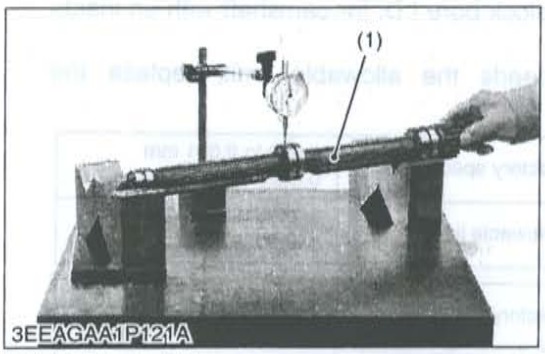
1. Set a dial indicator with tip on the balancer shaft.
2. Measure the side clearance by moving the balancer shaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the balancer shaft.

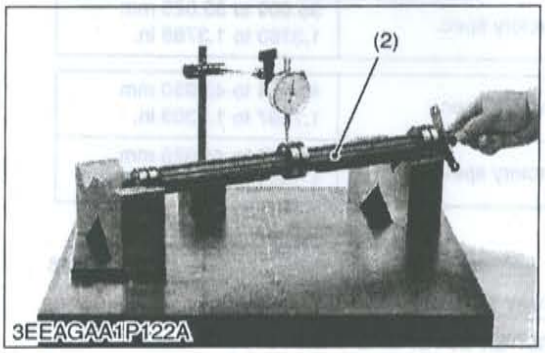
Side clearance of balancer shaft 1	Factory spec.	0.070 to 0.220 mm 0.0028 to 0.0087 in.
	Allowable limit	0.3 mm 0.0118 in.

Side clearance of balancer shaft 2	Factory spec.	0.070 to 0.320 mm 0.0028 to 0.0126 in.
	Allowable limit	0.3 mm 0.0118 in.

(A) Side Clearance of Balancer Shaft 2 **(B) Side Clearance of Balancer Shaft 1**

W1065273





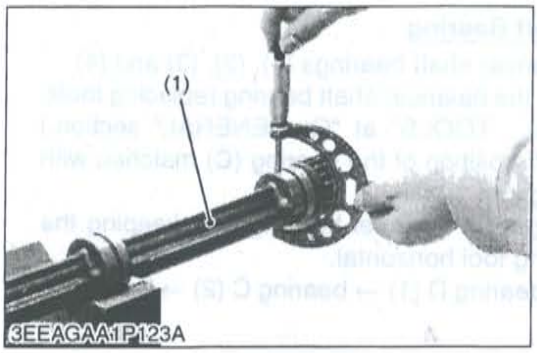
Balancer Shaft Alignment

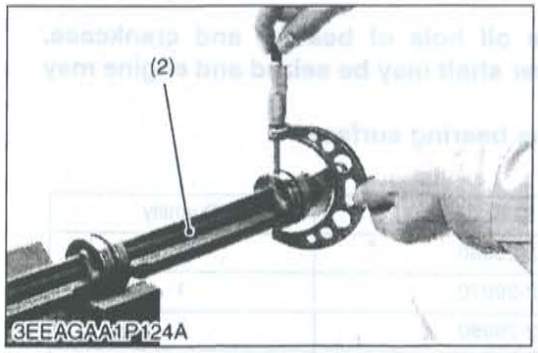
1. Support the balancer shaft with V blocks on the surface plate and set a dial indicator with its tip on the intermediate journal at high angle.
2. Rotate the balancer shaft on the V block and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the balancer shaft.

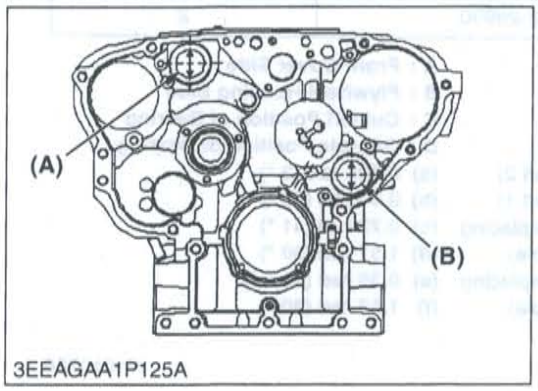
Balancer shaft 1, 2 alignment	Allowable limit	0.02 mm 0.0008 in.

(1) Balancer Shaft 1 (2) Balancer Shaft 2

W1065448







Oil Clearance of Balancer Shaft Journal

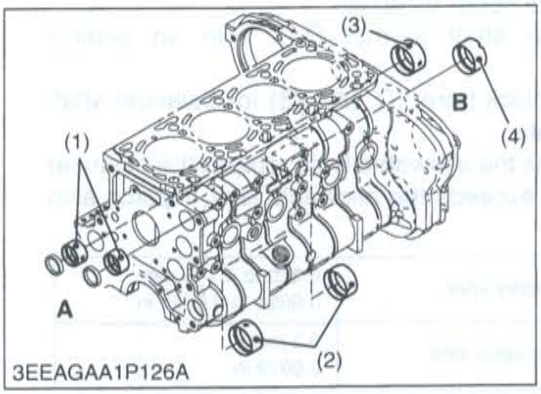
1. Measure the balancer shaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. **(A)**, **(B)** for balancer shaft with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace the balancer shaft bearing. If it still exceeds the allowable limit, replace also the balancer shaft.

Oil clearance of balancer shaft 1 journal	Factory spec.	0.060 to 0.146 mm 0.0024 to 0.0057 in.
	Allowable limit	0.2 mm 0.0079 in.
Balancer shaft 1 journal O.D.	Factory spec.	48.934 to 48.950 mm 1.9265 to 1.9272 in.
Balancer shaft 1 bearing I.D. **(A)**	Factory spec.	49.010 to 49.080 mm 1.9295 to 1.9323 in.
Oil clearance of balancer shaft 2 journal	Factory spec.	0.050 to 0.136 mm 0.0020 to 0.0054 in.
	Allowable limit	0.2 mm 0.0079 in.
Balancer shaft 2 journal O.D.	Factory spec.	48.934 to 48.950 mm 1.9265 to 1.9272 in.
Balancer shaft 2 bearing I.D. **(B)**	Factory spec.	49.000 to 49.070 mm 1.9291 to 1.9319 in.

(1) Balancer Shaft 1
(2) Balancer Shaft 2

(A) Balancer Shaft 1 Bearing I.D.
(B) Balancer Shaft 2 Bearing I.D.

W1065581



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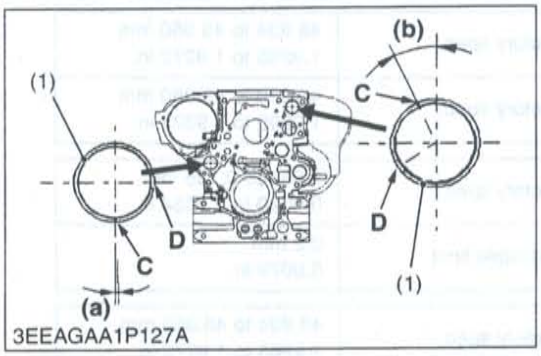

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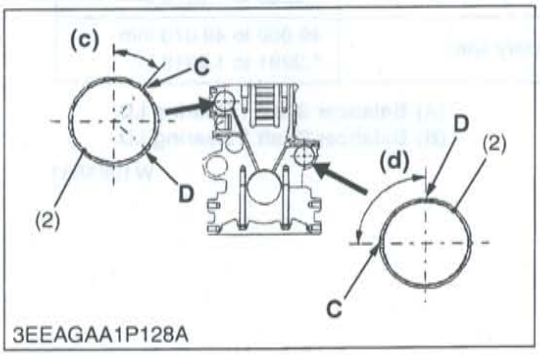

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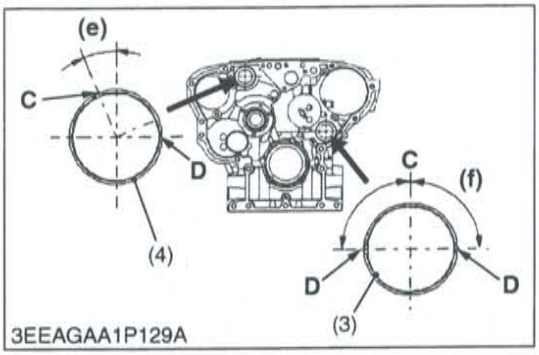

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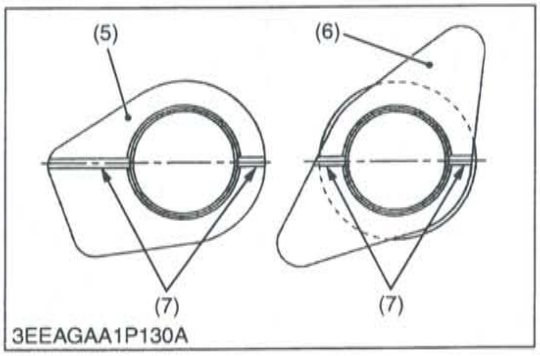

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Replacing Balancer Shaft Bearing

1. Remove the used balancer shaft bearings (1), (2), (3) and (4).
2. Set the new bearing to the balancer shaft bearing replacing tools. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.) Confirm that the cut off position of the bearing (**C**) matched with the pin of the replacing tool.
3. Install the new bearing from flywheel housing side keeping the ditch (7) of the replacing tool horizontal. (The installing order : bearing D (1) → bearing C (2) → bearing A (4), B (3))

■ **IMPORTANT**

- **Be sure to align the oil hole of bearing and crankcase. Otherwise the balancer shaft may be seized and engine may get damaged.**
- **Apply engine oil to the bearing surface.**

(Reference)

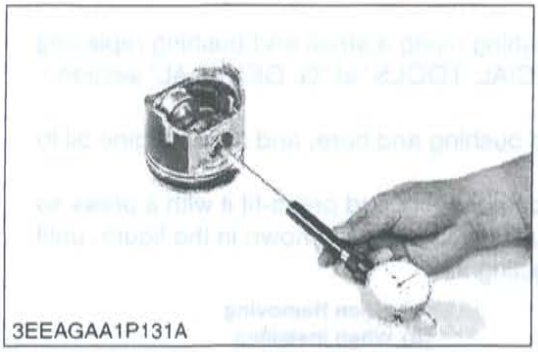
Bearing	Code No.	Quantity
Bearing A	1G772-26960	1
Bearing B	1G772-26970	1
Bearing C	1G772-26980	2
Bearing D	1G772-26990	2

(1) Bearing D (for Balancer Shaft 1 and 2)
(2) Bearing C (for Balancer Shaft 1 and 2)
(3) Bearing B (for Balancer Shaft 2)
(4) Bearing A (for Balancer Shaft 1)
(5) Balancer Shaft 1 Bearing Replacing Tool (3 kinds of tools available)
(6) Balancer Shaft 2 Bearing Replacing Tool (3 kinds of tools available)
(7) Ditch

A : Front Cover Side
B : Flywheel Housing Side
C : Cut Off Position of Bearing
D : Oil Hole Position of Bearing
(a) 0.035 rad (2 °)
(b) 0.44 rad (25 °)
(c) 0.72 rad (41 °)
(d) 1.57 rad (90 °)
(e) 0.39 rad (22.5 °)
(f) 1.57 rad (90 °)

W1010756

(3) Piston and Connecting Rod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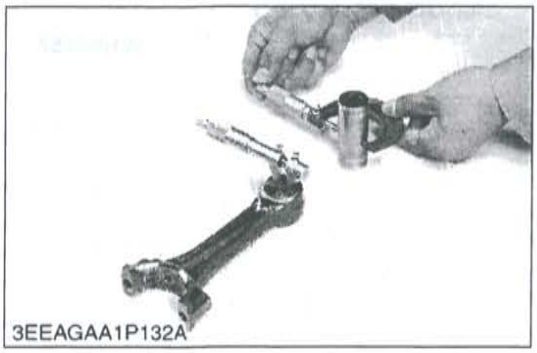
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Piston Pin Bore I.D.

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.	28.000 to 28.013 mm 1.1024 to 1.1029 in.
	Allowable limit	28.05 mm 1.1043 in.

W1065759

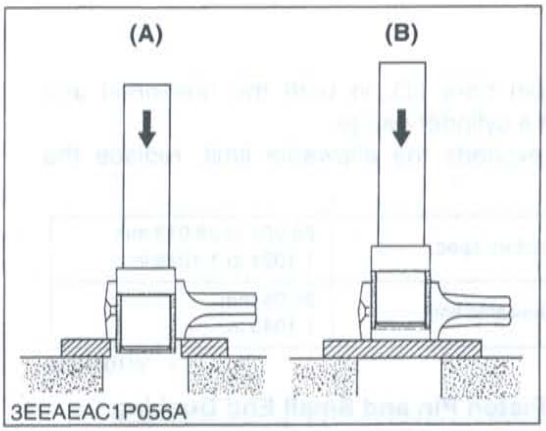
Oil Clearance between Piston Pin and Small End Bushing

1. Measure the O.D. of the piston pin where it contacts the bushing with an outside micrometer.
2. Measure the I.D. of the piston pin bushing at the connecting rod small end with a cylinder gauge.
   Calculate the oil clearance.
3. If the 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.	0.020 to 0.040 mm 0.0008 to 0.0016 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	28.006 to 28.011 mm 1.1026 to 1.1028 in.
Small end bushing I.D.	Factory spec.	28.031 to 28.046 mm 1.1036 to 1.1042 in.

W1065897



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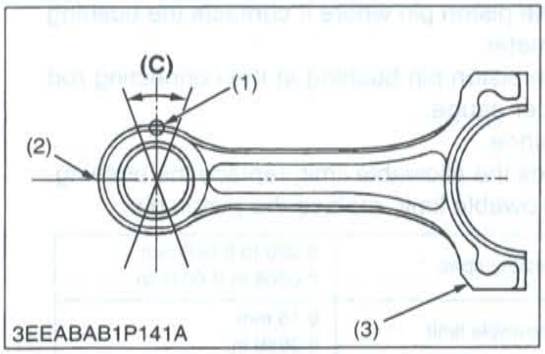

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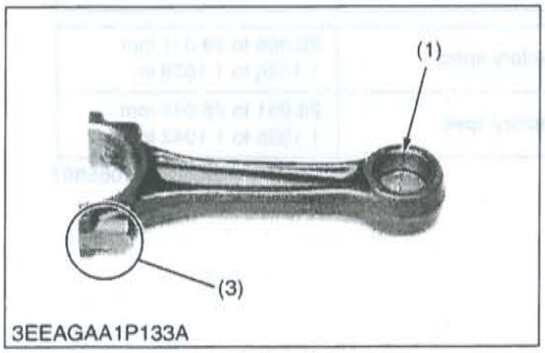

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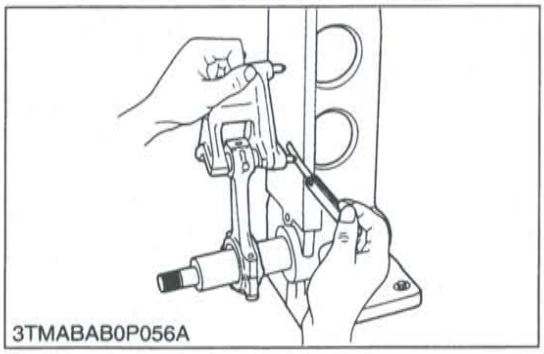
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Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(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 position as shown in the figure, until is flash with the connecting rod.

(1) Seam
(2) Oil Hole
(3) Mark

(A) When Removing
(B) When Installing
(C) 0.26 rad (15 °)

W1066057

Connecting Rod Alignment

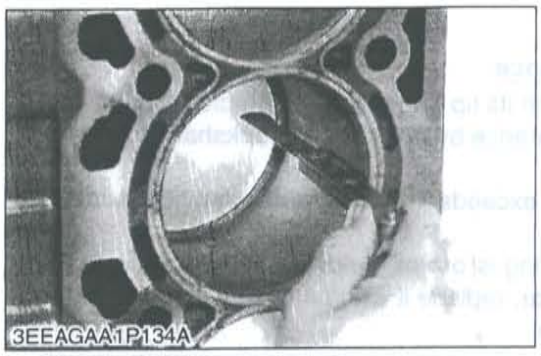
■ **NOTE**

- **Since the I.D. of the connecting rod small end bushing is the basis of this check, check the bushing for wear beforehand.**

1. Remove the piston pin from the piston.
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.

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.

W1066581



Piston Ring Gap

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

Top ring	Factory spec.	0.25 to 0.40 mm 0.0098 to 0.0157 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 0.45 mm 0.0098 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

W1066430

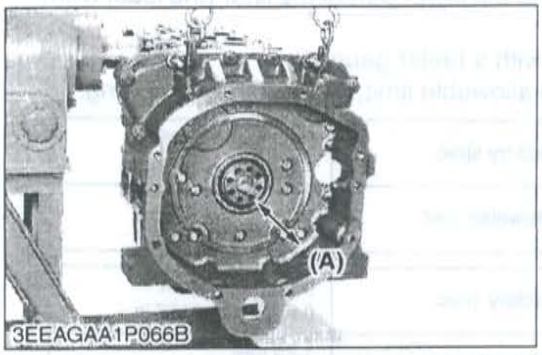
Clearance between Piston Ring and Groove

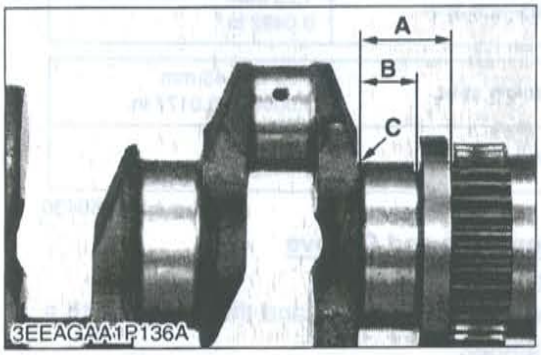
1. Remove carbon from the ring grooves.
2. Measure the clearance between the ring and the groove with a feeler gauge or depth gauge.
3. If the clearance exceeds allowable limit, check the new ring.
4. If clearance still exceeds the allowable limit after replacing the ring, replace the piston.

Factory spec.	Top ring	0.050 to 0.090 mm 0.0020 to 0.0035 in.
	Second ring	0.090 to 0.120 mm 0.0035 to 0.0047 in.
	Oil ring	0.020 to 0.060 mm 0.0008 to 0.0023 in.
Allowable limit	Top ring	0.15 mm 0.0059 in.
	Second ring	0.20 mm 0.0079 in.
	Oil ring	0.15 mm 0.0059 in.

W1066183

(4) Crankshaft





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 out of specifications because of the crankshaft journal wear, replace it with an oversize one referring to the table and figure.

Side clearance of crankshaft	Factory spec.	0.15 to 0.35 mm 0.0059 to 0.0138 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**	41.1 to 42.1 mm 1.6181 to 1.6575 in.	41.2 to 42.2 mm 1.6220 to 1.6614 in.
Dimension **B**	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 **C**	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
The crankshaft journal must be fine-finished to higher than ∇∇∇∇.		(0.8S)

(A) Side Clearance of Crankshaft

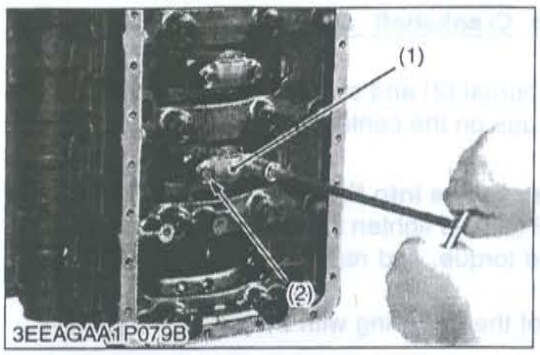
W1066738

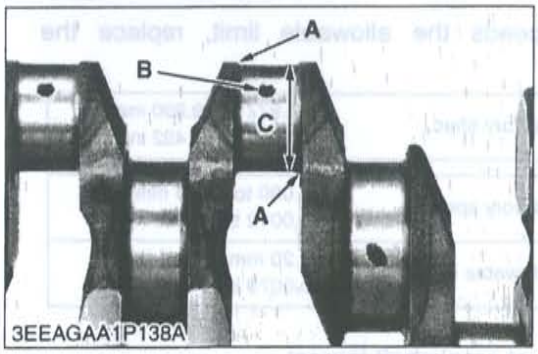
Crankshaft Alignment

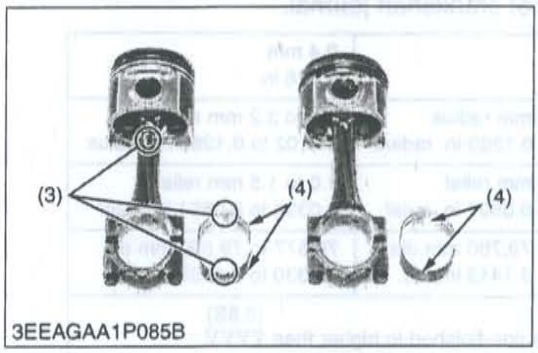
1. Support the crankshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the crankshaft on the V block and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the crankshaft.

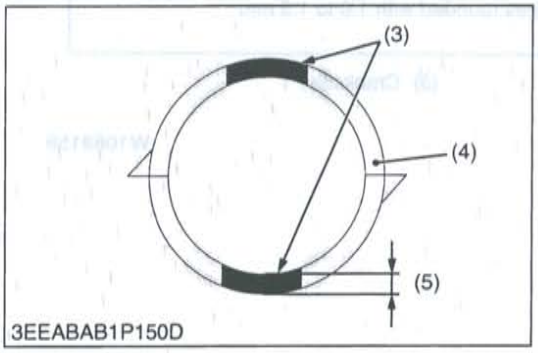
Crankshaft alignment	Allowable limit	0.02 mm 0.00079 in.

W1067285









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.**

Crankpin O.D.	Factory spec.	49.980 to 49.991 mm 1.9677 to 1.9682 in.

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.017 to 0.048 mm 0.0007 to 0.0019 in.
	Allowable limit	0.20 mm 0.0079 in.

■ **IMPORTANT**

- **STD size crankpin bearing.**
  To replace it with a specific STD service part, make sure the crankpin bearing has the same ID color as the connecting rod.

ID Color	Connecting rod	Crankpin bearing		
	Large-end in. dia.	Class	Part code	Center wall thick
Blue	53.01 to 53.02 mm 2.0870 to 2.0874 in.	L	1G772-22310	1.496 to 1.501 mm 0.0589 to 0.0591 in.
Without color	53.00 to 53.01 mm 2.0866 to 2.0870 in.	S	1G772-22330	1.491 to 1.496 mm 0.0587 to 0.0589 in.

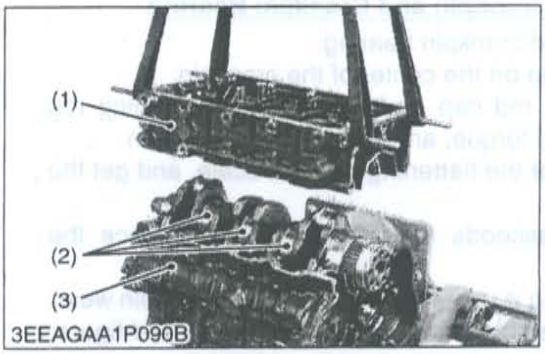
(Reference)

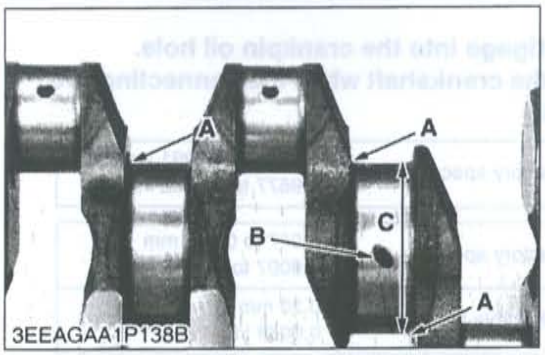
- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	3.3 to 3.7 mm radius 0.1299 to 0.1457 in. radius	3.3 to 3.7 mm radius 0.1299 to 0.1457 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**	49.780 to 49.791 mm dia. 1.9598 to 1.9603 in. dia.	49.580 to 49.591 mm dia. 1.9520 to 1.9524 in. dia.
(0.8S) The crankpin must be fine-finished to higher than ∇∇∇∇. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief.		

(1) Connecting Rod Cap
(2) Connecting Rod Screw
(3) ID Color
(4) Crankpin Bearing
(5) Center Wall Thick

W1067389





Oil Clearance between Crankshaft Journal and Crankshaft Bearing

1. Clean the crankshaft journal (2) and crankshaft bearing.
2. Put a strip of press gauge on the center of the journal.

■ **IMPORTANT**

- **Never insert the press gauge into the oil hole of the journal.**

3. Install the crankcase 2 (1) and tighten the crankcase 2 mounting screws to the specified torque, and remove the crankcase 2 (1) again.
4. Measure the amount of the flattening with the scale and get the oil clearance.
5. If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Crankshaft journal O.D.	Factory spec.	79.977 to 79.990 mm 3.1487 to 3.1492 in.

Oil clearance between crankshaft journal and crankshaft bearing	Factory spec.	0.030 to 0.073 mm 0.0012 to 0.0029 in.
	Allowable limit	0.20 mm 0.0079 in.

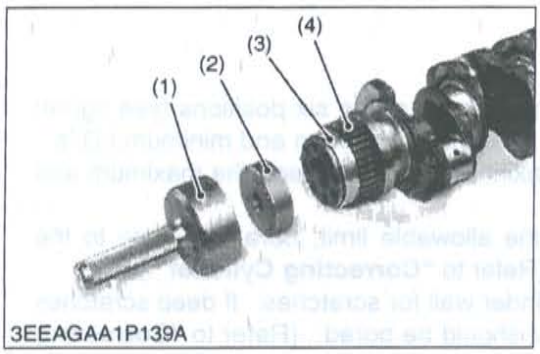
(Reference)

- Undersize dimensions of crankshaft journal.

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**	79.777 to 79.790 mm dia. 3.1408 to 3.1413 in. dia.	79.577 to 79.590 mm dia. 3.1330 to 3.1335 in. dia.
The crankshaft journal must be fine-finished to higher than ∇∇∇ (0.8S). *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief.		

(1) Crankcase 2
(2) Crankshaft Journal
(3) Crankcase 1

W1069159



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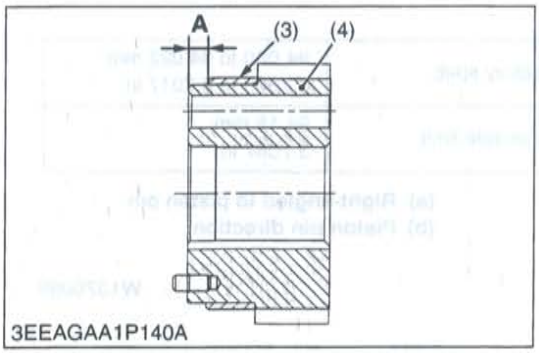
Replacing Crankshaft Sleeve

1. Remove the used crankshaft sleeve.
2. Set the sleeve guide (2) to the crankshaft gear (4).
3. Heat a new sleeve (3) to a temperature between 150 and 200 °C (302 and 392 °F), and fix the sleeve to the crankshaft as shown in figure.
4. Press fit the sleeve using the auxiliary socket for pushing (1). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

■ **NOTE**

- **Mount the sleeve with its largely chamfered surface facing outward.**
- **Keep the space (A) between the edge of the crankshaft gear and the crankshaft sleeve.**



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(1) Auxiliary Socket for Pushing
(2) Sleeve Guide
(3) Crankshaft Sleeve
(4) Crankshaft Gear
A : More than 6.5 mm (0.256 in.)

W1069911

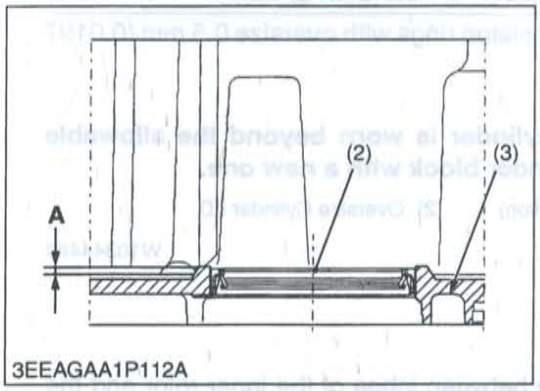
3EEAGAA1P111A

Replacing Flywheel Housing Oil Seal

1. Remove the used oil seal.
2. Clean the new flywheel housing oil seal (2) and apply engine oil to it.
3. Install the new oil seal (2) to the specific position using replacing tool (1). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(1) Flywheel Housing Oil Seal Replacing Tool
(2) Oil Seal
(3) Flywheel Housing
A : 1.0 mm (0.039 in.)

W1044329



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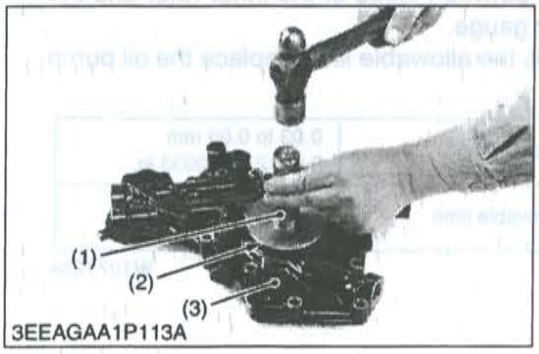

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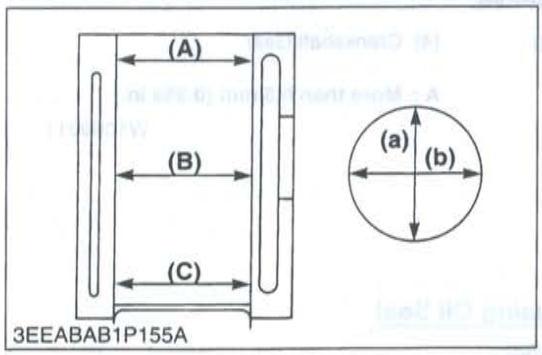
Replacing Front Cover Oil Seal

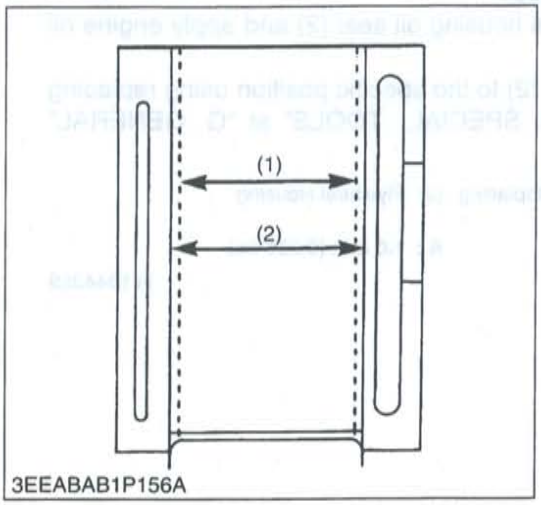
1. Remove the used front cover oil seal.
2. Clean a new front cover oil seal (2) and apply engine oil to it.
3. Install the new oil seal (2) using replacing tool (1). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(1) Front Cover Oil Seal Replacing Tool
(2) Oil Seal
(3) Front Cover

W1044902

(5) Cylinder





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 Bore I.D.	Factory spec.	94.000 to 94.022 mm 3.7008 to 3.7017 in.
	Allowable limit	94.15 mm 3.7067 in.

(A) Top
(B) Middle
(C) Bottom (Skirt)
(a) Right-angled to piston pin
(b) Piston pin direction

W1070089

Correcting Cylinder (Oversize)

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

Cylinder I.D. (2)	Factory spec.	94.500 to 94.522 mm 3.7205 to 3.7213 in.
Maximum wear	Allowable limit	94.65 mm 3.7264 in.
Finishing	Hone to 2.2 to 3.0 µm Rz (0.000087 to 0.00012 in. Rz) ∇∇∇.	

2. Replace the piston and piston rings with oversize 0.5 mm (0.0197 in.) ones.

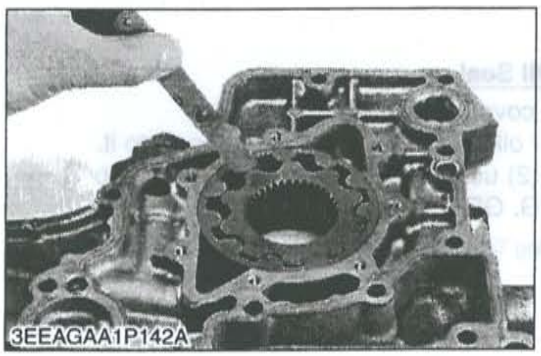
■ **NOTE**

- **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) Oversize Cylinder I.D.

W10344480

(6) Oil Pump

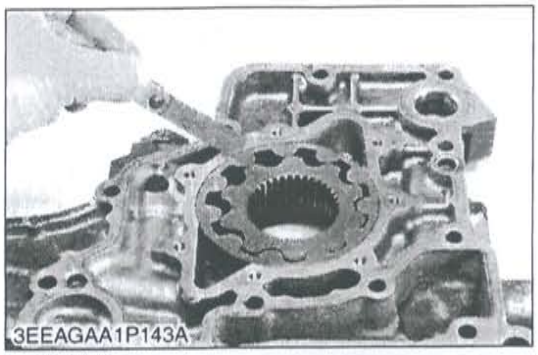


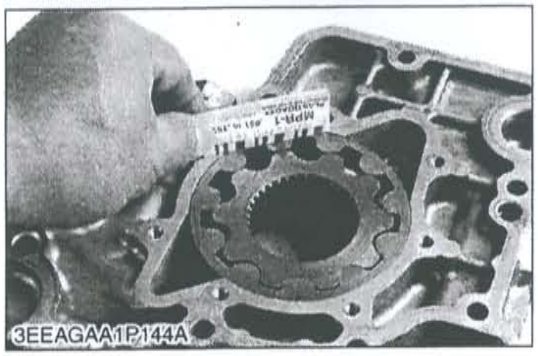
Rotor Lobe Clearance

1. Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor	Factory spec.	0.03 to 0.09 mm 0.0012 to 0.0035 in.
	Allowable limit	0.3 mm 0.0118 in.

W1071254





Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.100 to 0.184 mm 0.0039 to 0.0072 in.
	Allowable limit	0.3 mm 0.0118 in.

W1071334

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 with the specified torque.
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 allowable limit, replace oil pump rotor assembly and the cover.

Clearance between rotor and cover	Factory spec.	0.025 to 0.075 mm 0.0010 to 0.0030 in.
	Allowable limit	0.225 mm 0.0089 in.

Tightening torque	Oil pump cover screw	7.84 to 9.31 N·m 0.80 to 0.95 kgf·m 5.78 to 6.87 ft-lbs

W1148218

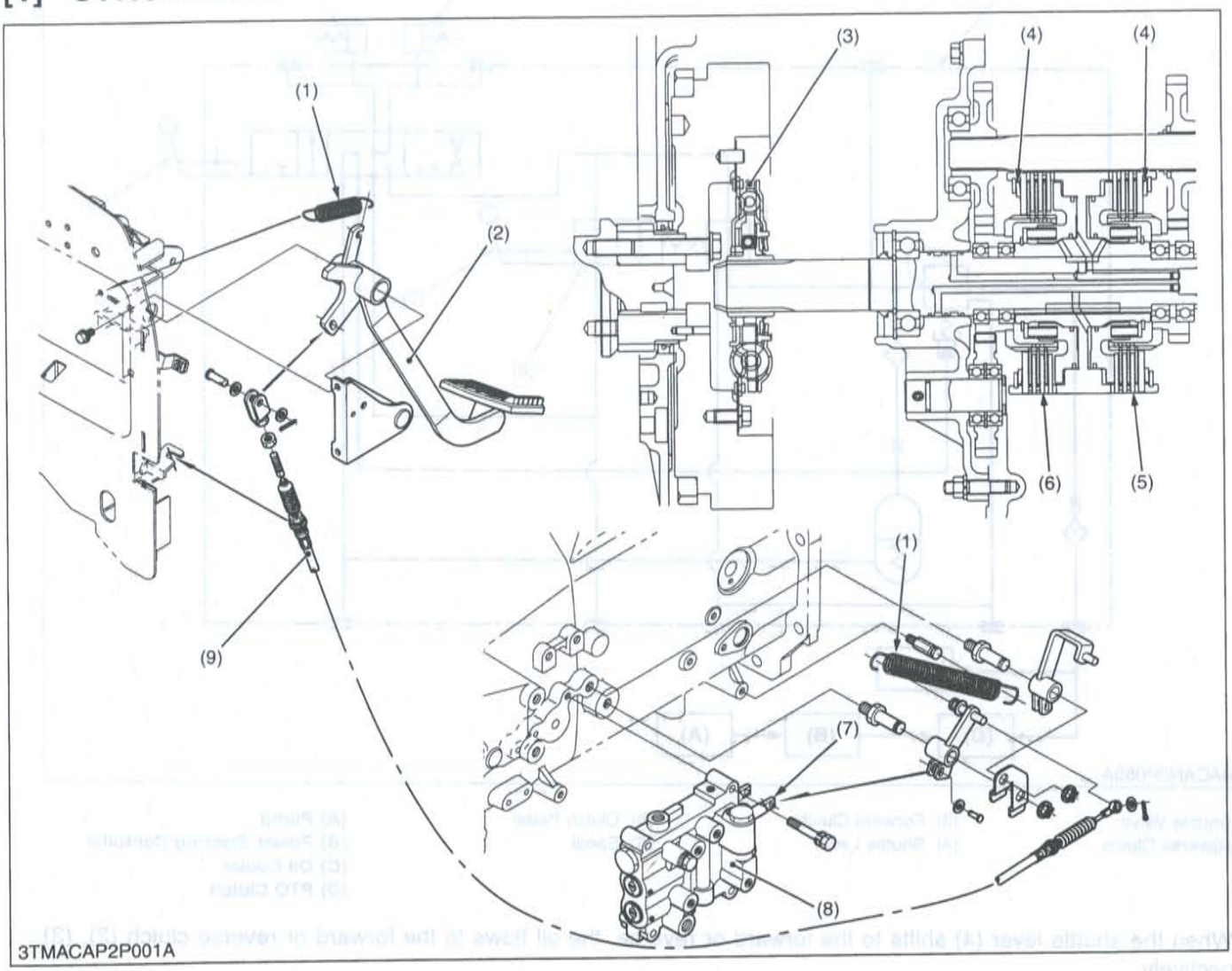
2 CLUTCH

MECHANISM

CONTENTS

1. TRAVELING CLUTCH

[1] STRUCTURE



(1) Return Spring
(2) Clutch Pedal
(3) Damper Disc
(4) Belleville Washer (Cupped Spring Washer)
(5) Forward Side Clutch
(6) Reverse Side Clutch
(7) Clutch Spool
(8) Hydraulic Shuttle Valve
(9) Clutch Cable

The damper disc (3) helps ease the shock load when engaging the shuttle clutch.

The belleville washer (cupped spring washer) (4) helps ease the engaging shock together with modulating valve effect.

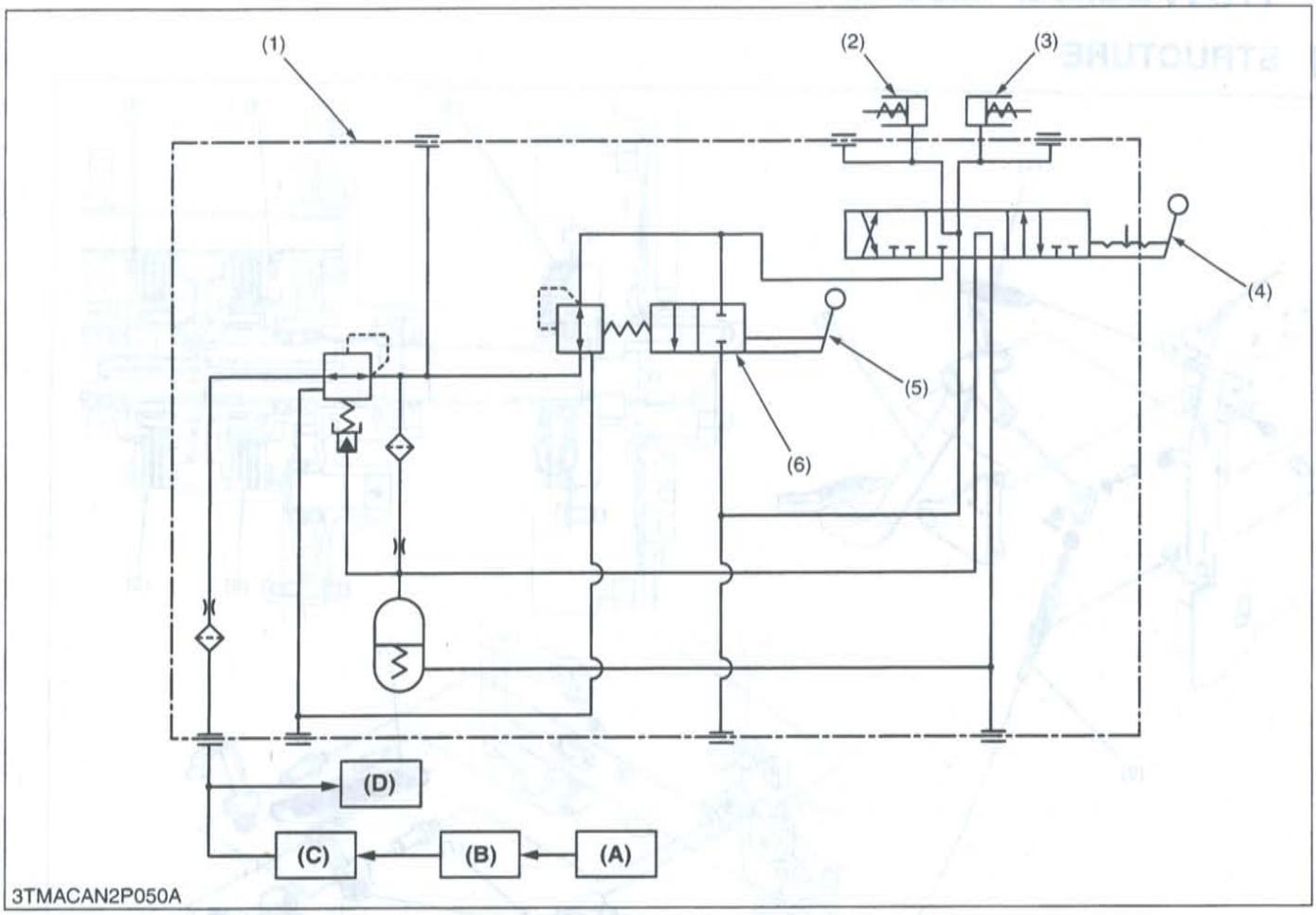
The hydraulic shuttle clutch, which switches forward and reverse running, function as the traveling clutch. When the clutch pedal (2) is depressed, the clutch spool of shuttle valve (8) moves via the clutch cable (9).

As for the oil, it does not flow to both the forward side (5) and reverse side (6) of the clutch pack, the clutch pack enters the state of "Disengaged" and power is not transmitted.

■ **NOTE**

- **Refer to "3. TRANSMISSION" section.**

[2] OIL FLOW



(1) Shuttle Valve
(2) Reverse Clutch
(3) Forward Clutch
(4) Shuttle Lever
(5) Clutch Pedal
(6) Spool

(A) Pump
(B) Power Steering Contoller
(C) Oil Cooler
(D) PTO Clutch

When the shuttle lever (4) shifts to the forward or reverse, the oil flows to the forward or reverse clutch (2), (3) respectively.

When the oil is feeding in the clutch pack and the clutch is depressed.

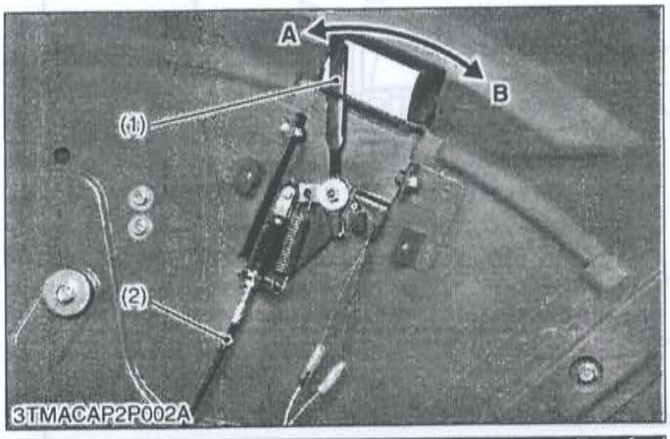
The feeding oil returns to the tank through the spool (6), and the clutch is in a **"Disengage"** condition.

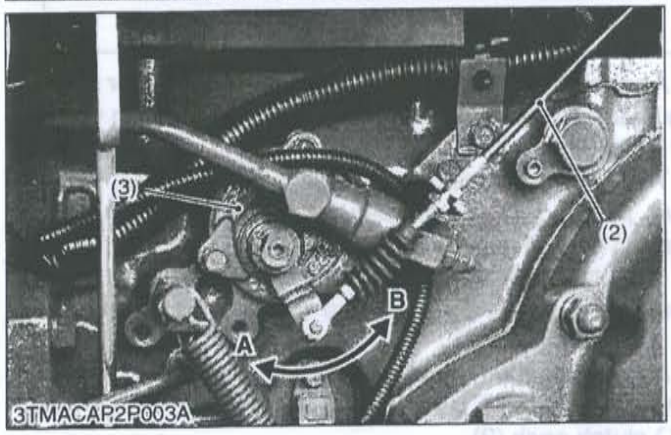
■ **NOTE**

- **Refer to "[2] HYDRAULIC SHUTTLE VALVE" at 3. TRANSMISSION section.**

2. PTO CLUTCH

[1] STRUCTURE





The PTO shift lever (1) and the PTO clutch valve (3) are connected by the PTO shift cable (2) as shown in the photo.

When the PTO shift lever (1) is moved to the **B** side, the PTO clutch valve (3) is set at **"Engaged"** position. Then the oil flows to clutch pack through the clutch valve (3). When the shift lever is moved to the **A** side, the PTO clutch is set at **"Disengaged"** position.

(1) PTO Shift Lever
(2) PTO Shift Cable
(3) PTO Clutch Valve

A : Disengage
B : Engage

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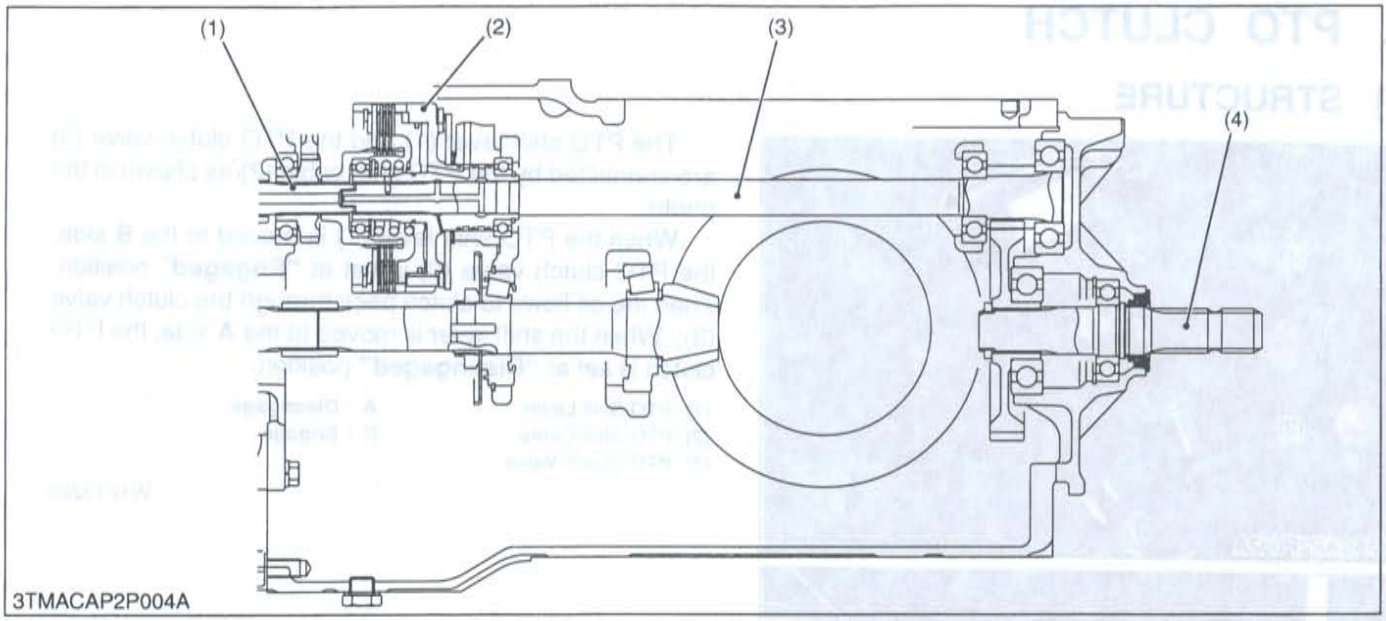
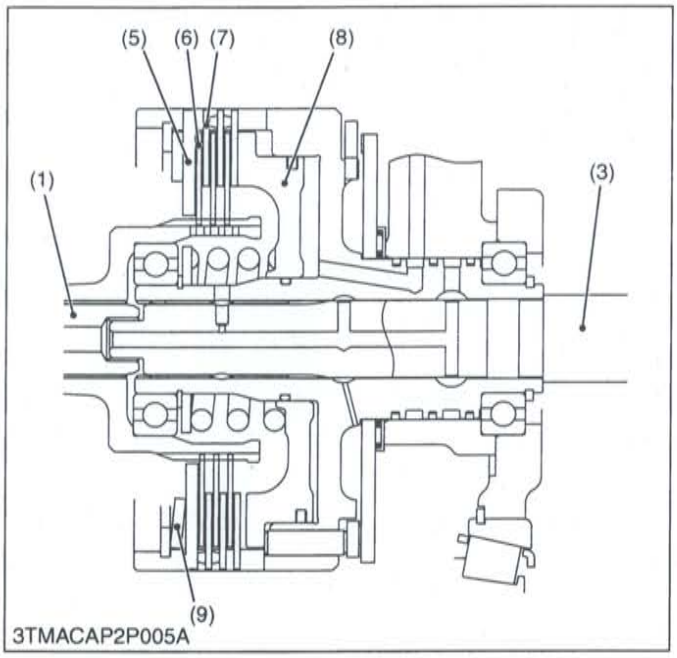




As shown in the figure above, the PTO propeller shaft 1 is splined to the spline hub and is always rotating while the engine is running.

The PTO clutch pack has three clutch discs (6), three drive plates (7), a belleville washer (cupped spring washer) (9) and one pressure plate (5). The clutch piston (8) actuated by hydraulic from PTO clutch valve, tightly presses the clutch discs (6) and drive plates (7) toward the pressure plate (5).

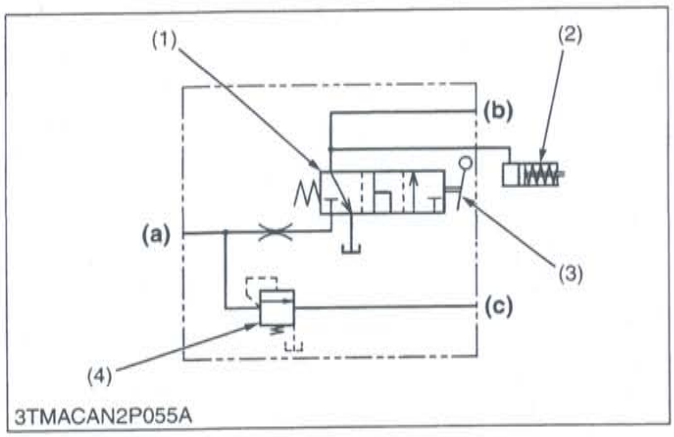
As a result, the rotation of the PTO propeller shaft 1 is transmitted to the PTO propeller shaft 2 (3) through the PTO clutch pack (2).

The belleville washer (cupped spring washer) (9) reduce the engaging shock. Thereby, the PTO clutch is engaged very smoothly.

(1) PTO Propeller Shaft 1
(2) PTO Clutch Pack
(3) PTO Propeller Shaft 2
(4) PTO Shaft
(5) Pressure Plate
(6) Clutch Disc
(7) Drive Plate
(8) Clutch Piston
(9) Belleville Washer (Cupped Spring Washer)

W1014609

[2] OIL FLOW



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When the PTO lever (3) is at the disengaged position, the oil flows is stopped by the PTO clutch valve (1). When the PTO lever (3) is at the engaged position, the oil flows through the PTO clutch valve (1) to the PTO clutch pack (2) to engage it.

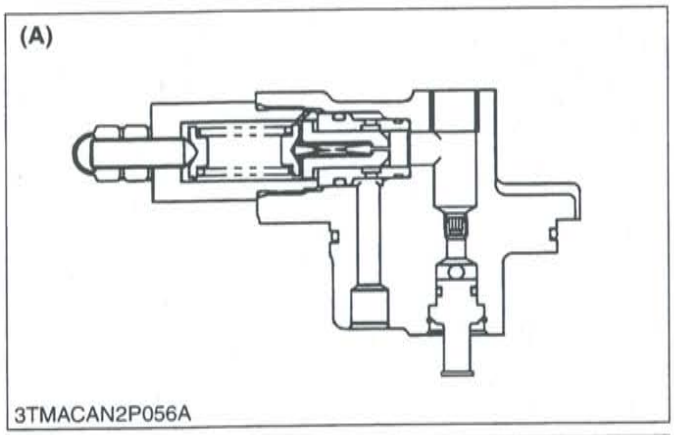
The relief valve (4) maintain the oil pressure and supply the oil to lubricate the shuttle section, synchromesh gears, PTO hydraulic pack and PTO brake.

(1) PTO Clutch Valve
(2) PTO Clutch Pack
(3) PTO Lever
(4) Relief Valve

(a) Pressure Port
(b) Pressure Check Port
(c) Lubricating Port

W1013531

[3] PTO CLUTCH VALVE



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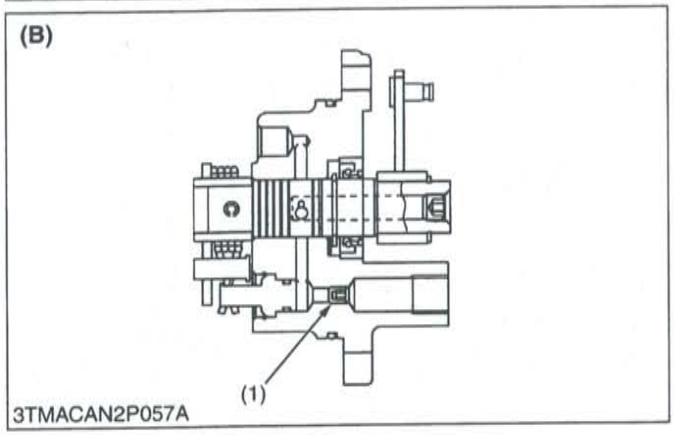

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PTO clutch valve is composed of the following parts.

(A) Main Relief Valve

PTO clutch inner pressure is kept in approx. 2157.5 kPa (22.0 kgf/cm^2, 313.1 psi) by the main relief valve.

(B) Rotary Valve

This valve change the oil flow to PTO clutch. This is rotated by the PTO operation lever via to PTO clutch cable. The oil from steering controller passes through the orifice (1) and flow to the PTO clutch.

(1) Orifice

W1013459

SERVICING

CONTENTS

1. TROUBLESHOOTING

TRAVELING CLUTCH (HYDRAULIC SHUTTLE MODEL)

Symptom	Probable Cause	Solution	Reference Page
Shuttle Clutch Slip	Operating pressure is low	Adjust	2-S9, 3-S11
	Shuttle clutch valve malfunctioning	Replace	3-S24
	Clutch disc or steel plate excessively worn	Replace	3-S26, 45
	Deformation of piston or steel plate	Replace	–
Shuttle Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	G-10
	Relief valve malfunctioning	Adjust or replace	2-S9
Shuttle Clutch Drags	Return spring weak or broken	Replace	–
	Modulating valve malfunctioning	Replace	3-S24
	Deformation of piston or steel plate	Replace	–
Tractor Does Not Keep in Neutral	Shuttle linkage defective or deformed	Adjust or replace	3-S5

W1014322

TRAVELING CLUTCH (SYNCHRO SHUTTLE MODEL)

Symptom	Probable Cause	Solution	Reference Page
Clutch Drags	Clutch pedal free travel excessive	Adjust	2-S7
	Dust on clutch disc generated from clutch disc facing	Remove rust	2-S23
	Release fork broken	Replace	2-S23
	Clutch disc or pressure plate warped	Replace	2-S23, 27
	Pressure plate worn	Replace (Pressure plate assembly)	2-S23, 27
Clutch Slips	Clutch pedal free travel too small	Adjust	2-S7
	Clutch disc excessively worn	Replace	2-S23, 27
	Grease or oil on clutch disc facing	Replace	2-S23
	Clutch disc or pressure plate warped	Replace	2-S23, 27
	Pressure plate worn	Replace (Pressure plate assembly)	2-S23, 27
Chattering	Grease or oil on clutch disc facing	Replace	2-S23
	Clutch disc or pressure plate warped	Replace	2-S23, 27
	Pressure plate or flywheel face cracked or scored	Replace	2-S23
	Clutch disc boss spline and gear shaft spline worn	Replace	2-S27
Rattle During Running	Clutch disc boss spline worn	Replace	2-S27
	Release bearing worn or sticking	Replace	2-S28
Clutch Squeaks	Release bearing sticking or dry	Replace or lubricate	2-S28
	Clutch disc excessively worn	Replace	2-S27
Vibration	Clutch disc rivet broken	Replace	2-S27
	Clutch parts broken	Replace	–

W1013580

PTO CLUTCH

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	Operating pressure is low	Adjust	2-S9
	PTO clutch valve malfunctioning	Repair or replace	2-S22
	Clutch disc or drive plate excessively worn	Replace	2-S25, 28
	Deformation of piston or return plate	Replace	2-S25, 29
PTO Shaft Does Not Rotate	PTO clutch malfunctioning	Repair or replace	2-S9
	PTO propeller shaft coupling disengaged	Engage	–
PTO Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	G-10
	Relief valve malfunctioning	Adjust or replace	2-S9
PTO Clutch Drags	Brake plate excessively worn	Replace	2-S28
	Return spring weaken or broken	Replace	2-S29
	Deformation of plate or steel plate	Replace	2-S25, 28

W1011019

2. SERVICING SPECIFICATIONS

TRAVELING CLUTCH (HYDRAULIC SHUTTLE MODEL)

Item		Factory Specification	Allowable Limit
Clutch Pedal (ROPS Model)	Free Travel	15 to 25 mm 0.59 to 0.98 in.	–
	Total Stroke	145 to 155 mm 5.71 to 6.10 in.	–
Clutch Pedal (CABIN Model)	Free Travel	15 to 25 mm 0.59 to 0.98 in.	–
	Total Stroke	145 to 155 mm 5.71 to 6.10 in.	–
Damper Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	–	2.0 mm 0.079 in.

W1013874

TRAVELING CLUTCH (SYNCHRO SHUTTLE MODEL)

Clutch Pedal (ROPS Model)	Free Travel	35 to 45 mm 1.38 to 1.77 in.	–
	Total Stroke	155 to 165 mm 6.10 to 6.50 in.	–
Clutch Pedal (CABIN Model)	Free Travel	40 to 50 mm 1.57 to 1.97 in.	–
	Total Stroke	153 to 163 mm 6.02 to 6.42 in.	–
Release Lever Plate to PTO Spline Boss	Height	81.7 to 83.3 mm 3.22 to 3.28 in.	98.3 mm 3.87 in.
Diaphragm Spring	Mutual Difference	–	0.5 mm 0.020 in.
Clutch Disc	Disc Surface to Rivet Top (Depth)	–	0.3 mm 0.0118 in.
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	–	2.0 mm 0.079 in.
Pressure Plate	Flatness	–	0.2 mm 0.0079 in.

W1013874

PTO CLUTCH

Item		Factory Specification	Allowable Limit
PTO Clutch Valve Condition • Engine Speed Maximum • Oil temperature 45 to 55 °C (113 to 131 °F)	Relief Valve Setting Pressure	2.16 to 2.26 MPa 22 to 23 kgf/cm^2 312.91 to 327.14 psi	–
PTO Clutch Disc	Thickness	2.5 to 2.7 mm 0.098 to 0.106 in.	2.1 mm 0.083 in.
PTO Steel Plate	Thickness	1.93 to 2.07 mm 0.076 to 0.081 in.	1.80 mm 0.071 in.
PTO Piston	Flatness	–	0.15 mm 0.006 in.
PTO Steel Plate	Flatness	–	0.30 mm 0.012 in.
PTO Return Spring	Free Length	46.0 mm 1.811 in.	37.5 mm 1.48 in.
Seal Ring	Thickness	2.45 to 2.50 mm 0.096 to 0.098 in.	2.0 mm 0.079 in.

W1013874

3. TIGHTENING TORQUES

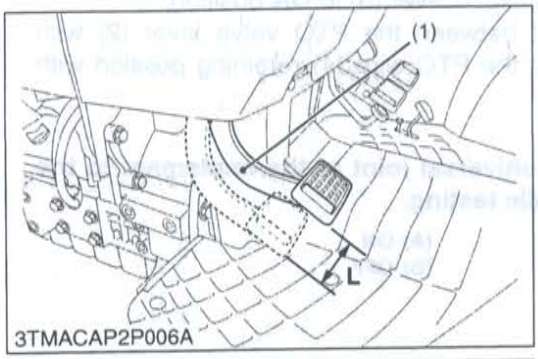
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G.GENERAL" section.)

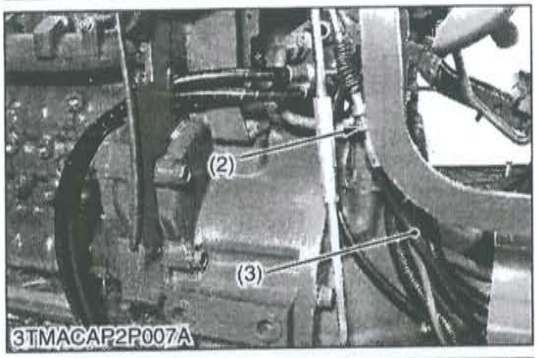
Item	N·m	kgf·m	ft-lbs
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Oil cooler pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Engine and clutch housing mounting stud bolt	61.8 to 73.6	6.3 to 7.5	45.6 to 54.2
Starter's **B** terminal mounting nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7
Power steering pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
PTO delivery pipe joint screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
3-point hitch delivery pipe 2 retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Transmission case and clutch housing mounting screw and nut (M10, 9T)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Transmission case and clutch housing mounting screw and nut (M14, 9T)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.6
PTO clutch holder mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Damper disc mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Release fork setting screw	166.7 to 191.2	17.0 to 19.5	123.0 to 141.0

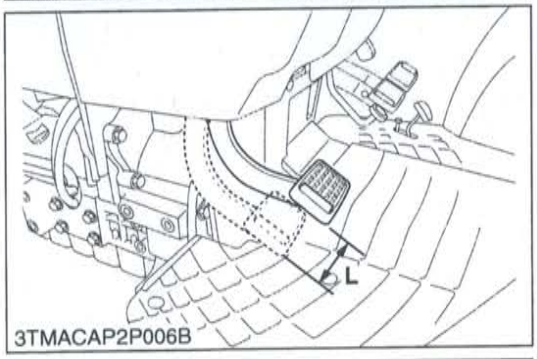
W1012736

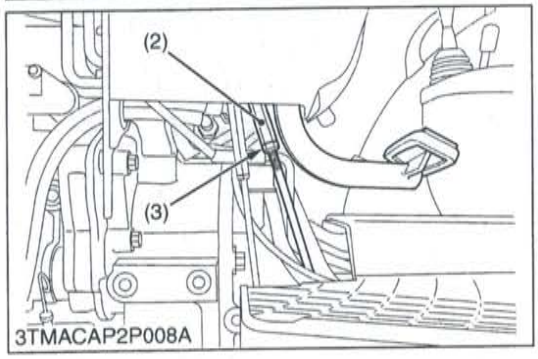
4. CHECKING AND ADJUSTING

[1] TRAVELING CLUTCH









Clutch Pedal Free Travel (Hydraulic Shuttle Model)

1. Measure the clutch pedal free travel (**L**).
2. If adjustment is needed, change with clutch wire cable (3) lock nut (2) so that the free travel becomes 15.0 to 25.0 mm (0.59 to 0.98 in.).
3. After adjustment is completed secure the nut.

Clutch pedal free travel (**L**)	Factory spec.	15 to 25 mm 0.59 to 0.98 in.

(1) Clutch Pedal
(2) Lock Nut
(3) Clutch Wire Cable

L : Free Travel

W1028233

Clutch Pedal Free Travel (Synchro Shuttle Model)

1. Measure the clutch pedal free travel (**L**).
2. If adjustment is needed, change the clutch rod length with turnbuckle so that the free travel becomes 35 to 45 mm (1.38 to 1.77 in.).
3. After adjustment is completed secure the lock nut and turnbuckle.

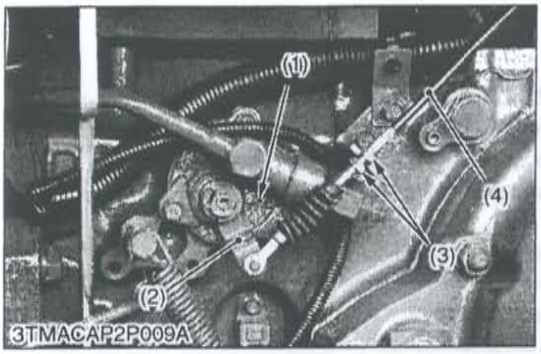
Clutch pedal free travel (**L**)	Factory spec.	35 to 45 mm 1.38 to 1.77 in.

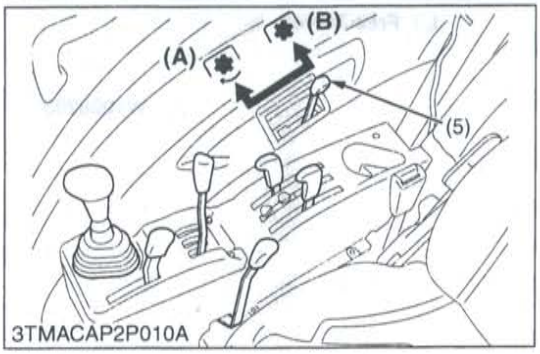
(1) Turnbuckle
(2) Lock Nut

L : Free Travel

W1014076

[2] PTO CLUTCH





PTO Clutch Lever Stroke

1. Be sure to contact the stopper pin (1) and PTO valve lever (2) when shifting the PTO clutch lever (5) to **ON** position.
2. If not making contact between the PTO valve lever (2) with stopper pin (1), adjust the PTO wire (4) retaining position with nuts (3).

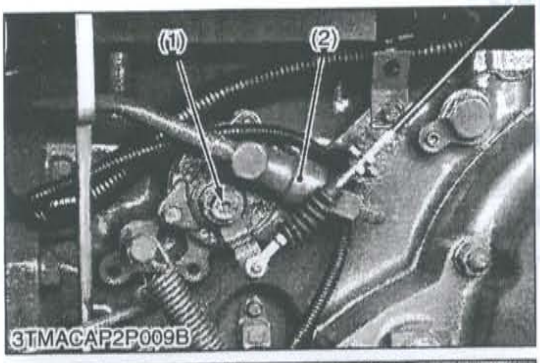
■ **IMPORTANT**

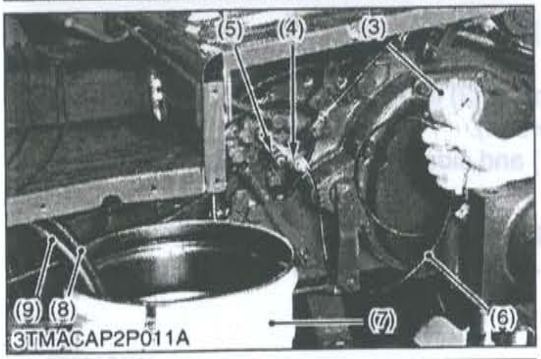
- **Do not connect the universal joint of the implement to the tractor PTO shaft while testing.**

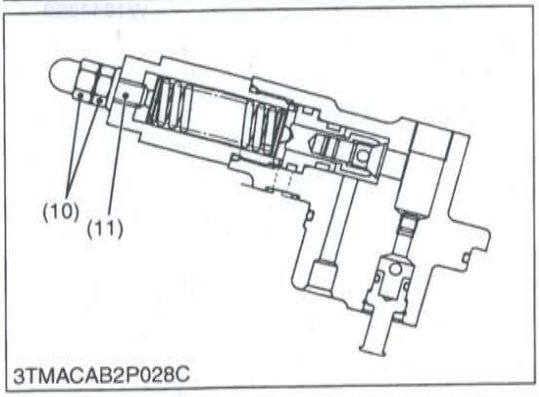
(1) Stopper Pin
(2) PTO Valve Lever
(3) Nut
(4) PTO Wire
(5) PTO Clutch Lever

(A) ON
(B) OFF

W1014440







Relief Valve Setting Pressure

■ **IMPORTANT**
- **Do not connect the universal joint of the implement to the tractor PTO shaft while testing.**
- **Set the main shift lever and shuttle lever in Neutral position.**
- **Set the parking brake lever in parking position.**

1. Place the disassembling stand under the transmission case.
2. Remove the left rear wheel.
3. Place the disassembling stand under the left rear axle case.
4. Drain the fuel and remove the fuel tank.
5. Prepare the can (7) for fuel and put in the fuel hose (8) and return hose (9).
6. Remove the plug (R1/8) (1) on the PTO valve (2).
7. Assemble the adaptor (R1/8) (4), threaded joint (5), cable (6) and pressure gauge (3).
8. Start the engine and set the engine speed to maximum.
9. Engage the PTO clutch lever to the **"ON"** position, and measure the pressure.
10. If only the pressure in the PTO clutch engaged position is low, check the hydraulic PTO clutch system.
11. If the measurement is not within the factory specifications, loosen the lock nut (10) and turn the screw (11) to adjust.

PTO pressure (when PTO clutch lever is **"ON"** position)	Factory spec.	2.16 to 2.26 MPa 22 to 23 kgf/cm^2 312.91 to 327.14 psi
PTO pressure (when PTO clutch lever is **"OFF"** position)	Factory spec.	No pressure

Condition
- Engine speed : Approx. 2600 min^{-1} (rpm)
- Oil temperature : 45 to 55 °C
  113 to 131 °F

(Reference)
- Turn the screw (11) clockwise direction → Pressure increase
- Turn the screw (11) counterclockwise direction → Pressure decrease.

■ **NOTE**
- **Plug thread size : R1/8**

(1) Plug
(2) PTO Valve
(3) Pressure Gauge
(4) Adaptor
(5) Threaded Joint
(6) Cable
(7) Can
(8) Fuel Hose
(9) Return Hose
(10) Lock Nut
(11) Screw

W1075337

5. DISASSEMBLING AND ASSEMBLING

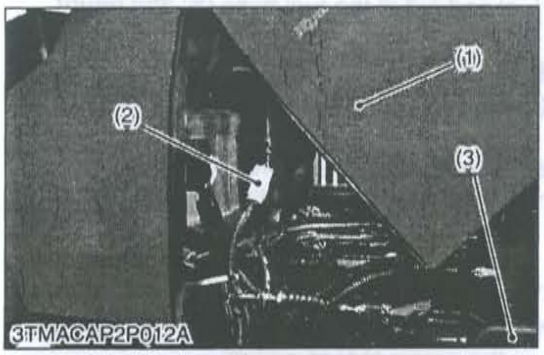
[1] PREPARATION

(1) Separating Engine from Clutch Housing (ROPS Model)

Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1039800



Bonnet

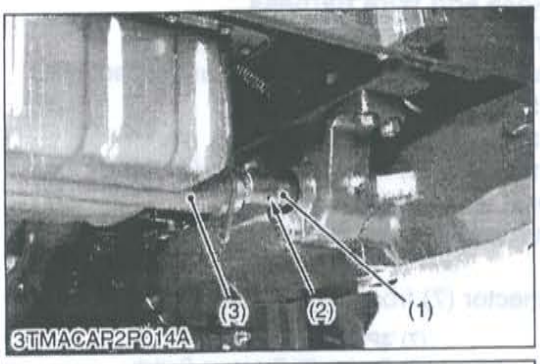
1. Open the bonnet (1) and disconnect the negative battery terminal.
2. Disconnect the connectors (2) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1) and side cover (3) (R.H) (L.H.).

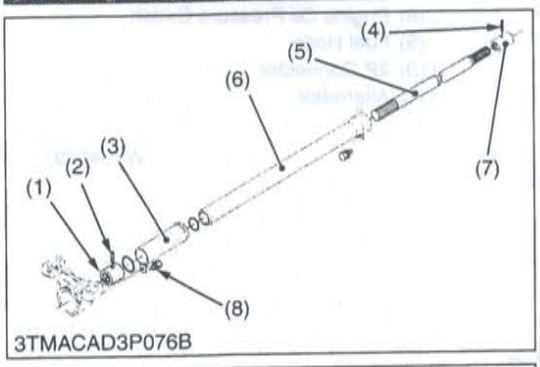
■ **IMPORTANT**

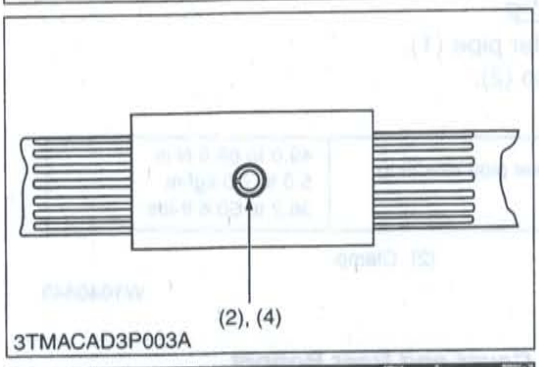
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

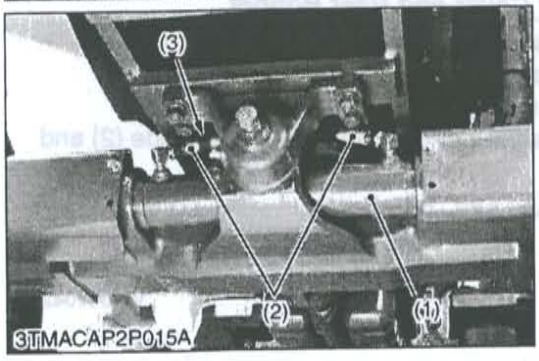
(1) Bonnet
(2) Connector
(3) Side Cover
(4) Damper

W1044829









Propeller Shaft (4WD Model)

1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1044966

Power Steering Hose

1. Disconnect both power steering hoses (2) from power steering cylinder (1).

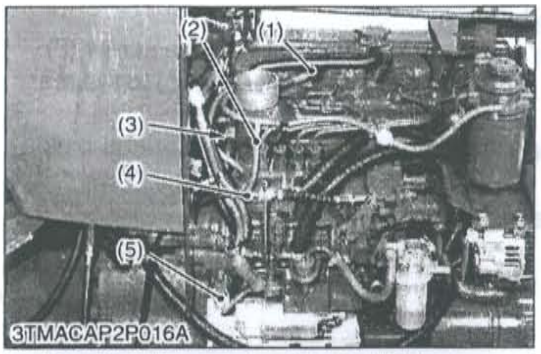
(When reassembling)

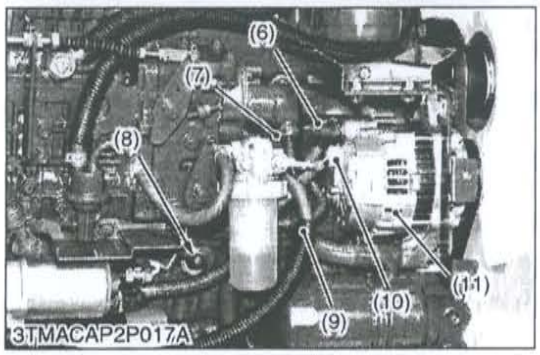
- Connect the power steering hose with blue tape (3) to the R.H..

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Power Steering Cylinder
(2) Power Steering Hose
(3) Blue Tape

W1045122



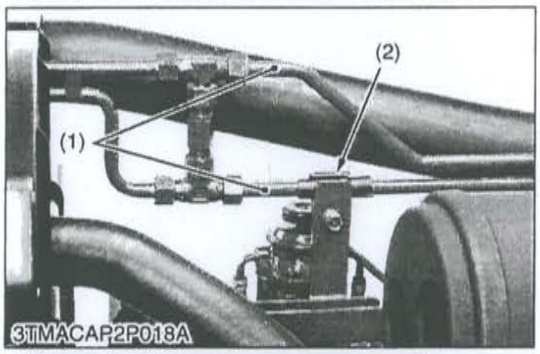


Accelerator Wire, Fuel Hose and Wire Harness

1. Disconnect the accelerator wire (4) and fuel hose (2).
2. Disconnect the wire harness from water temperature sensor (3), engine speed sensor (5) and glow plug (1).
3. Disconnect the fuel hose (9) from fuel filter.
4. Disconnect the **2P** connector (10) from alternator (11) and wire harness from alternator **B** terminal (6).
5. Disconnect the wire harness from the engine oil pressure switch (8).
6. Disconnect the **3P** connector (7) from engine stop solenoid.

(1) Glow Plug
(2) Fuel Hose
(3) Water Temperature Sensor
(4) Accelerator Wire
(5) Engine Speed Sensor
(6) Alternator **B** Terminal
(7) **3P** Connector
(8) Engine Oil Pressure Switch
(9) Fuel Hose
(10) **2P** Connector
(11) Alternator

W1040397



Oil Cooler Pipe and Clamp

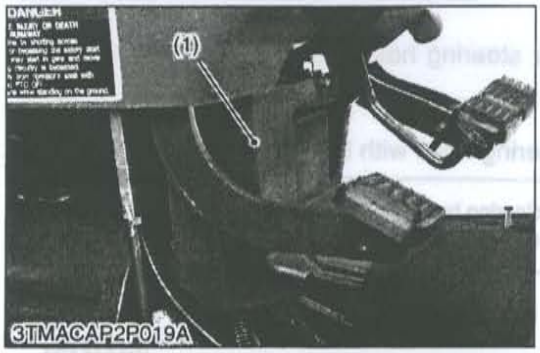
1. Disconnect the oil cooler pipe (1).
2. Remove the pipe clamp (2).

(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Oil Cooler Pipe
(2) Clamp

W1040843

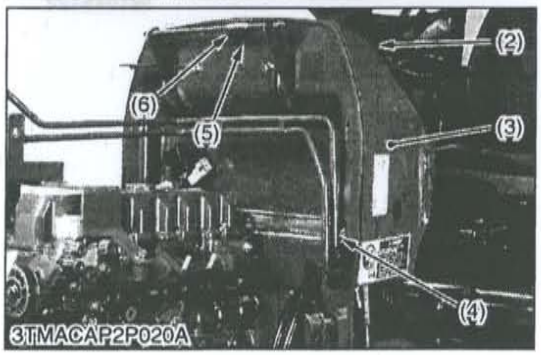


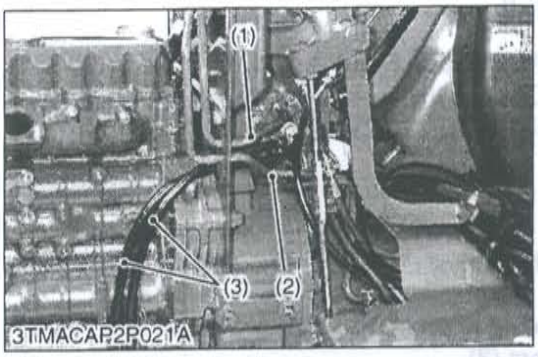
Steering Support Under Cover and Rear Bonnet

1. Remove the steering support under cover (1).
2. Loosen the rear bonnet mounting screws (4).
3. Remove the seal (6) and panel guide mounting screw (5).
4. Disconnect the wire harness and remove the panel guide (2) and rear bonnet (3).

(1) Steering Support Under Cover
(2) Panel Guide
(3) Rear Bonnet
(4) Screw
(5) Screw
(6) Seal

W1041042





Oil Cooler Pipe

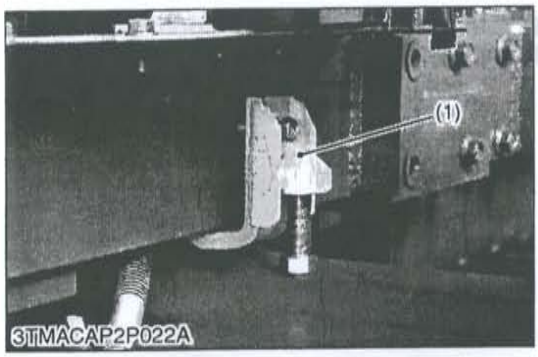
1. Remove the oil cooler pipes (1) and (2).
2. Disconnect the power steering hoses (3).

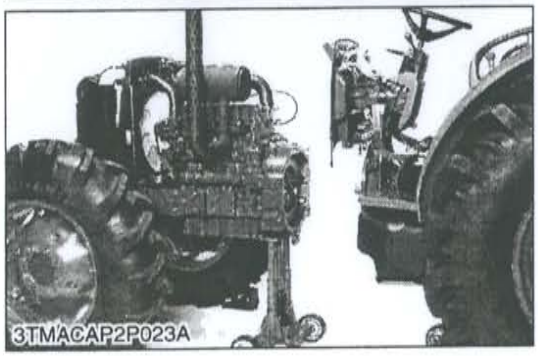
(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Oil Cooler Pipe
(2) Oil Cooler Pipe
(3) Power Steering Hose

W1041321





Separating Engine from Clutch Housing

1. Make sure the engine and clutch housing case are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the front axle bracket.
3. Remove the engine mounting screws and nut, and separate the engine from the clutch housing.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs
	Engine and clutch housing mounting stud bolt	61.8 to 73.6 N·m 6.3 to 7.5 kgf·m 45.6 to 54.2 ft-lbs

(1) Front Axle Rocking Restrictor

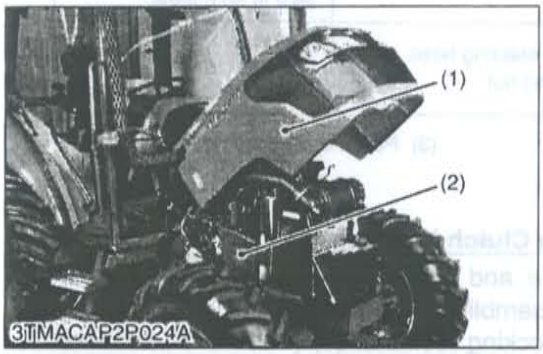
W1030352

(2) Separating Engine from Clutch Housing (CABIN Model)

Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1095369



Bonnet

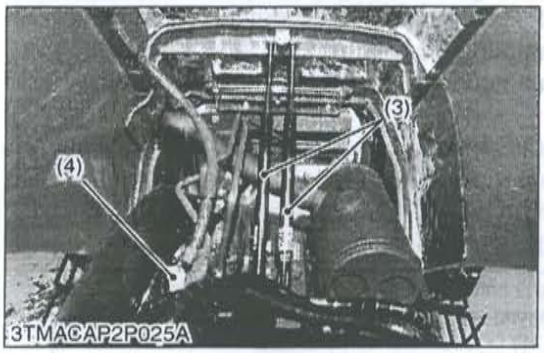
1. Open the bonnet (1) and disconnect the negative battery terminal.
2. Disconnect the connectors (4) for head lights.
3. Disconnect the dampers (3).
4. Remove the bonnet (1) and side cover (2) (R.H) (L.H.).

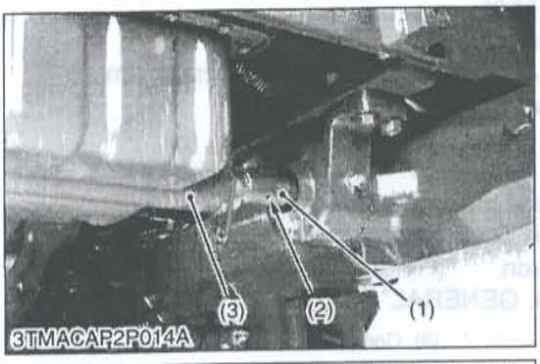
■ **IMPORTANT**

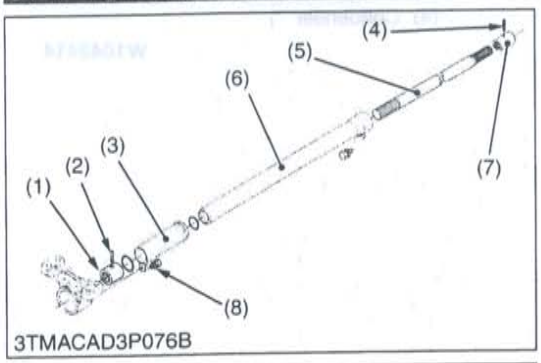
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

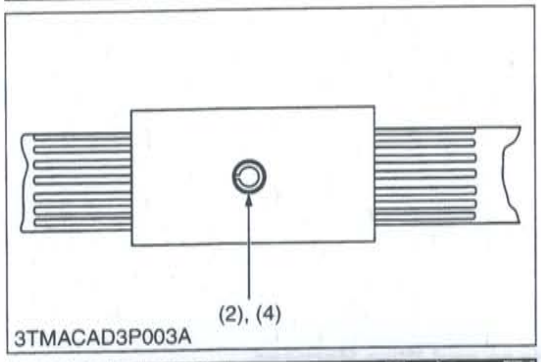
(1) Bonnet
(2) Side Cover
(3) Damper
(4) Connector

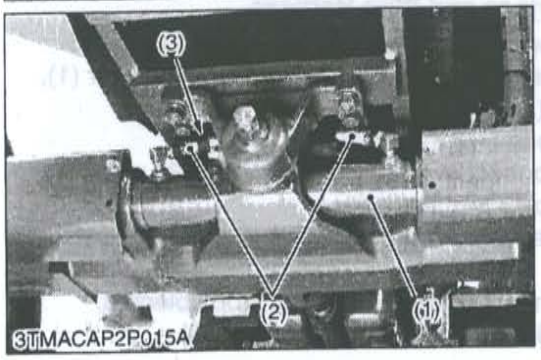
W1041876











Propeller Shaft (4WD Model)

1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1042088

Power Steering Hose

1. Disconnect both power steering hoses (2) from power steering cylinder (1).

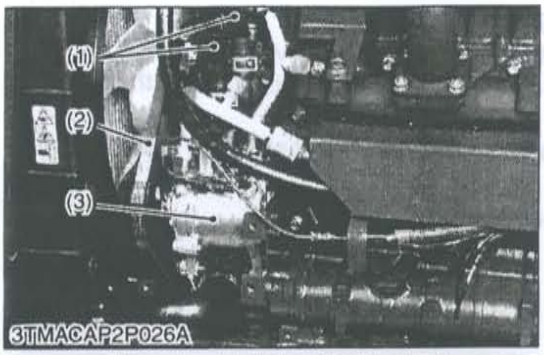
(When reassembling)

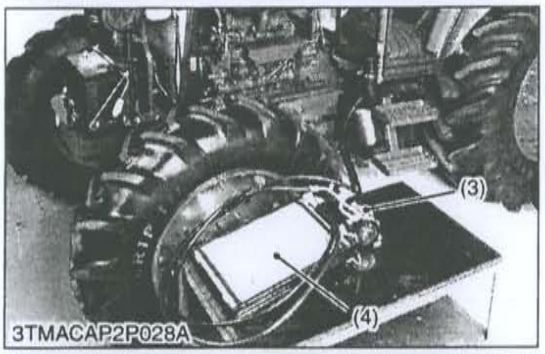
- Connect the power steering hose with blue tape (3) to the R.H..

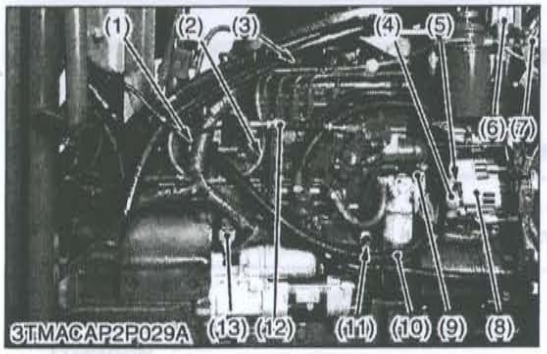
Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Power Steering Cylinder
(2) Power Steering Hose
(3) Blue Tape

W1042271







Condenser and Compressor

1. Remove the air conditioner belt (2).
2. Remove the compressor (3) and condenser (4) without removing the air conditioner hoses.
3. Disconnect the heater hoses (1).

(When reassembling)

- Take care not to damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the air condenser belt tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)

(1) Heater Hose
(2) Belt
(3) Compressor
(4) Condenser

W1042414

Accelerator Wire, Fuel Hose and Wire Harness

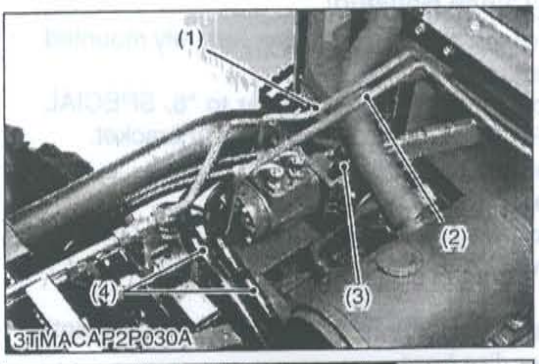
1. Disconnect the accelerator wire (12) and fuel hose (2).
2. Disconnect the wire harness from water temperature sensor (1), engine speed sensor (13) and glow plug (3).
3. Disconnect the fuel hose (10) from fuel filter.
4. Disconnect the **2P** connector (5) from alternator (8) and wire harness from alternator **B** terminal (4).
5. Disconnect the wire harness from the engine oil pressure switch (11).
6. Disconnect the **3P** connector (9) from engine stop solenoid.
7. Remove the heater relays (7) and slow blow fuse (6).

(When reassembling)

Tightening torque	Starter's **B** terminal mounting nut	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 ft-lbs

(1) Water Temperature Sensor
(2) Fuel Hose
(3) Glow Plug
(4) Alternator **B** Terminal
(5) **2P** Connector
(6) Slow Blow Fuse
(7) Heater Relay
(8) Alternator
(9) **3P** Connector
(10) Fuel Hose
(11) Engine Oil Pressure Switch
(12) Accelerator Wire
(13) Engine Speed Sensor

W1042799



Power Steering Pipe and Oil Cooler Pipe

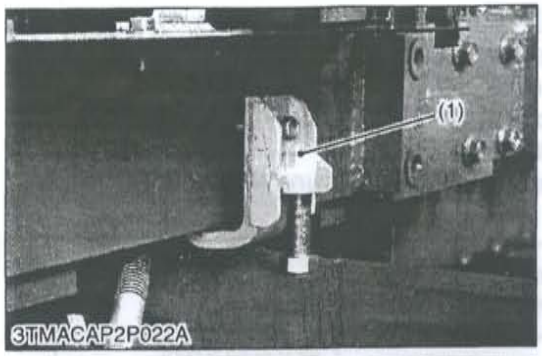
1. Disconnect the power steering pipe (1).
2. Disconnect the oil cooler pipe (2).
3. Remove the steering joint shaft (3).
4. Disconnect the heater hoses (4).
5. Disconnect the breather hose (5) and grounding wire (6).

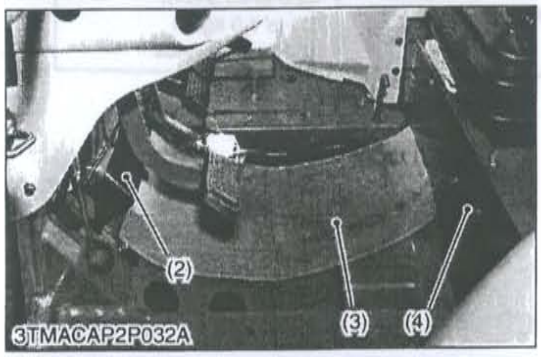
(When reassembling)

Tightening torque	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Oil Cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Power Steering Pipe
(2) Oil Cooler Pipe
(3) Steering Joint Shaft
(4) Heater Hose
(5) Breather Hose
(6) Grounding Wire

W1043207





Separating Engine from Clutch Housing

1. Check the engine and clutch housing case are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the front axle bracket.
3. Remove the floor cover and duct retainer (2).
4. Remove the seat under cover (4) and duct (3).
5. Remove the engine mounting screws and nuts.
6. Separate the engine from the clutch housing.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs

(1) Front Axle Rocking Restrictor
(2) Duct Retainer
(3) Duct
(4) Seat Under Cover

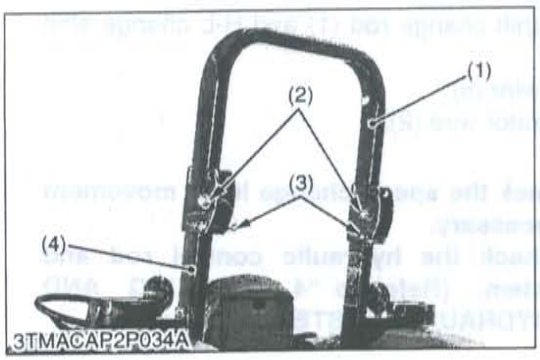
W1101378

(3) Separating Clutch Housing from Transmission Case

Removing Cabin from Body (CABIN Model)

1. Refer to "10. CABIN" section.

W1044097



Removing ROPS Upper

1. Loosen the ROPS under frame (4) mounting screws. (Do not remove screws.)
2. Remove the ROPS upper frame (1).

(When reassembling)

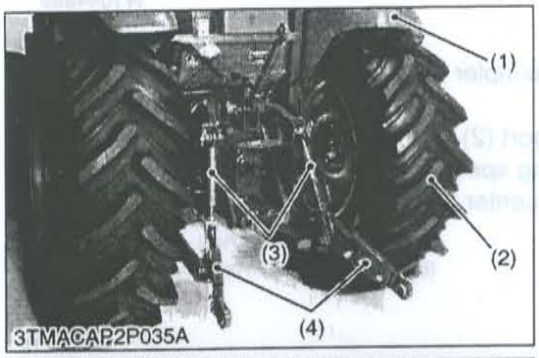
- To assemble the ROPS, fix the upper frame with screw (2) and pin (3) temporarily, then tighten the under frame screws evenly with specified torque.
- Attach the upper frame with screws (2) so not to fall down.

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

ROPS upper frame lift up force at center of upper frame	Reference value	245.2 to 284.2 N 25.0 to 29.0 kgf 55.1 to 63.9 lbs

(1) ROPS Upper Frame
(2) Screw
(3) Pin
(4) ROPS Under Frame

W1041135



Lift Rod, Lower Link and Fender (R.H., L.H.)

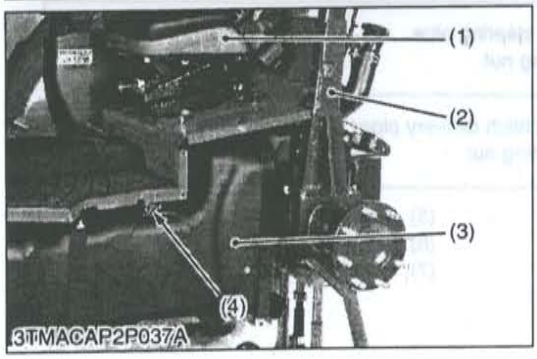
1. Place the disassembling stand under the transmission case.
2. Remove the lift rod (3) and lower link (4).
3. Remove the rear wheel (2) (R.H., L.H.).
4. Disconnect the wire harness from turn signal light and PTO switch.
5. Disconnect the PTO clutch cable (5).
6. Remove the rear fender (1) (R.H., L.H.).

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fender
(2) Rear Wheel
(3) Lift Rod
(4) Lower Link
(5) PTO Clutch Cable

W1044376



ROPS Under, Fuel Tank and Seat

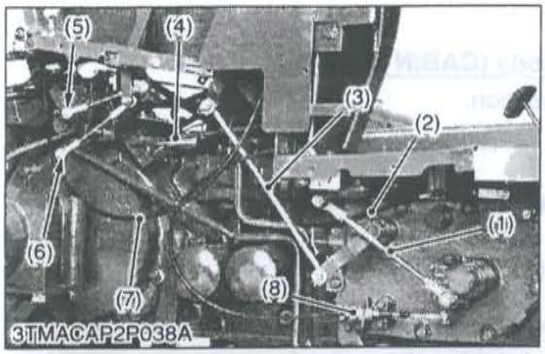
1. Disconnect the wire harness from seat and remove the seat (1).
2. Disconnect the wire harness from fuel level sensor (4).
3. Remove the fuel tank (3).
4. Remove the ROPS under frame (R.H., L.H.).

(When reassembling)

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) Seat
(2) ROPS Under Frame
(3) Fuel Tank
(4) Fuel Level Sensor

W1044655



Hydraulic Control Rod, Shift Change Rod and Wire

1. Disconnect the position control rod (6) and draft control rod (5).
2. Remove the differential lock rod (4).
3. Disconnect the auxiliary hydraulic control wire (7) from auxiliary hydraulic control valve.
4. Disconnect the main shift change rod (1) and H-L change shift rod (3).
5. Disconnect the select wire (8).
6. Disconnect the accelerator wire (2).

■ **NOTE**

- **After assembling check the speed change lever movement and adjust them if necessary.**
- **After assembling check the hydraulic control rod and auxiliary control system. (Refer to "4. CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.)**

(When reassembling)

Main shift rod length (L)	Reference value	Approx. 262 mm 10.32 in.

(1) Main Shift Change Rod
(2) Accelerator Wire
(3) H-L Change Shift Rod
(4) Differential Lock Rod
(5) Draft Control Rod
(6) Position Control Rod
(7) Auxiliary Hydraulic Control Wire
(8) Select Wire

L : Length

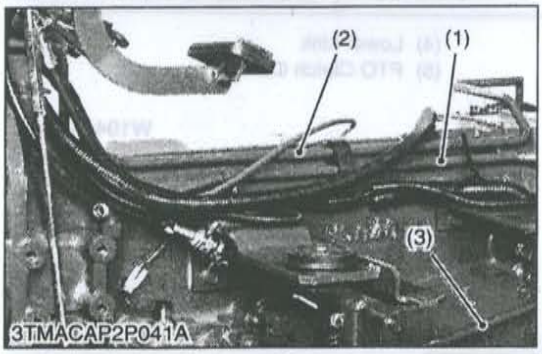
W1044889

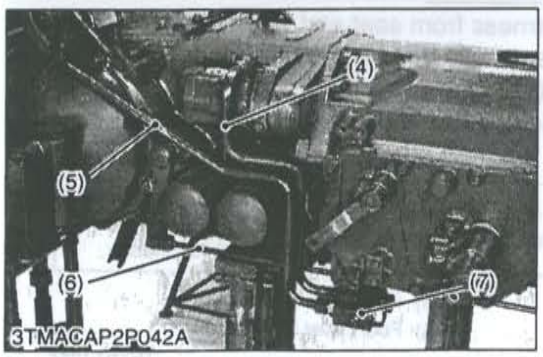
Step and Center Frame

1. Disconnect the trailer coupler harness (5).
2. Remove the grip (1).
3. Remove the seat support (2).
4. Disconnect the lowering speed rod (4).
5. Remove the step and center frame (3) as a unit.

(1) Grip
(2) Seat Support
(3) Step and Center Frame
(4) Lowering Speed Rod
(5) Trailer Coupler Harness

W1045473





Hydraulic Pipes and Brake Rods

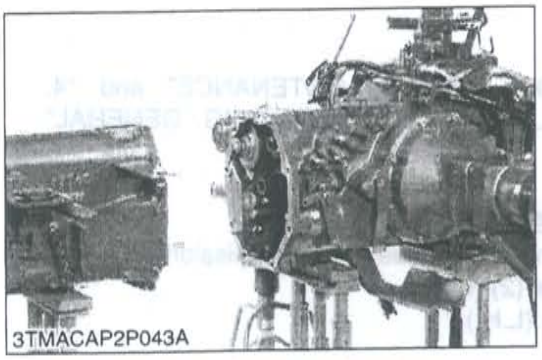
1. Remove the PTO delivery pipe (1).
2. Remove the power steering pipe (2).
3. Remove the 3-point hitch delivery pipe 1 (4) and 3-point hitch delivery pipe 2 (5) with outlet block (7).
4. Remove the brake rod (6) (R.H.) (L.H.) and DT rod (3).

(When reassembling)

Tightening torque	PTO delivery pipe joint screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	3-point hitch delivery pipe 2 retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 ft-lbs

(1) PTO Delivery Pipe
(2) Power Steering Pipe
(3) DT Rod
(4) 3-point Hitch Delivery Pipe 1
(5) 3-point Hitch Delivery Pipe 2
(6) Brake Rod
(7) Outlet Block

W1045712



Separating Transmission Case

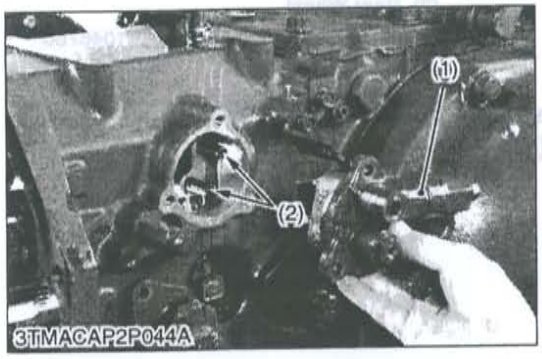
1. Make sure the clutch housing case and transmission case are securely mounted on the disassembling stands.
2. Remove the transmission case mounting screws and nuts.
3. Separate the transmission case from the clutch housing.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D, 1206C or equivalent) to joint face of transmission case and clutch housing case.

Tightening torque	Transmission case and clutch housing mounting screw, nut (M10, 9T)	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
	Transmission case and clutch housing mounting screw, nut (M14, 9T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 ft-lbs

W1022873



Removing PTO Clutch Valve

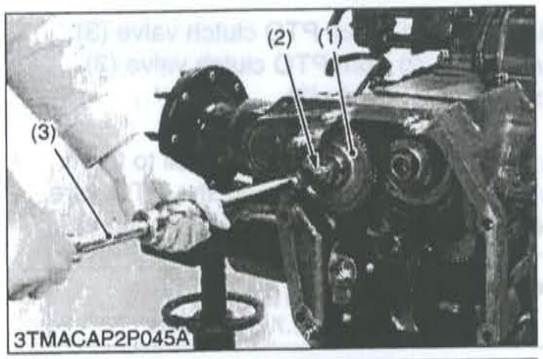
1. Remove the PTO clutch valve (1).

(When reassembling)

- Apply transmission fluid to O-ring and hydraulic pipes (2).
- Remove the two hydraulic pipes from the PTO clutch holder.
- Insert both the hydraulic pipes into the PTO clutch valve holes down to the bottom.
- Replace the hydraulic pipes with new one.
- Now while aligning the hydraulic pipe ends with the PTO clutch holder holes, assemble the PTO clutch valve (1) to the transmission case.

(1) PTO Clutch Valve
(2) Hydraulic Pipe

W1023008



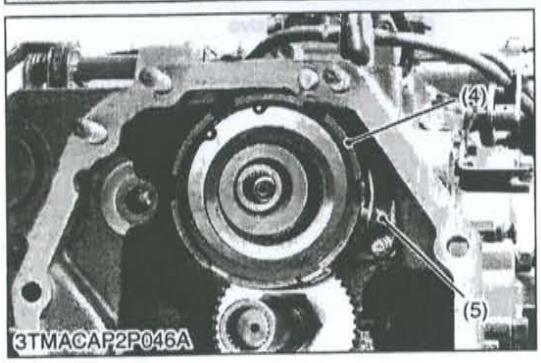
Removing PTO Clutch Pack and Holder

1. Draw out the pin (2) with sliding hammer (3).
2. Take out the hydraulic pump drive gear (1).
3. Remove the PTO clutch holder mounting screws.
4. Remove the PTO clutch (4) with holder (5).

(When reassembling)

- Take care not to damage the hydraulic pipes.

Tightening torque	PTO clutch holder mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs



■ **IMPORTANT**

- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-pressure.**

(1) Gear
(2) Pin
(3) Sliding Hammer
(4) PTO Clutch
(5) Holder

W1023169

(4) Removing PTO Clutch Valve

Draining Fuel

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1046689

Rear Wheel (L.H.) and Fender (L.H.)

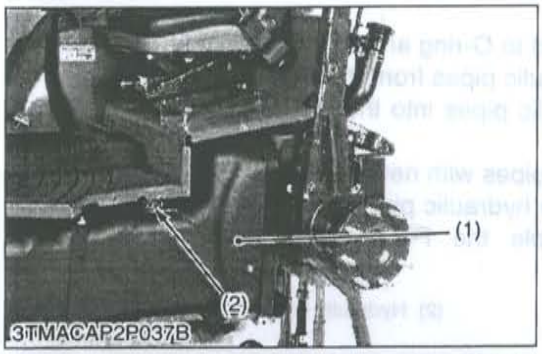
1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (2) (L.H.).
3. Remove the fender (1) (L.H.).

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fender (2) Rear Wheel

W1046760

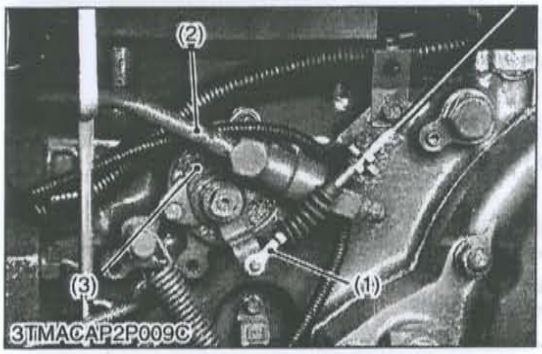


Fuel Tank

1. Disconnect the wire harness from fuel level sensor (2).
2. Remove the fuel tank (1).

(1) Fuel Tank (2) Fuel Level Sensor

W1047207



PTO Clutch Valve

1. Disconnect the PTO clutch wire (1) from PTO clutch valve (3).
2. Remove the PTO delivery pipe (2) from PTO clutch valve (3).
3. Remove the PTO clutch valve assembly (3).

(When reassembling)

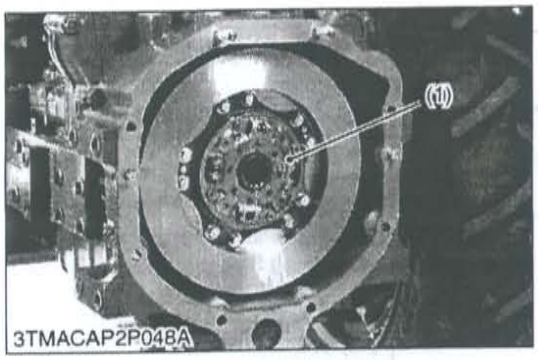
- Replace the PTO pipe (4) with new ones and apply oil to them.
- When assembling the PTO clutch valve, adjust the PTO wire. (Refer to "4. CHECKING AND ADJUSTING" in this section.)

Tightening torque	PTO delivery pipe joint screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

(1) PTO Clutch Wire (3) PTO Clutch Valve
(2) PTO Delivery Pipe (4) Hydraulic Pipe

W1047337

[2] DAMPER DISC (HYDRAULIC SHUTTLE MODEL)



Removing Damper Disc

1. Remove the damper disc (1).

(When reassembling)

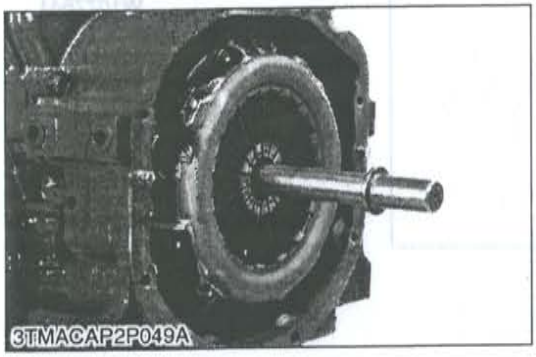
- Direct the shorter end of the damper disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the spline.

Tightening torque	Damper disc mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Damper Disc

W1030546

[3] CLUTCH DISC (SYNCHRO SHUTTLE MODEL)



Removing Clutch

1. Remove the clutch 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**

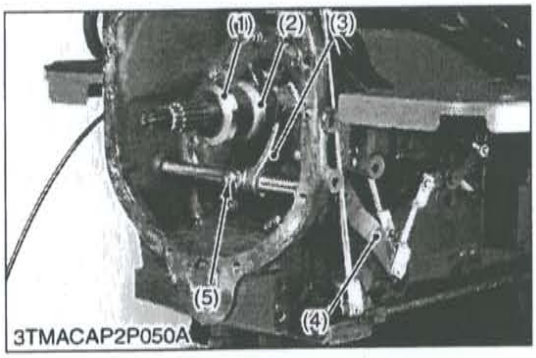
- **Align the center of disc and flywheel by inserting the clutch center tool.**

■ **NOTE**

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

Tightening torque	Clutch mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

W1047775



Release Holder and Clutch Lever

1. Draw out the clutch release holder (2) and the release bearing (1) as a unit.
2. Remove the release fork setting screws (5).
3. Draw out the clutch lever (4) to remove the release fork (3).

(When reassembling)

- Make sure the direction of the release fork (3) is correct.
- Inject grease to the release holder (2).
- Apply grease to the bushing and clutch lever.
- After tightening the release fork setting screw to the specified torque, insert a wire through the hole on the setting screw head and bind with release fork together.

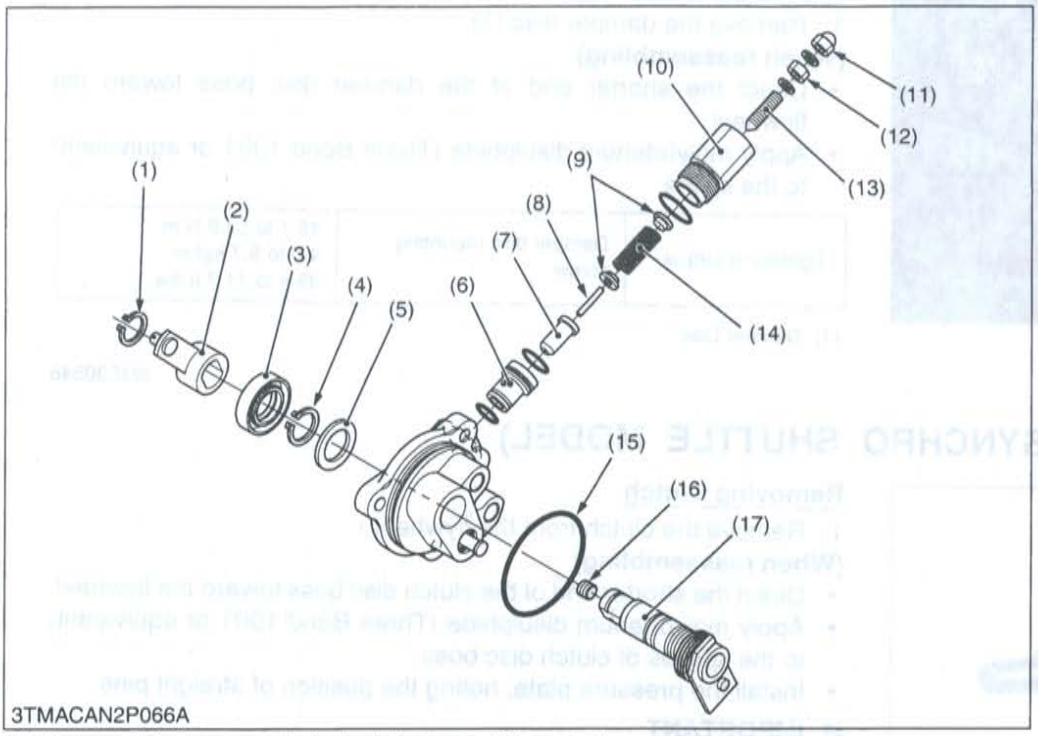
Tightening torque	Release fork setting screw	166.7 to 191.2 N·m 17.0 to 19.5 kgf·m 123.0 to 141.1 ft-lbs

(1) Release Bearing
(2) Release Holder
(3) Release Fork
(4) Clutch Lever
(5) Setting Screw

W1047965

[4] PTO CLUTCH VALVE

Disassembling PTO Clutch Valve



(1) External Circlip
(2) Lever
(3) Oil Seal
(4) External Circlip
(5) Washer
(6) Relief Sleeve
(7) Relief Poppet
(8) Push Pin
(9) Spring Seat
(10) Relief Body
(11) Cap Nut
(12) Lock Nut
(13) Adjuster
(14) Spring
(15) O-ring
(16) Plug (Check Port)
(17) Spool

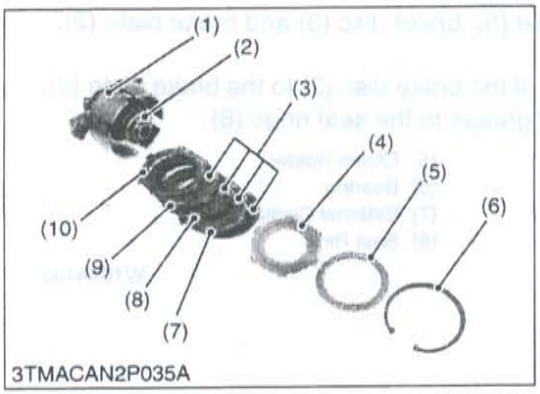
W1077641

1. Remove the external circlip (1), lever (2) and oil seal (3).
2. Remove the external circlip (4) and draw out the spool (17).
3. Remove the cap nut (11) and lock nut (12).
4. Remove the adjuster (13) and relief body (10).
5. Draw out the relief sleeve (6) and relief poppet (7).
6. Draw out the spring seat (9) and spring (14).

(When reassembling)

- When assembling the PTO clutch valve, adjust the PTO relief valve setting pressure (refer to "4. CHECKING AND ADJSUTING" in this section).

[5] PTO CLUTCH PACK



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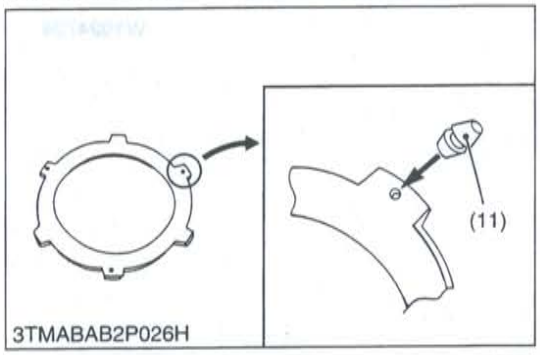

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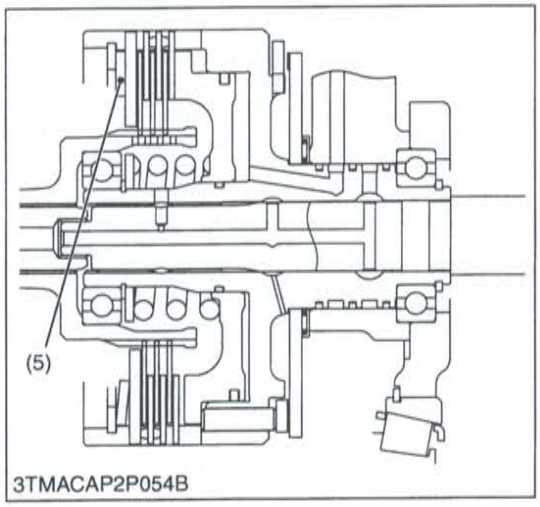

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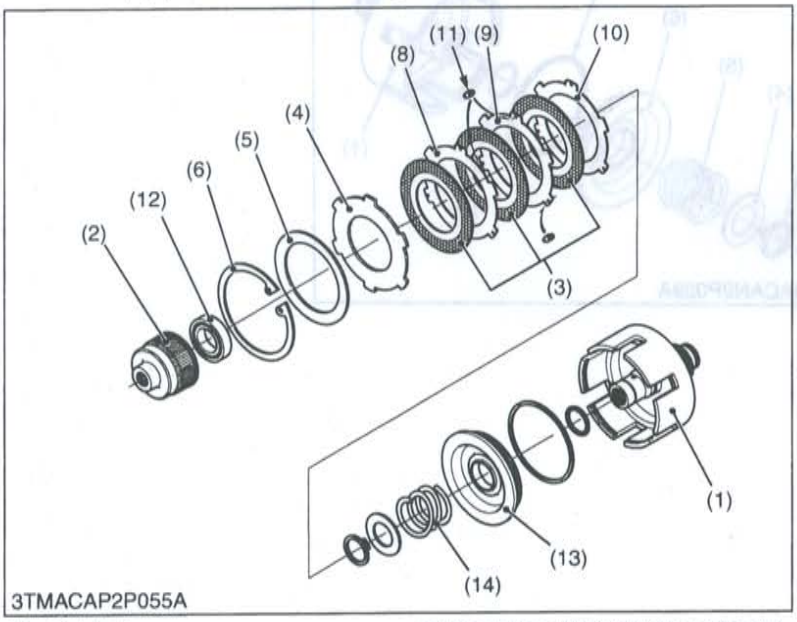
Clutch Hub and Clutch Discs

1. Remove the internal circlip (6), and then take out the clutch discs (3), belleville washer (cupped spring washer) (5), back plate (4), steel plates (7), (8), (9), (10), and the hub (2).

(When reassembling)

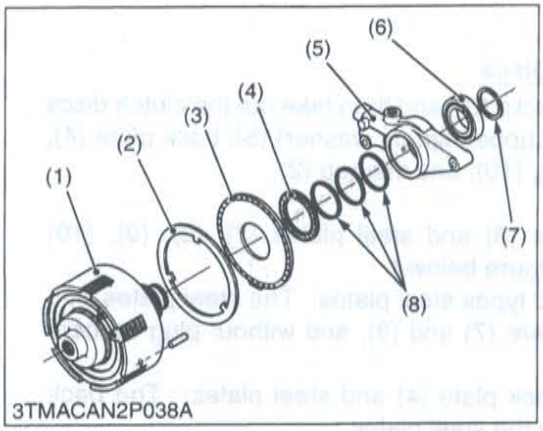
- Install the clutch discs (3) and steel plates (7), (8), (9), (10) alternately. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (11) are (7) and (9), and without plug rubbers (11) are (8) and (10).
- Do not confuse the back plate (4) and steel plates. The back plate (4) is thicker than the steel plates.
- Assemble the plug rubbers portion of the two steel plates (7) and (9) are same positions while assembling them. (Refer to figure below.)
- Apply enough transmission fluid to the discs (3).
- Confirm the moving of the piston (13) smoothly when pressure air at 0.29 to 0.39 MPa (3 to 4 kgf/cm^2, 42 to 57 psi) is sent to clutch pack. (Refer to the photo.)
- Assemble the steel plates with rubber (7) and (9) and steel plates without rubber (8) and (10) alternately, and steel plates are built in so that the part of rubber is not corresponding to the part of the hole.
- Be sure to assemble the belleville washer (cupped spring washer) (5) as shown in the figure.



3TMACAP2P055A

(1) Clutch Case
(2) Hub
(3) Clutch Discs
(4) Back Plate
(5) Belleville Washer (Cupped Spring Washer)
(6) Internal Circlip
(7) Steel Plate (With Plug Rubbers)
(8) Steel Plate (Without Plug Rubbers)
(9) Steel Plate (With Plug Rubbers)
(10) Steel Plate (Without Plug Rubbers)
(11) Plug Rubber
(12) Bearing
(13) Piston
(14) Spring

W1023397



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Clutch Case

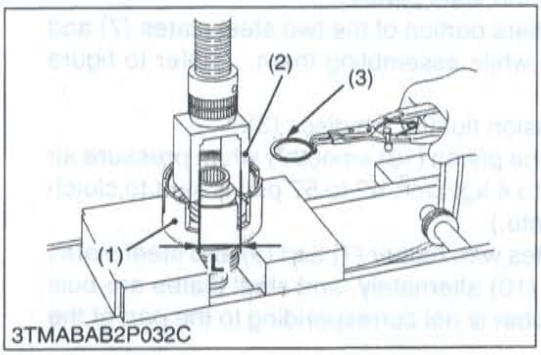
1. Remove the external circlip (7).
2. Remove the clutch case (5), brake disc (3) and brake plate (2).

(When reassembling)

- Direct the contact part of the brake disc (3) to the brake plate (2).
- Apply small amount of grease to the seal rings (8).

(1) Clutch Case
(2) Brake Plate
(3) Brake Disc
(4) Needle Bearing
(5) Clutch Holder
(6) Bearing
(7) External Circlip
(8) Seal Ring

W1024435



3TMABAB2P032C

Piston

1. Press the washer (4) lightly by the hand press, using the hand made jig. (Refer to the figure left.)
2. Remove the external circlip (3).
3. Draw out the piston (6).

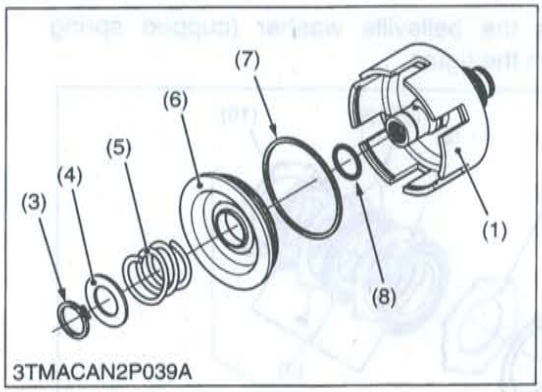
(When reassembling)

- Apply enough transmission fluid to seal ring (7) and (8).

(1) Clutch Case
(2) Jig
(3) External Circlip
(4) Washer
(5) Spring
(6) Piston
(7) Seal Ring
(8) Seal Ring

L : 54 mm (2.1 in.)

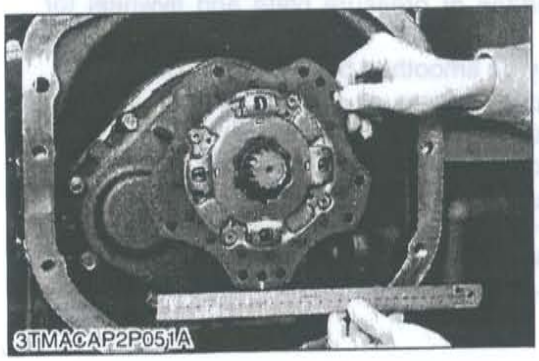
W1024734



3TMACAN2P039A

6. SERVICING

[1] TRAVELING CLUTCH (HYDRAULIC SHUTTLE MODEL)


3TMACAP2P051A

Backlash between Damper Disc Boss and Shaft

1. Mount the damper disc to the input shaft.
2. Hold the shaft so that it does not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace the damper disc.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

W1024206

[2] TRAVELING CLUTCH (SYNCHRO SHUTTLE MODEL)

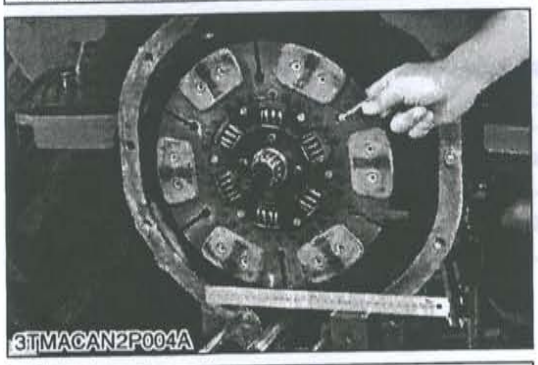

3TMACAP2P052A

Clutch Disc Thickness

1. Measure the depth from the surface of the clutch disc facing to the rivet.
2. If the measurement is less than the allowable limit, replace it.
3. If oil or grease is adhering to the clutch disc facing, replace it.

Depth to rivet top	Allowable limit	0.3 mm 0.118 in.

W1024461


3TMACAN2P004A

Spline Backlash between Clutch Disc Boss and Shaft

1. Mount the clutch disc to the shaft.
2. Hold the shaft so that it does not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace it.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

W1024559


3TMACAP2P053A

Pressure Plate Flatness

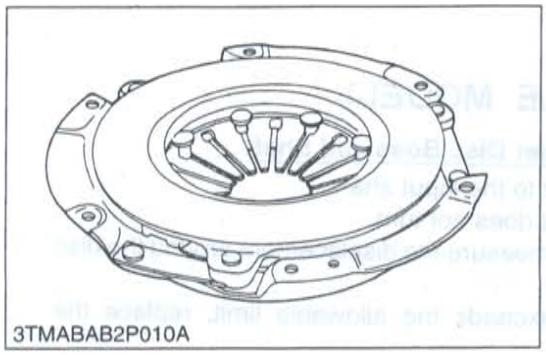
1. Place a straightedge on the contacting surface of the pressure plate.
2. Measure the outside circumference of the pressure plate with the straightedge, and determine if a 0.10 mm (0.0039 in.) feeler gauge will fit on the outside circumference, if it will fit, replace it.
3. Measure the inside circumference flatness following the same ways above, if the measurement exceed the allowable limit, replace it.

■ **NOTE**

- **Small heat cracks will not affect the clutch performance.**

Pressure plate flatness	Allowable limit	0.2 mm 0.0079 in.

W1025126

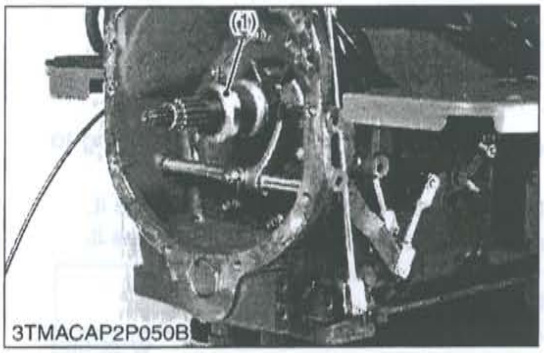

3TMABAB2P010A

Checking Pressure Plate Assembly and Flywheel

1. Wash the disassembling parts except clutch disc with a suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.
2. Inspect the friction surface of pressure plate and flywheel for scoring or roughness.
   - Slight roughness may be smoothed by using fine emery cloth.
   - If these parts have deep scores or grooves on their surface, they should be replaced.
3. Inspect the surface of diaphragm spring for wear.
   If excessive wear is found, replace the clutch cover assembly.

Diaphragm spring mutual difference	Allowable limit	0.5 mm 0.020 in.

W1015894



3TMACAP2P050B

Release Bearing

1. Check for abnormal wear on contact surface.
2. Rotate bearing outer race, while applying pressure to it.
3. If the bearing rotation is rough or noisy, replace the release bearing (1).

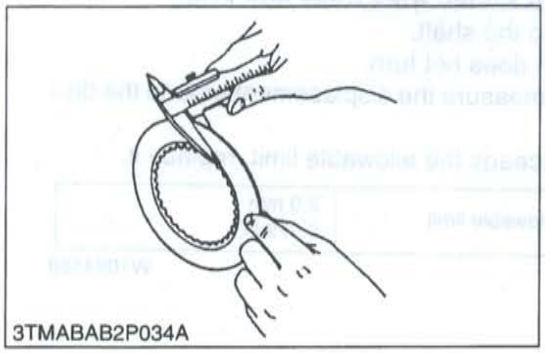
■ **NOTE**

- **Do not depress bearing outer race, when replacing release bearing.**
- **Do not wash the release bearing with a cleaning solvent.**

(1) Release Bearing

W1015573

[3] PTO CLUTCH PACK

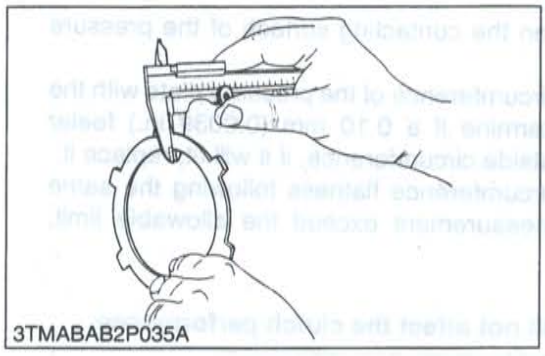

3TMABAB2P034A

PTO Clutch Disc Wear

1. Measure the thickness of PTO clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of PTO clutch disc	Factory spec.	2.5 to 2.7 mm 0.098 to 0.106 in.
	Allowable limit	2.1 mm 0.083 in.

W1024926

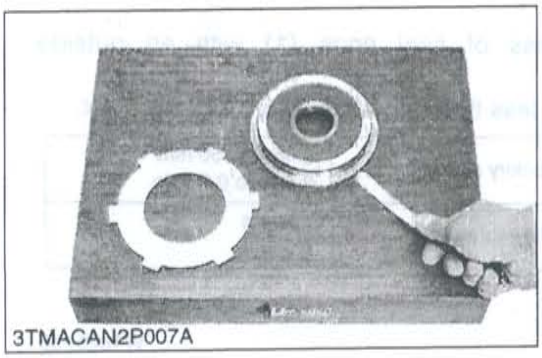

3TMABAB2P035A

PTO Steel Plate Wear

1. Measure the thickness of PTO steel plate with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of PTO steel plate	Factory spec.	1.93 to 2.07 mm 0.076 to 0.081 in.
	Allowable limit	1.80 mm 0.071 in.

W1025021

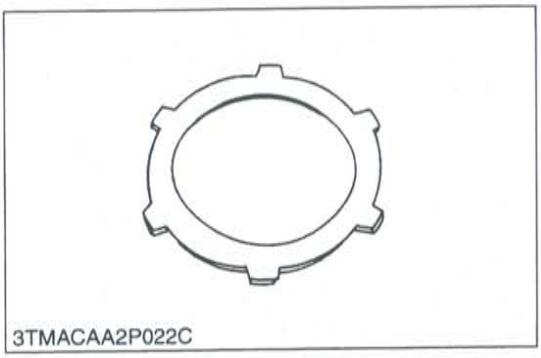

3TMACAN2P007A

Flatness of PTO Piston and PTO Steel Plate

1. Place the part on a surface plate.
2. Try to insert a feeler gauge (allowable limit size) underneath it at least four points.
3. If the gauge can be inserted, replace it.

Flatness of PTO piston	Allowable limit	0.15 mm 0.006 in.
Flatness of PTO steel plate	Allowable limit	0.30 mm 0.012 in.

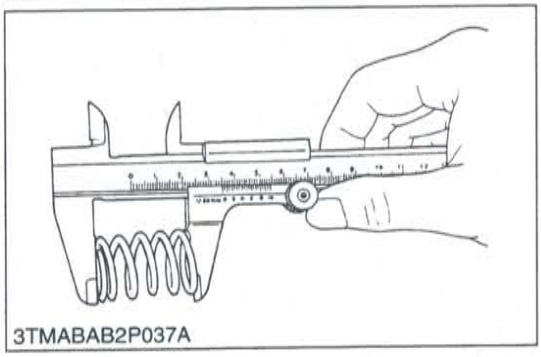
W1025149


3TMACAA2P022C

Plate

1. Check the contact surface to belleville washer (cupped spring washer).
2. If the back plate has deformed or is scratched and/or scared, replace it.

W1026255

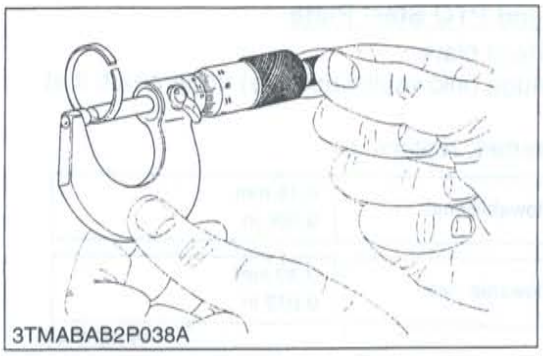

3TMABAB2P037A

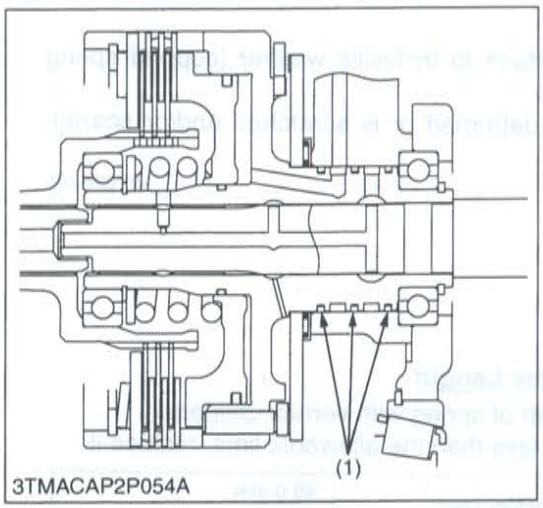
Piston Return Spring Free Length

1. Measure the free length of spring with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

PTO return spring free length	Factory spec.	46.0 mm 1.811 in.
	Allowable limit	37.5 mm 1.48 in.

W1025269


3TMABAB2P038A



3TMACAP2P054A

Thickness of Seal Ring

1. Measure the thickness of seal rings (1) with an outside micrometer.
2. If the measurement is less than the allowable limit, replace it.

Thickness of seal ring	Factory spec.	2.45 to 2.50 mm 0.096 to 0.098 in.
	Allowable limit	2.0 mm 0.079 in.

(1) Seal Ring

W1025453

3 TRANSMISSION

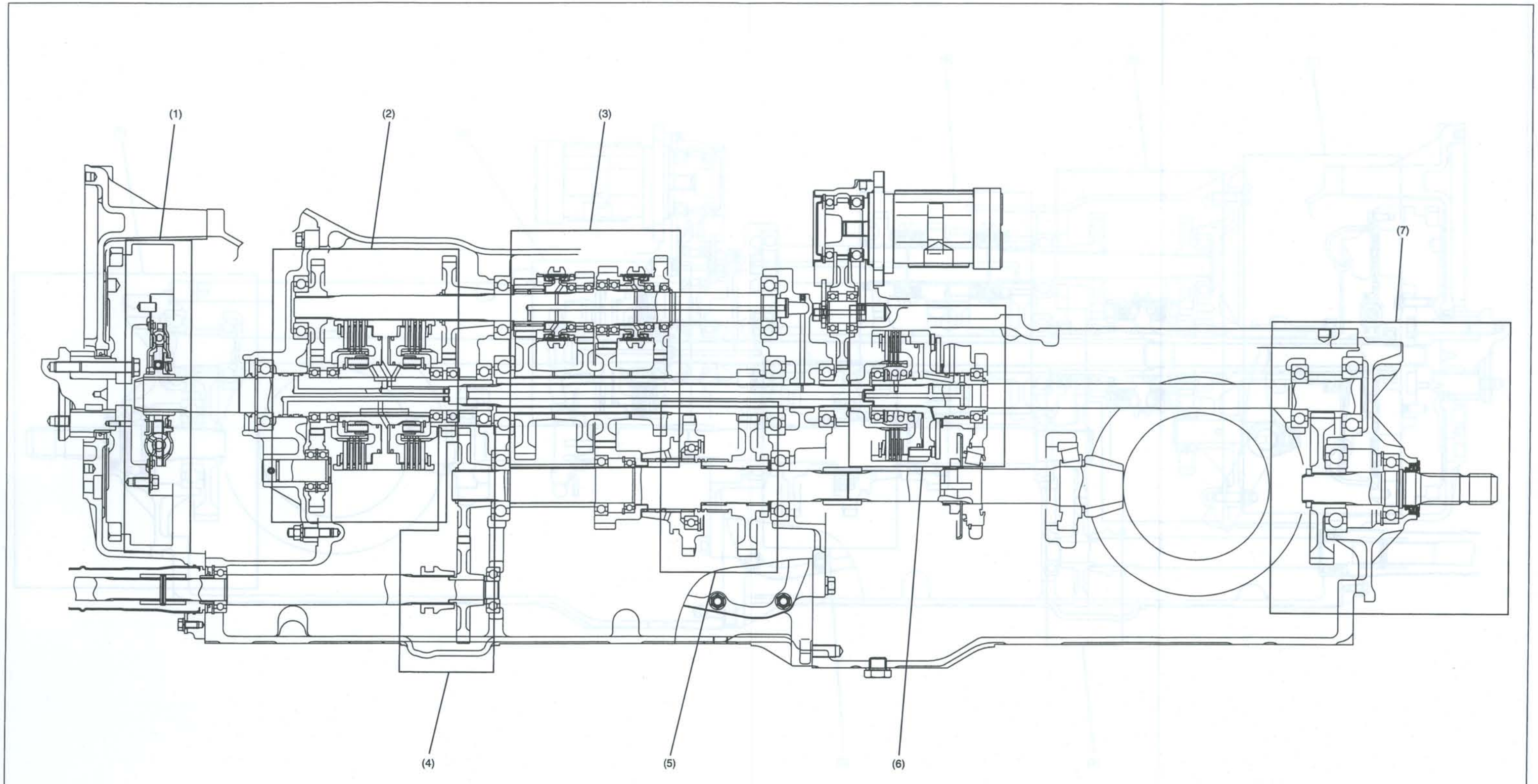
MECHANISM

CONTENTS

1. STRUCTURE

[1] HYDRAULIC SHUTTLE MODEL

■ **F8/R8 Speed Transmission**

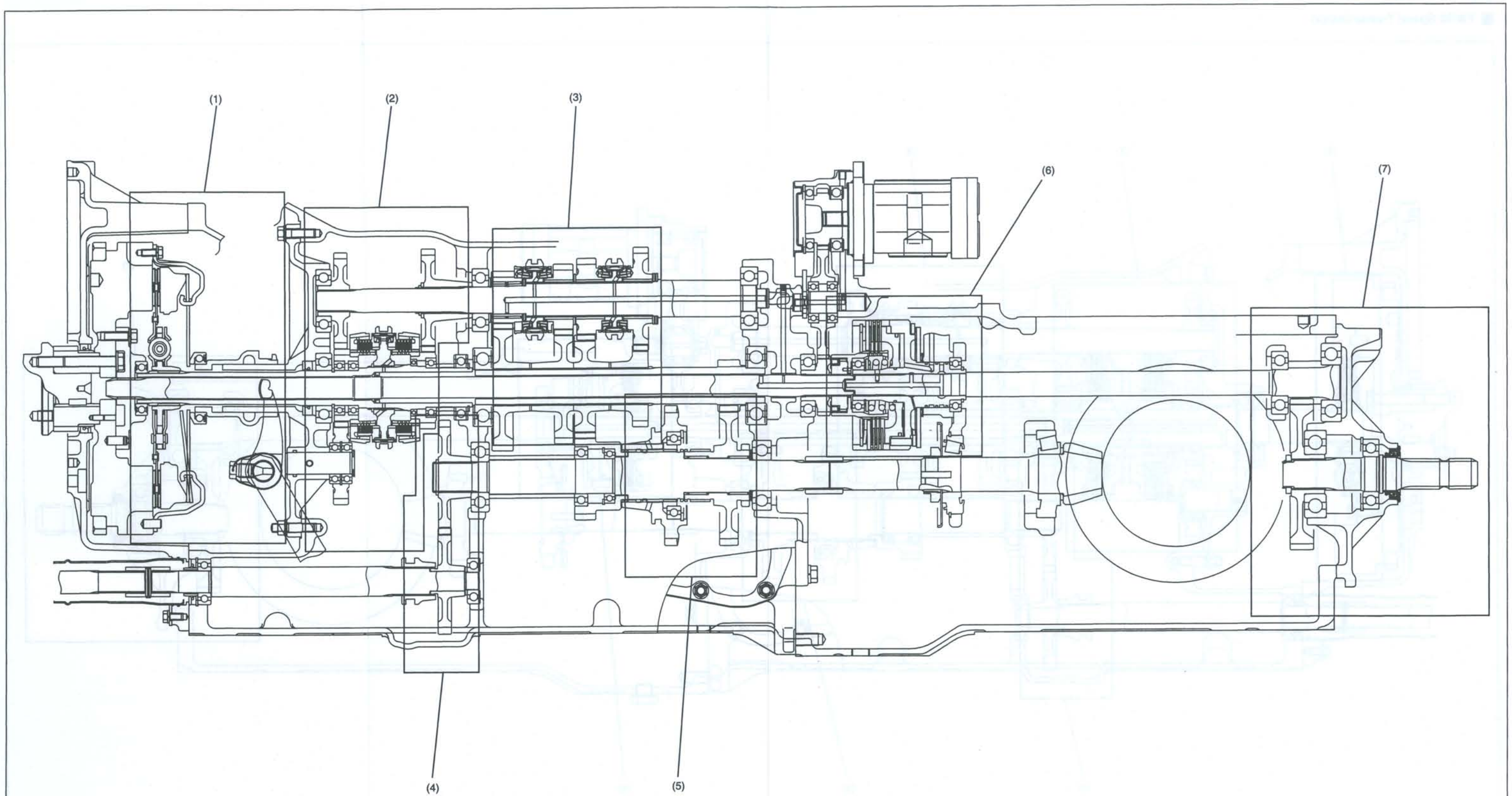


3TMACAP3P001A

(1) Damper (2) Hydraulic Shuttle Clutch (3) Main Gear Shift (4) Front Wheel Drive Shift (5) Range Gear Shift (6) PTO Clutch (7) PTO Gear Case

[2] SYNCHRO SHUTTLE MODEL

■ F8/R8 Speed Transmission

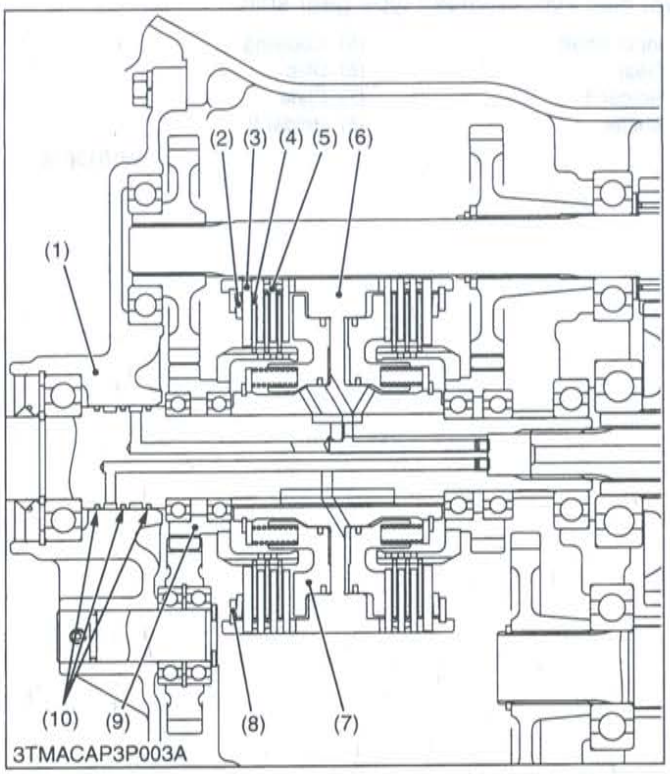


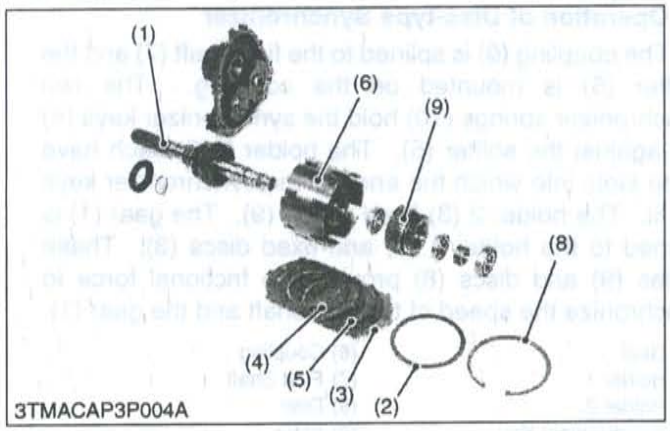
3TMACAP3P002A

(1) Traveling Clutch (2) Shuttle Gear Shift (3) Main Gear Shift (4) Front Wheel Drive Shift (5) Range Gear Shift (6) PTO Clutch (7) PTO Gear Case

2. SHUTTLE SHIFT

[1] HYDRAULIC SHUTTLE





The shuttle shift section allows the operators to change forward and reverse with a shuttle lever. It is using hydraulic clutch shifting.

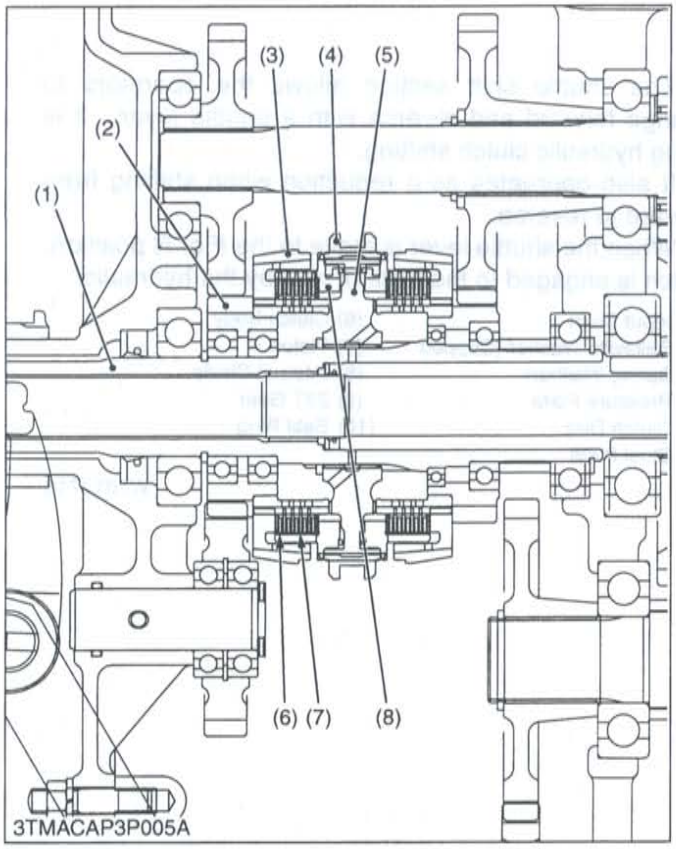
It also operaates as a reduction when shifting from forward to reverse.

When the shuttle lever is move to the **F** or **R** position, clutch is engaged to the front or rear by the hydraulic.

(1) Input Shaft
(2) Belleville Washer (Cupped Spring Washer)
(3) Pressure Plate
(4) Clutch Disc
(5) Steel Plate
(6) Clutch Body
(7) Piston
(8) Internal Circlip
(9) 29T Gear
(10) Seal Ring

W1012718

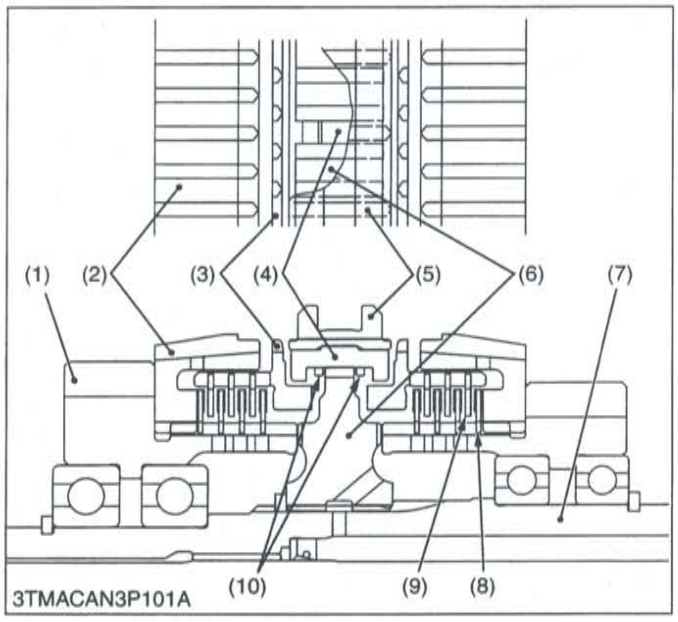
[2] SYNCHRO SHUTTLE (DISC TYPE)



The shuttle shift section allows the operators to change forward and reverse with a shuttle lever. It uses a wet disc synchromesh type gear shift.

(1) Input Shaft
(2) Gear
(3) Holder 1
(4) Shifter
(5) Coupling
(6) Disc
(7) Plate
(8) Holder 2

W1013012

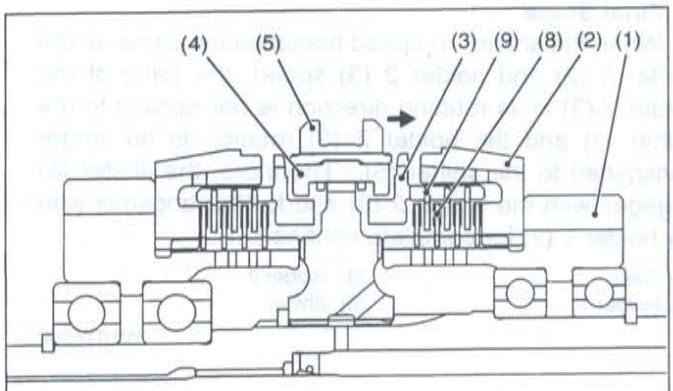


■ Operation of Disc-type Synchronizer

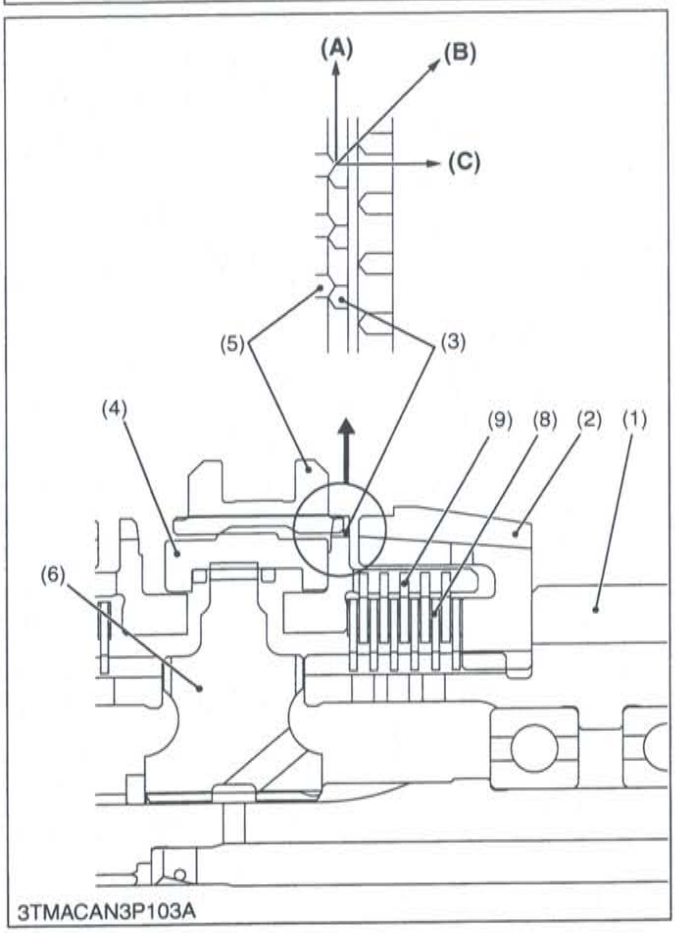
The coupling (6) is splined to the first shaft (7) and the shifter (5) is mounted on the coupling. The two synchronizer springs (10) hold the synchronizer keys (4) out against the shifter (5). The holder 2 (3) each have three slots into which the ends of the synchronizer keys (4) fit. The holder 2 (3) fixed plates (9). The gear (1) is splined to the holder 1 (2) and fixed discs (8). These plates (9) and discs (8) provide the frictional force to synchronize the speed of the first shaft and the gear (1).

(1) Gear
(2) Holder 1
(3) Holder 2
(4) Synchronizer Key
(5) Shifter
(6) Coupling
(7) First Shaft
(8) Disc
(9) Plate
(10) Synchronizer Springs

W1014654



3TMACAN3P102A



3TMACAN3P103A

● **First Stage**

An effort to place the shuttle lever to change the direction causes the shifter (5) and synchronizer keys (4) to move slightly. Then, the end surface of the synchronizer key (4) presses the holder 2 (3) against the plates (9) and discs (8). The frictional force generated at the plates (9) and discs (8) rotates the holder 2 (3), holder 1 (2) and gear (1).

(1) Gear
(2) Holder 1
(3) Holder 2
(4) Synchronizer Key
(5) Shifter
(8) Disc
(9) Plate

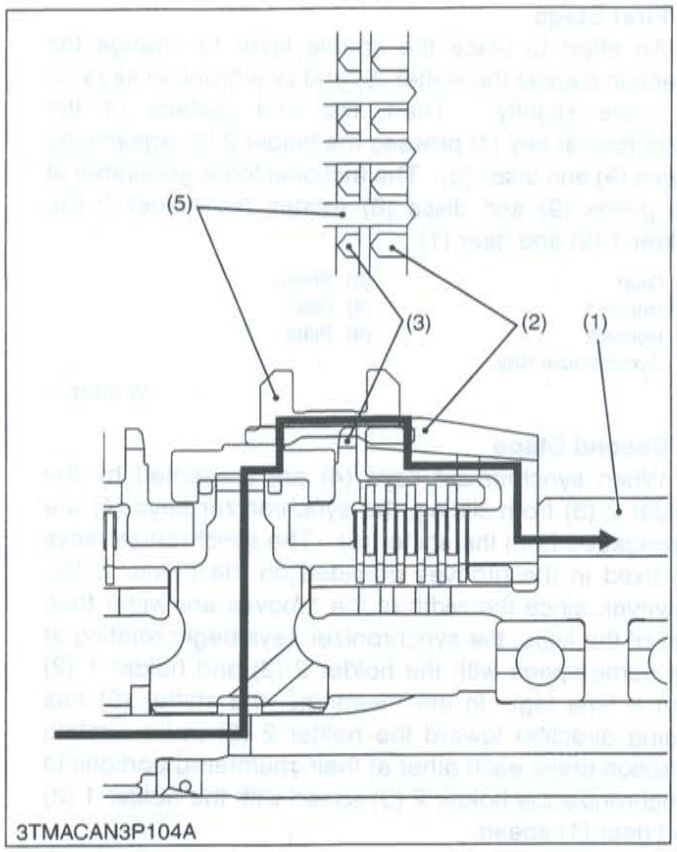
W1014872

● **Second Stage**

When synchronizer keys (4) are prevented by the holder 2 (3) from sliding, the synchronizer keys (4) are disengaged from the shifter (5). The synchronizer keys (4) fixed in the grooves provided on the holder 2 (3), however, since the width of the grooves are wider than that of the keys, the synchronizer keys begin rotating at the same speed with the holder 2 (3) and holder 1 (2) with a time lag. In the meantime, the shifter (5) has sliding direction toward the holder 2 (3) in its rotating direction press each other at their chamfered portions to synchronize the holder 2 (3) speed with the holder 1 (2) and gear (1) speed.

(1) Gear
(2) Holder 1
(3) Holder 2
(4) Synchronizer Key
(5) Shifter
(A) Turning Effort
(B) Composition of force
(C) Force to Shift

W1015067



3TMACAN3P104A

● **Final Stage**

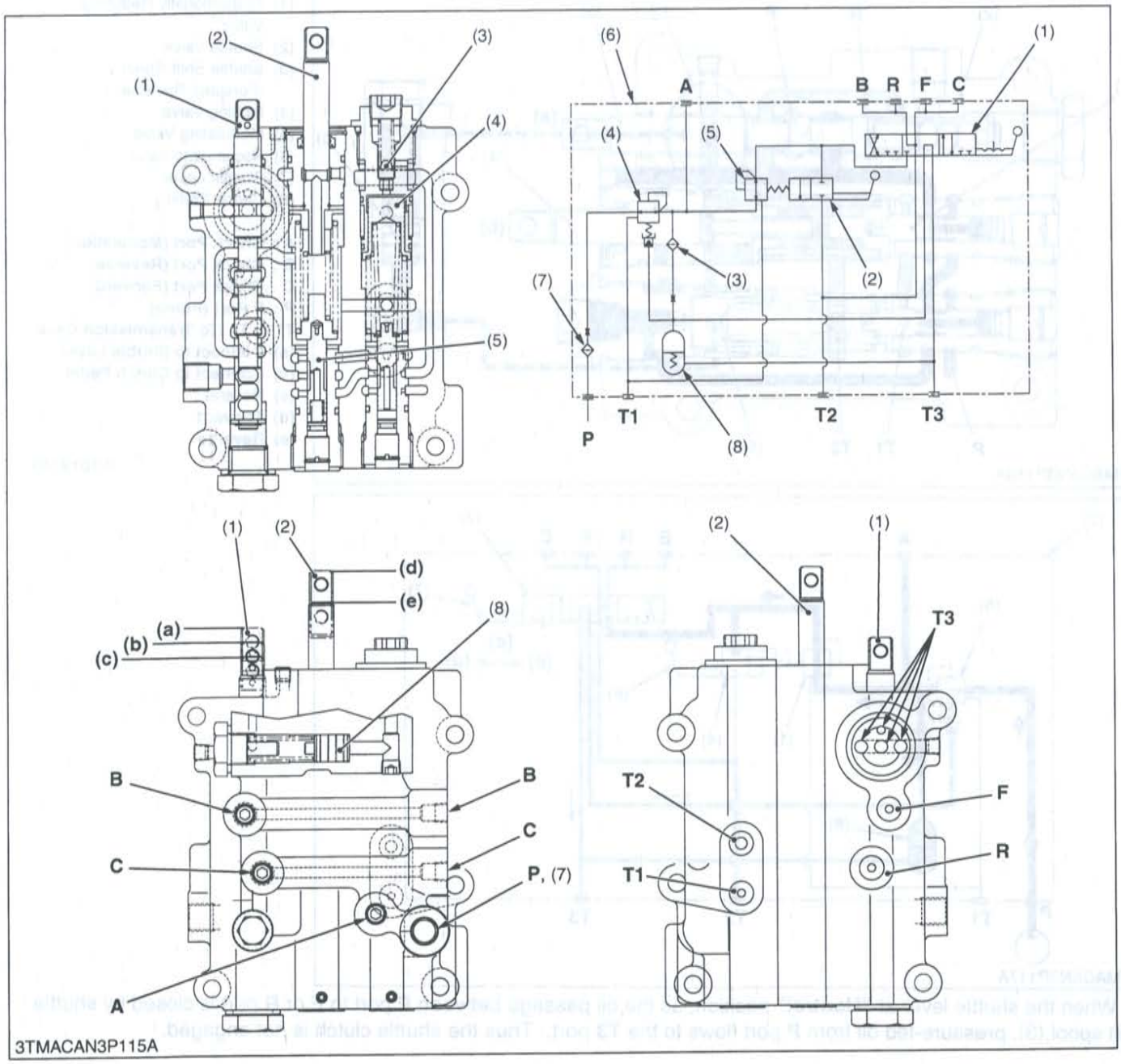
When the shifter (5) speed becomes the same as the holder 1 (2) and holder 2 (3) speed, the force of the holder 2 (3) in its rotating direction is not applied to the shifter (5) and the holder 2 (3) rotation is no longer transmitted to the shifter (5). Therefore, the shifter (5) engages with the holder 2 (3) and further engages with the holder 1 (2) for complete connection.

(1) Gear
(2) Holder 1
(3) Holder 2
(5) Shifter

W1014968

[3] HYDRAULIC SHUTTLE VALVE (HYDRAULIC SHUTTLE MODEL)

(1) Structure



(1) Shuttle Shift Spool (Forward, Reverse)
(2) Inching Valve Spool
(3) Line Filter
(4) Modulating Valve
(5) Proportionally Reducing Valve
(6) Shuttle Valve
(7) Line Filter
(8) Accumulate Valve

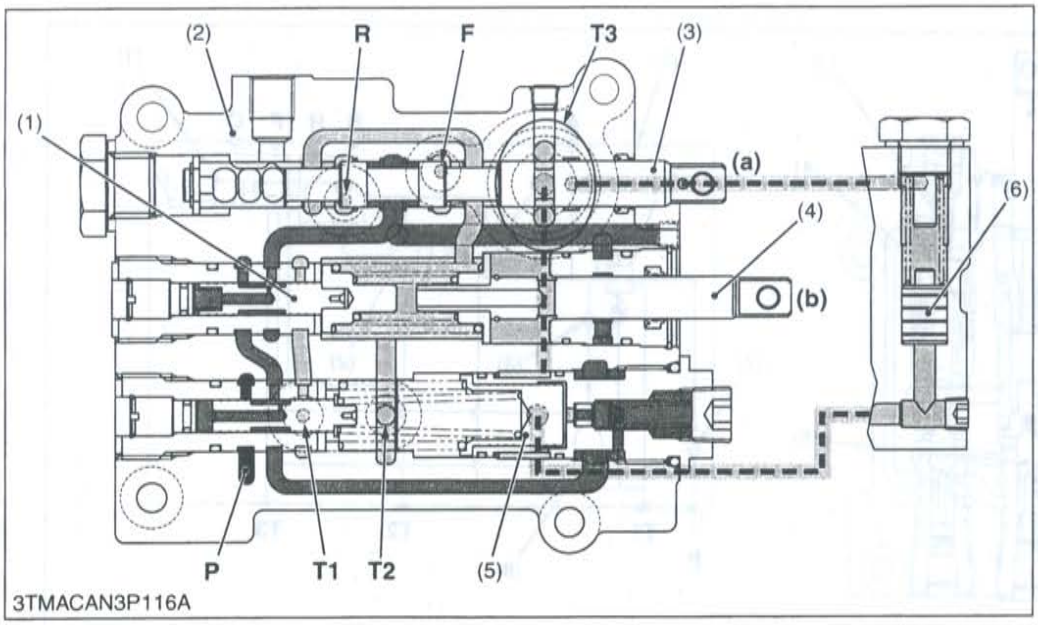
(a) Shuttle Forward Position
(b) Shuttle Neutral Position
(c) Shuttle Reverse Position
(d) Clutch Pedal Depressed Position
(e) Clutch Pedal Released Position

A : Pressure Check Port (Modulation)
B : Pressure Check Port (Reverse)
C : Pressure Check Port (Forward)
F : To Clutch Body (Forward)
P : P Port (Pump)
R : To Clutch Body (Reverse)
T1 to T3 : Tank Port

Hydraulic shuttle valve is composed of modulating valve (4), proportionally reducing valve (5), shuttle shift spool (1), accumulate valve (8) and other component parts.

(2) Operation

■ Shuttle Lever at Neutral Position

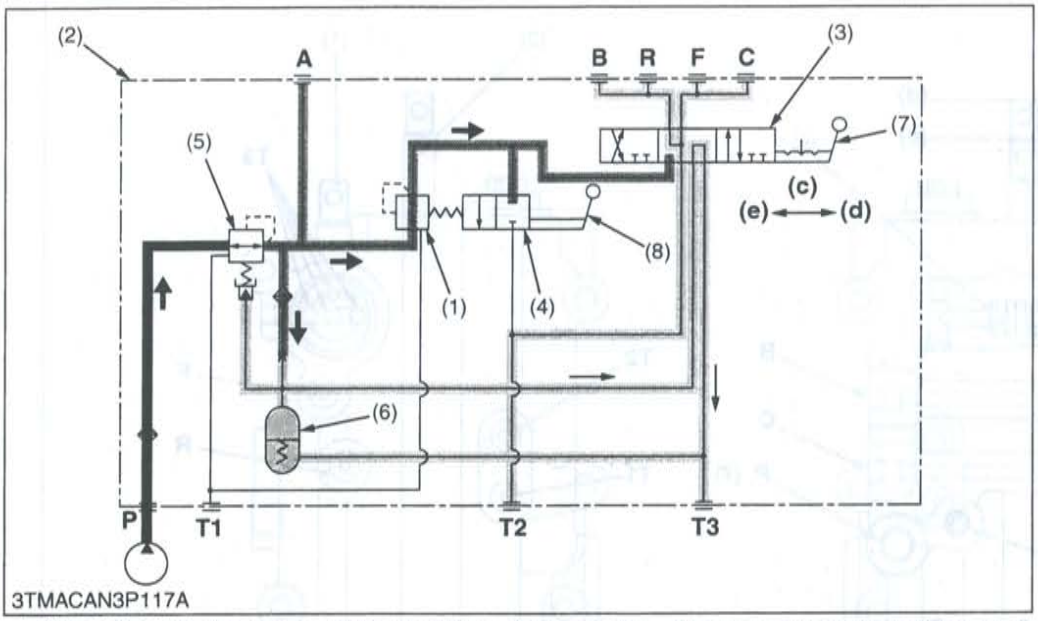


3TMACAN3P116A

(1) Proportionally Reducing Valve
(2) Shuttle Valve
(3) Shuttle Shift Spool (Forward, Reverse)
(4) Inching Valve
(5) Modulating Valve
(6) Accumulate Valve
(7) Shuttle Lever
(8) Clutch Pedal

A : Check Port (Modulation)
B : Check Port (Reverse)
C : Check Port (Forward)
P : P Port (Pump)
T1 to T3 :To Transmission Case
(a) Connect to Shuttle Lever
(b) Connect to Clutch Pedal
(c) Neutral
(d) Forward
(e) Reverse

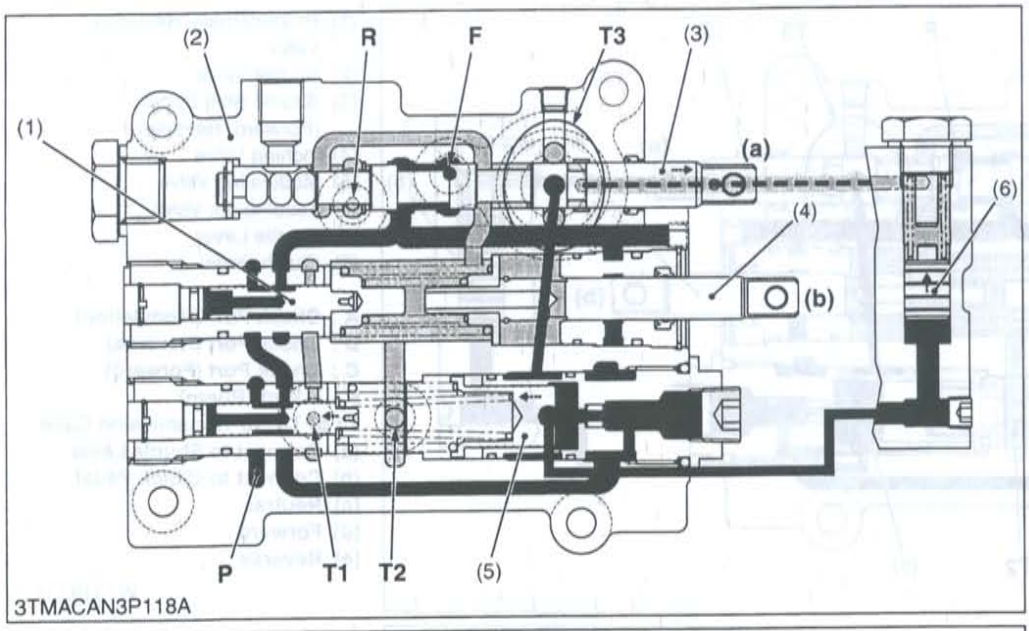
W1018749



3TMACAN3P117A

When the shuttle lever at **"Neutral"** position, as the oil passage between **P** port to **F** or **R** port is closed by shuttle shift spool (3), pressure-fed oil from **P** port flows to the **T3** port. Thus the shuttle clutch is not engaged.

■ When Shuttle Lever is Shifting Neutral to Reverse or Forward Position (Clutch Pedal is Released)

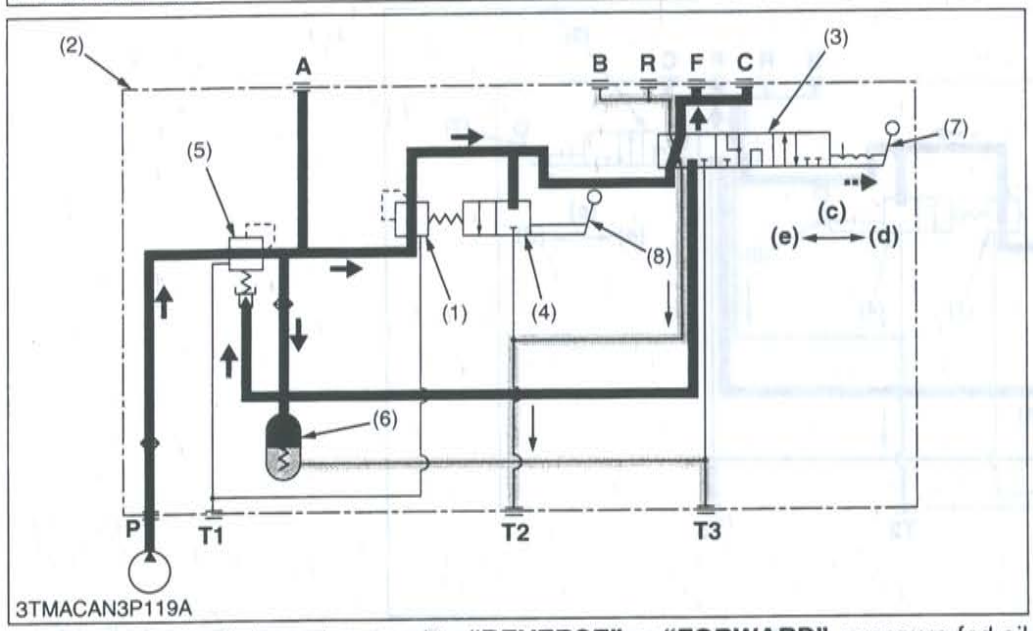


3TMACAN3P118A

(1) Proportionally Reducing Valve
(2) Shuttle Valve
(3) Shuttle Shift Spool (Forward, Reverse)
(4) Inching Valve
(5) Modulating Valve
(6) Accumulate Valve
(7) Shuttle Lever
(8) Clutch Pedal

A : Check Port (Modulation)
B : Check Port (Reverse)
C : Check Port (Forward)
P : P Port (Pump)
T1 to T3 :To Transmission Case
(a) Connect to Shuttle Lever
(b) Connect to Clutch Pedal
(c) Neutral
(d) Forward
(e) Reverse

W1018977

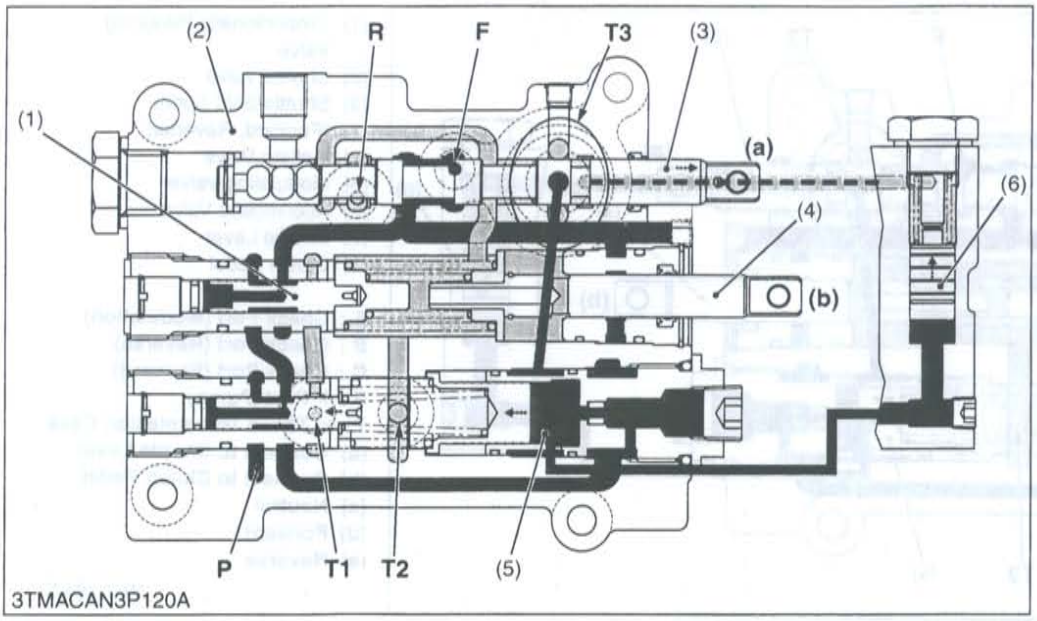


3TMACAN3P119A

When the shuttle lever is moved to **"REVERSE"** or **"FORWARD"**, pressure-fed oil from **P** port flows into shuttle clutch via **R** or **F** port. At this time, the pressure of **R** of **F** port is increased gradually by modulating valve (5).

When the shuttle clutch is engaging, the accumulate valve (6) assists the operation of modulating valve (5) to reduce a shock.

■ When Lever at Forward Position (Clutch Pedal is Released)

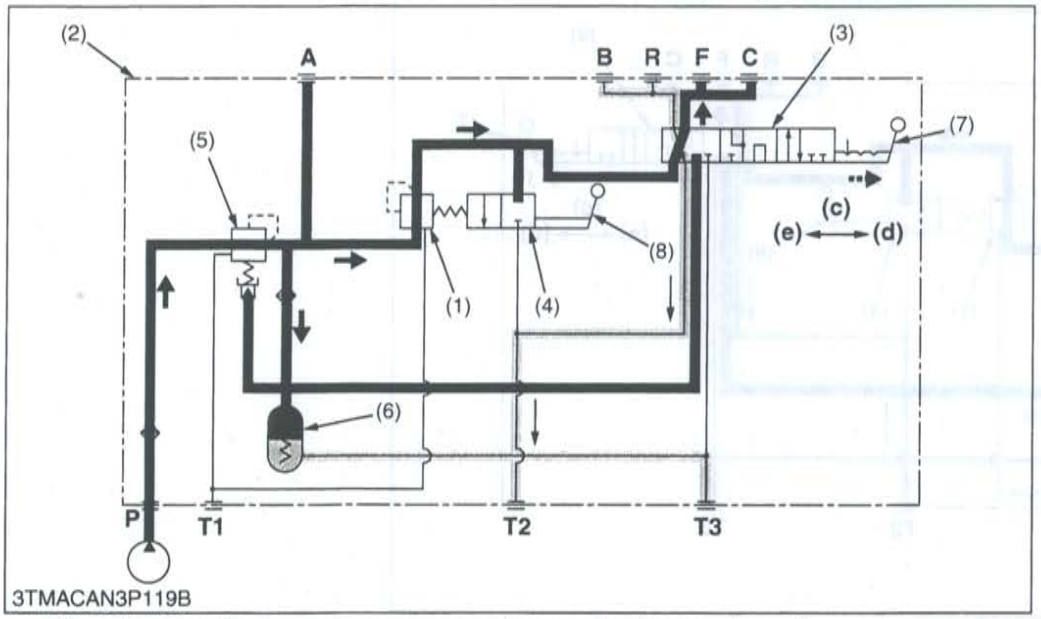


3TMACAN3P120A

(1) Proportionally Reducing Valve
(2) Shuttle Valve
(3) Shuttle Shift Spool (Forward, Reverse)
(4) Inching Valve
(5) Modulating Valve
(6) Accumulate Valve
(7) Shuttle Lever
(8) Clutch Pedal

A : Check Port (Modulation)
B : Check Port (Reverse)
C : Check Port (Forward)
P : P Port (Pump)
T1 to T3 :To Transmission Case
(a) Connect to Shuttle Lever
(b) Connect to Clutch Pedal
(c) Neutral
(d) Forward
(e) Reverse

W1019232

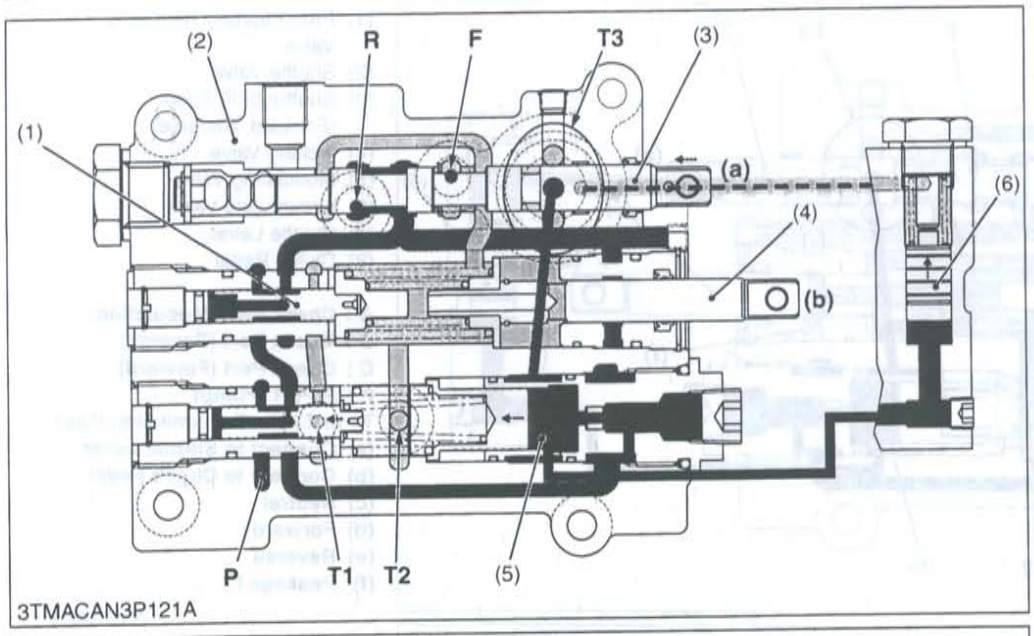


3TMACAN3P119B

When the shuttle lever has been setting on the **F** side, the oil pressure on **F** port is constantly controlled by proportionally reducing valve (1).

On the other hand, the oil in the **R** side of shuttle clutch returns to **T2** port through **R** port and shuttle shift spool (3).

■ When Lever at Reverse Position (Clutch Pedal is Released)

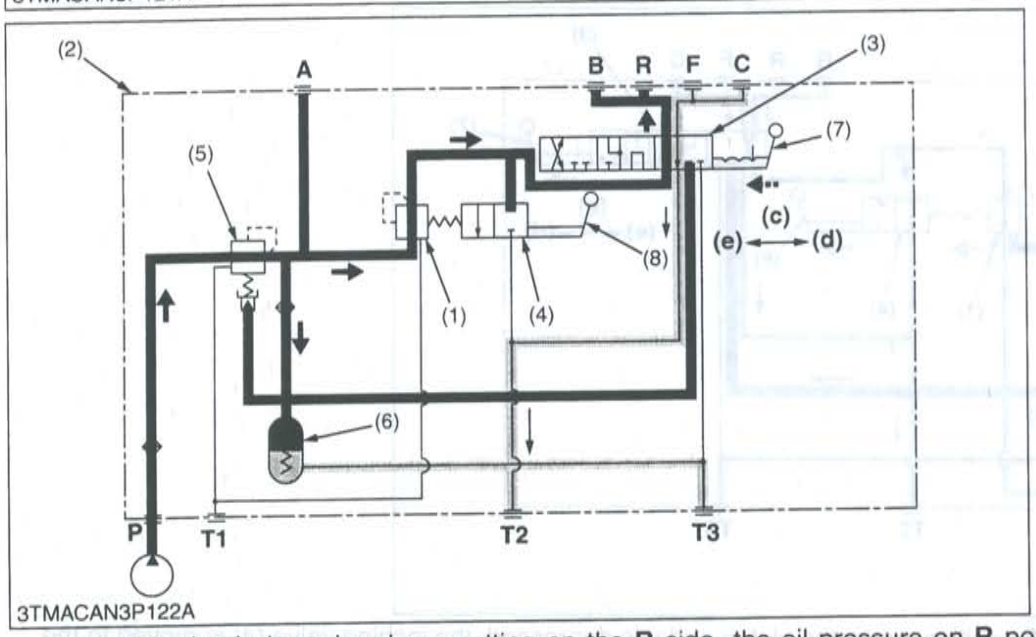


3TMACAN3P121A

(1) Proportionally Reducing Valve
(2) Shuttle Valve
(3) Shuttle Shift Spool (Forward, Reverse)
(4) Inching Valve
(5) Modulating Valve
(6) Accumulate Valve
(7) Shuttle Lever
(8) Clutch Pedal

A : Check Port (Modulation)
B : Check Port (Reverse)
C : Check Port (Forward)
P : P Port (Pump)
T1 to T3 :To Transmission Case
(a) Connect to Shuttle Lever
(b) Connect to Clutch Pedal
(c) Neutral
(d) Forward
(e) Reverse

W1019466



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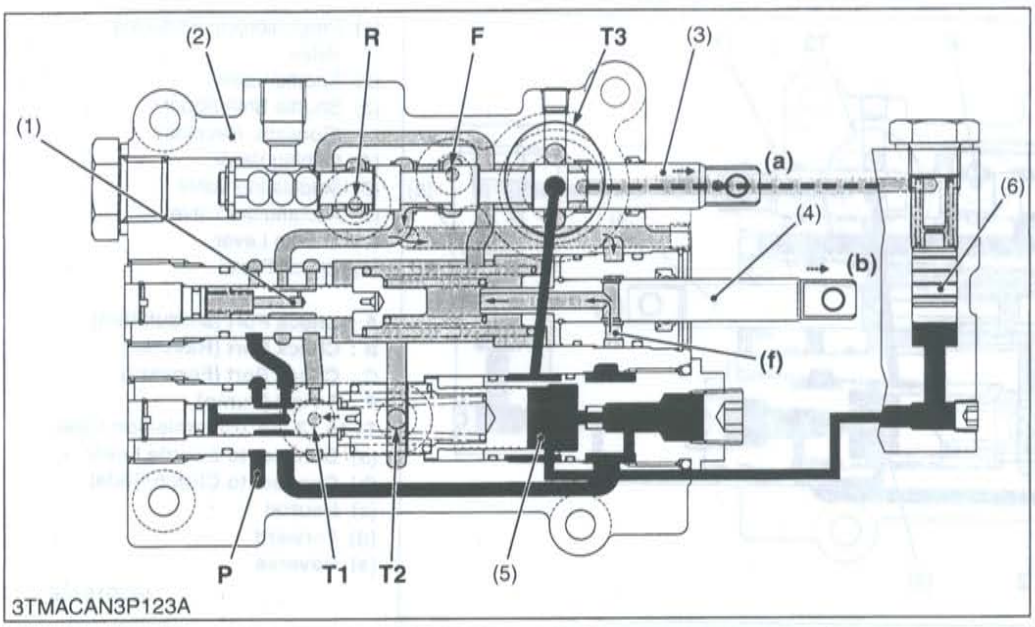
When the shuttle lever has been setting on the **R** side, the oil pressure on **R** port is constantly controlled by proportionally reducing valve (1).

On the other hand, the oil in the **F** side of shuttle clutch returns to **T2** through **F** port and shuttle shift spool (3).

■ When Clutch Pedal is Depressed (with Shuttle Lever at Reverse or Forward Position)



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(1) Proportionally Reducing Valve
(2) Shuttle Valve
(3) Shuttle Shift Spool (Forward, Reverse)
(4) Inching Valve
(5) Modulating Valve
(6) Accumulate Valve
(7) Shuttle Lever
(8) Clutch Pedal

A : Check Port (Modulation)
B : Check Port (Reverse)
C : Check Port (Forward)
P : P Port (Pump)
T1 to T3 :To Transmission Case
(a) Connect to Shuttle Lever
(b) Connect to Clutch Pedal
(c) Neutral
(d) Forward
(e) Reverse
(f) Passage f

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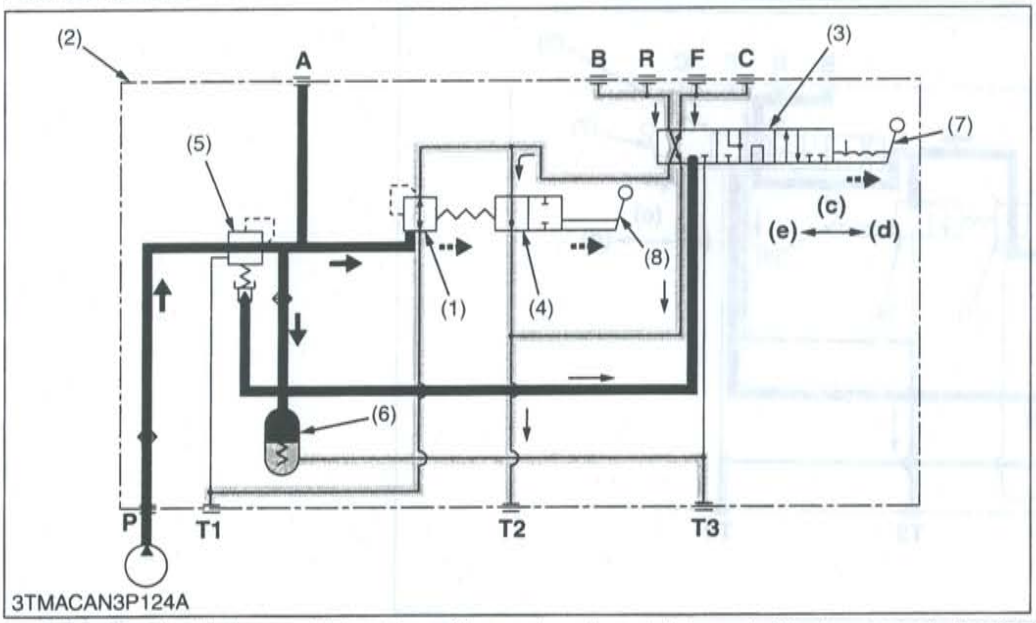

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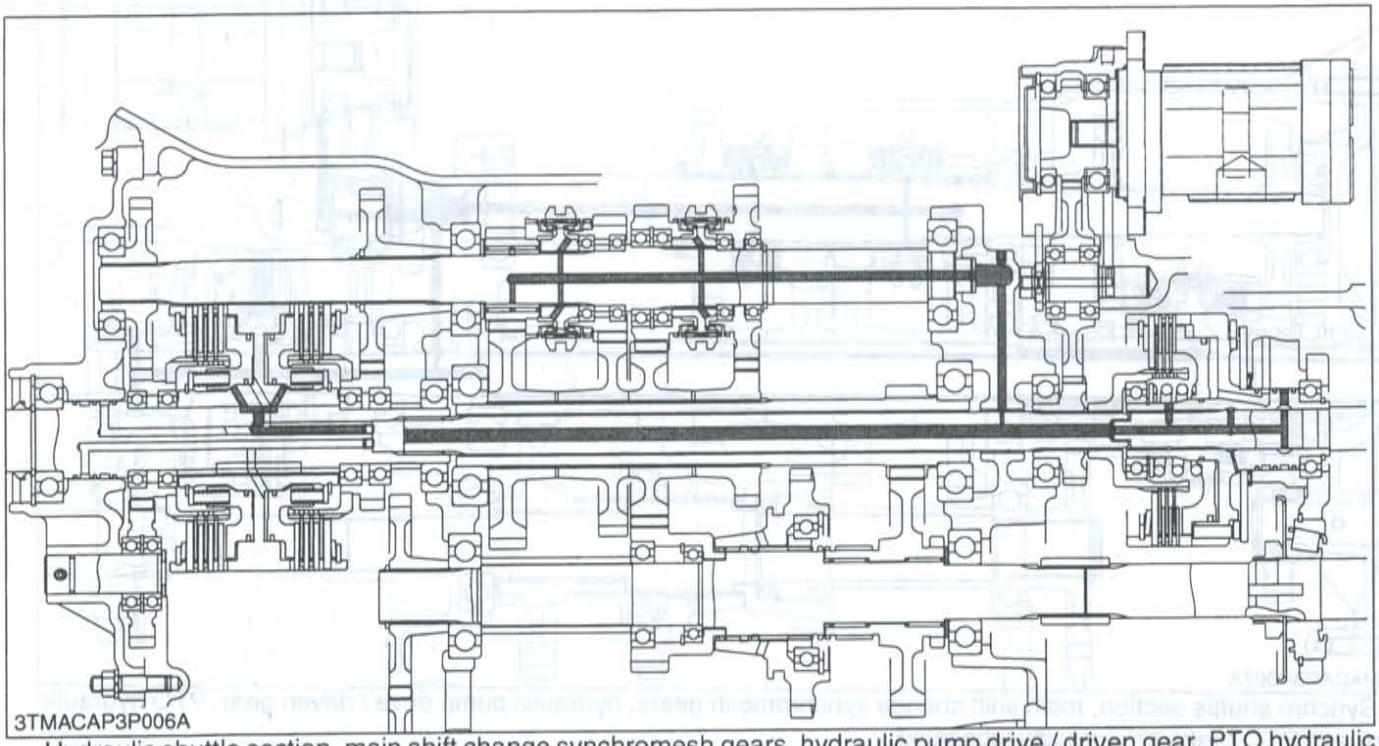
With the shuttle lever at **R** or **F** position, when the clutch pedal is depressed, the inching valve (4) is moved to the right. And connect the passage 1 **(f)** to **T2** port. As the proportionally reducing valve (1) is moved to the right by pressure difference, **R** port (or **F** port) and **T2** port are connected.

The oil in the shuttle clutch returns into the transmission case via **R** port (of **F** port) through the proportionally reducing valve (1) and **T2** port. This cause the shuttle clutch to be set to off.

As a result, even when the proportionally reducing valve (1) does not move, the oil passage from **R** port (or **F** side) to **T2** port is secured.

3. LUBRICATION FOR TRANSMISSION

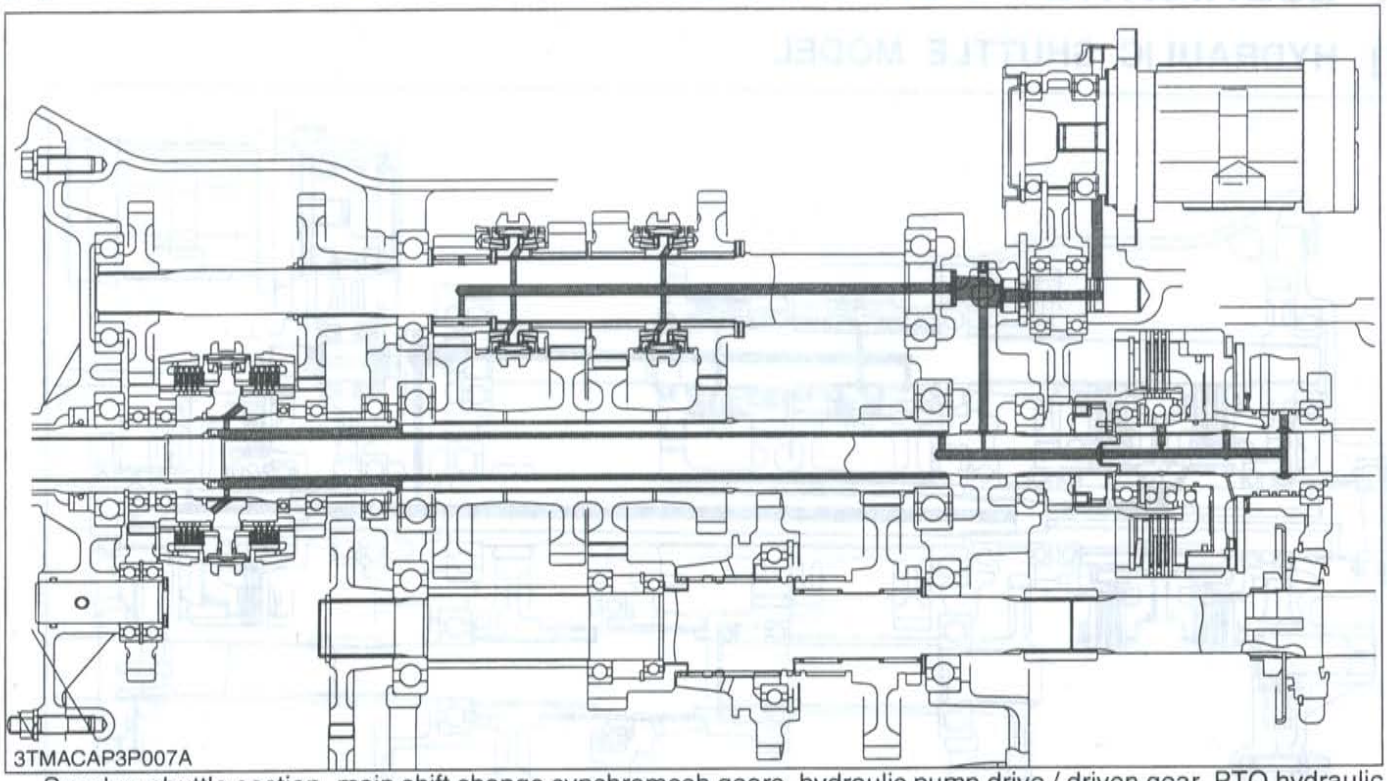
[1] HYDRAULIC SHUTTLE MODEL



Hydraulic shuttle section, main shift change synchromesh gears, hydraulic pump drive / driven gear, PTO hydraulic pack and PTO brake are forcedly lubricated.

The lubrication oil from the PTO valve to PTO clutch holder and lubricate the each section through PTO propeller shaft and 1st shaft.

[2] SYNCHRO SHUTTLE MODEL



Synchro shuttle section, main shift change synchromesh gears, hydraulic pump drive / driven gear, PTO hydraulic pack and PTO brake are forcedly lubricated.

The lubrication oil from the PTO valve to PTO clutch holder and lubricate the each section through PTO propeller shaft and 1st shaft.

The oil transferred between 2nd shaft and PTO propeller shaft to lubricate the synchro shuttle section.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive Transmission Noise	Transmission fluid insufficient	Replenish	G-10
	Improper backlash between bevel pinion shaft and bevel gear	Adjust	3-S50
	Improper backlash between differential pinion and side gear	Adjust	3-S53
	Collars or shims have not been installed	Repair	–
	Bearing worn	Replace	3-S44
Gears Slip Out of Mesh	Shifter or shift fork worn or damaged	Replace	3-S46
	Shift fork spring weaken or damaged	Replace	–
	Interlock ball fallen	Reassemble	–
	Synchronizer unit damaged	Repair or replace	3-S46
Hard Shifting	Shifter or shift fork worn or damaged	Replace	3-S46
	Shift fork rod bent	Replace	–
	Synchronizer unit damaged	Repair or replace	3-S46
Gears Clash When Shifting	Synchronizer unit damaged	Repair or replace	3-S46
	Clutch does not release	Adjust	2-S7
Differential Lock Can Not Be Set	Differential lock shift fork damage	Replace	3-S40
	Differential lock shift fork mounting spring pin damaged	Replace	3-S40
	Movement of differential lock shifter improperly adjusted	Adjust	3-S53
Differential Lock Pedal Does Not Return	Differential lock cam spring weaken or damaged	Replace	3-S40
	Differential shifter pin damaged	Repair or replace	3-S40

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Gear on 1st Shaft (3rd-4th) [Hydraulic Shuttle Model]	Side Clearance	Less than 0.2 mm 0.0078 in.	–
Gear on 1st Shaft (1st-2nd) [Hydraulic Shuttle Model]	Side Clearance	Less than 0.2 mm 0.0078 in.	–
Gear on 1st Shaft [Synchro Shuttle Model]	Side Clearance	Less than 0.2 mm 0.0078 in.	–
Internal Circlip to Belleville Washer (Cupped Spring Washer) of Shuttle Hydraulic Pack [Hydraulic Shuttle Model]	Clearance	1.8 to 2.0 mm 0.071 to 0.079 in.	3.6 mm 0.142 in.
Shift Fork to Shift Groove of Synchro Shuttle Gear [Synchro Shuttle Model]	Clearance	0.2 to 0.45 mm 0.0078 to 0.0177 in.	0.80 mm 0.031 in.
Holder 2 to Coupling of Synchro Shuttle Gear [Synchro Shuttle Model]	Clearance	1.8 to 2.0 mm 0.071 to 0.078 in.	–
Shift Fork to Shift Groove (for Main Change Section and Range Section)	Clearance	0.15 to 0.40 mm 0.0059 to 0.0157 in.	0.80 mm 0.031 in.
Spiral Bevel Pinion Shaft Only	Turning Torque	2.94 to 3.43 N·m 0.3 to 0.35 kgf·m 2.17 to 2.53 ft-lbs	–
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.2 to 0.3 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case Bore to Differential Side Gear Boss	Clearance	0.080 to 0.181 mm 0.004 to 0.00712 in.	0.35 mm 0.014 in.
Differential Case Bore	I.D.	40.53 to 40.592 mm 1.5960 to 1.5981 in.	–
Differential Side Gear Boss	O.D.	40.411 to 40.45 mm 1.5910 to 1.592 in.	–
39T Bevel Gear Bore to Differential Side Gear Boss	Clearance	0.09 to 0.169 mm 0.004 to 0.00665 in.	0.35 mm 0.014 in.
39T Bevel Gear Bore	I.D.	40.54 to 40.58 mm 1.596 to 1.597 in.	–
Differential Side Gear Boss	O.D.	40.411 to 40.45 mm 1.591 to 1.592 in.	–

W1013874

Item		Factory Specification	Allowable Limit
Differential Pinion Shaft to Differential Pinion	Clearance	0.08 to 0.122 mm 0.004 to 0.0048 in.	0.25 mm 0.010 in.
Differential Pinion Shaft	O.D.	20.06 to 20.081 mm 0.7898 to 0.79059 in.	–
Differential Pinion	I.D.	19.959 to 19.980 mm 0.78579 to 0.7866 in.	–
Differential Pinion to Differential SIde Gear	Backlash	0.15 to 0.30 mm 0.0059 to 0.0118 in.	0.4 mm 0.016 in.
Differential Lock Shifter	Clearance	6.0 to 8.0 mm 0.236 to 0.315 in.	–
Shuttle Valve System	Pressure	2.06 to 2.26 MPa 21 to 23 kgf/cm^2 298.7 to 327.1 psi	–

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 : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" Section.)

Item	N·m	kgf·m	ft-lbs
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Oil cooler pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Engine and clutch housing mounting screw and nut (M14, 7T)	124.0 to 147.0	12.6 to 15.0	91.2 to 108.0
Engine and clutch housing stud bolt	61.8 to 73.0	6.3 to 7.5	45.6 to 54.2
Starter's **B** terminal mounting nut	9.8 to 11.8	1.0 to 1.2	7.2 to 8.7
Power steering pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
ROPS under mounting frame screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting nut	260 to 304	26.5 to 31.0	181.8 to 224.2
PTO delivery pipe joint screw	29.4 to 34.3	3.0 to 3.5	21.7 to 26.3
3-point hitch delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Transmission case and clutch housing mounting screw and nut (M10, 9T)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Transmission case and clutch housing mounting screw and nut (M14, 9T)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.6
Shuttle valve pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Shuttle valve mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.2
Shuttle case mounting screw and nut	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Synchro shuttle gear case mounting screw and nut	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Shift change cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
PTO clutch holder mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Cylinder hose retaining nut	34.3 to 48.1	3.5 to 4.9	25.3 to 35.4
3-point hitch hydraulic block mounting screw and nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.6
Rear axle case mounting screw and nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.6
PTO gear case mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Differential bearing support mounting screw	48.1 to 55.8	4.9 to 5.7	35.4 to 41.2
Spiral bevel pinion shaft staking nut	117.7	12.0	86.8
Spiral bevel gear mounting UBS screw	142.2 to 161.8	14.5 to 16.5	104.9 to 119.3
PTO shaft staking nut	225.5 to 264.8	23.0 to 27.0	166.4 to 195.2

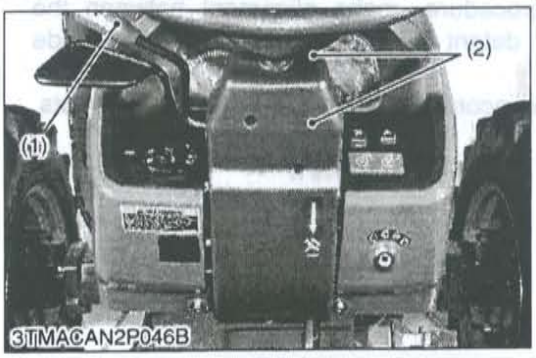
W1012736

4. CHECKING AND ADJUSTING

[1] SHUTTLE LEVER

⚠ CAUTION

- **Park the machine on a firm, flat and level surface, set the parking brake and place the gear shift in neutral.**
- **Stop the engine and remove the key before checking and adjusting.**



Steering Post Cover

1. Remove the steering post cover (2).

(1) Shuttle Lever (2) Steering Post Cover

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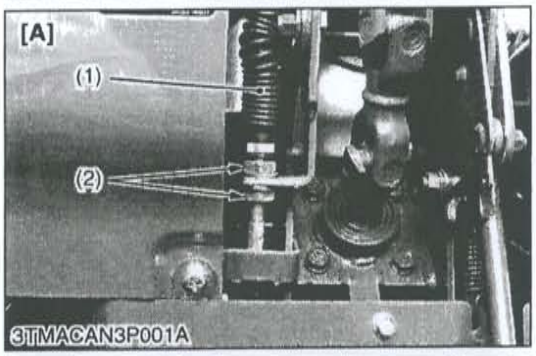

Shuttle Cable 1

1. The movement of shuttle lever is adjusted with the shuttle cable retaining nuts of the shuttle cable.

(1) Shuttle Cable
(2) Retaining Nut

[A] ROPS Model
[B] CABIN Model

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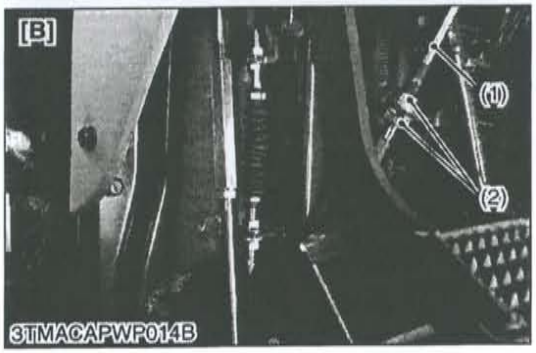

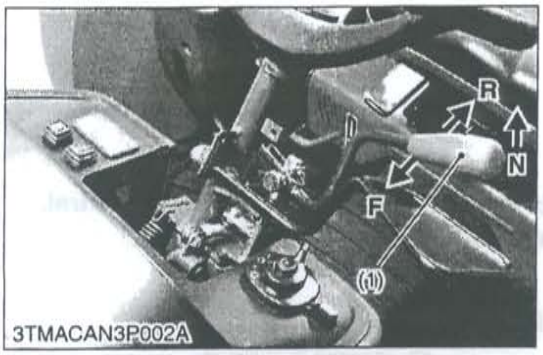

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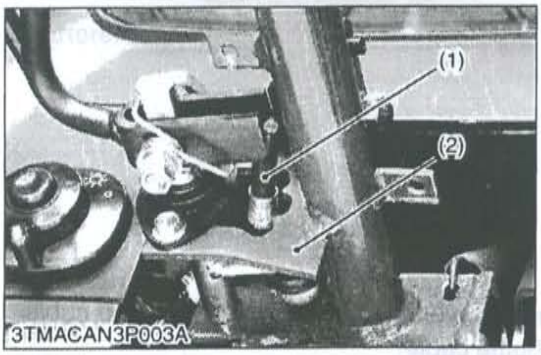

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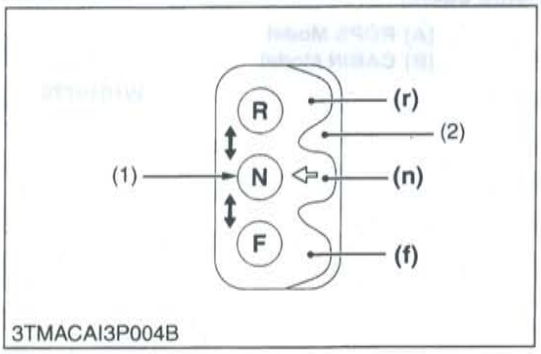

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Checking Shuttle Valve and Shuttle Shift Neutral Position and Lever Guide Neutral Position

1. The shuttle valve spool or synchro shuttle shift rod is provided with **F**, **N** and **R** ball detents. (Lift the shuttle lever (1) and slowly move it to the **F** and **R** directions until you feel the lever clicking at the ball detents.)
2. The steering column also has the **f**, **n** and **r** grooves for the shuttle lever.
3. In this adjustment procedure, make alignment between the shuttle valve neutral detent position and shuttle lever guide groove **N**.
4. If the neutral position is incorrect, adjust with cable retaining nuts.

(1) Shuttle Lever
(2) Shuttle Lever Guide

F : Forward
R : Reverse
N : Neutral

(f) Groove F
(n) Groove N
(r) Groove R

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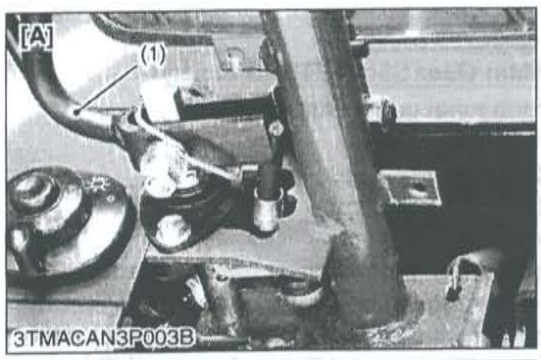

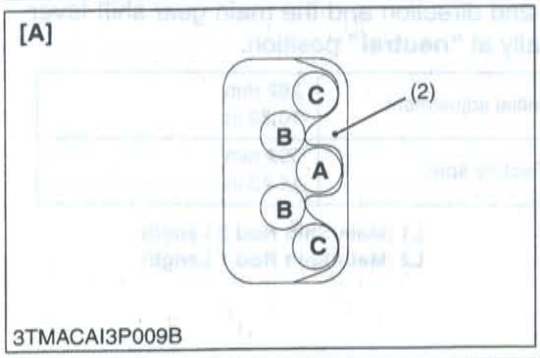

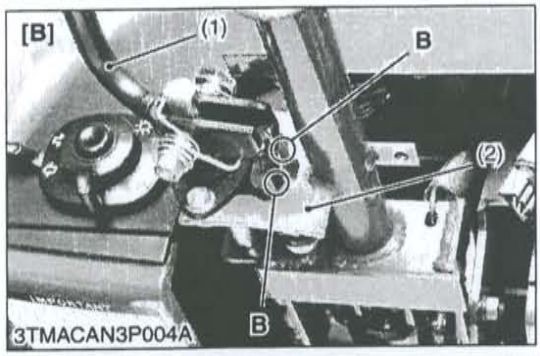

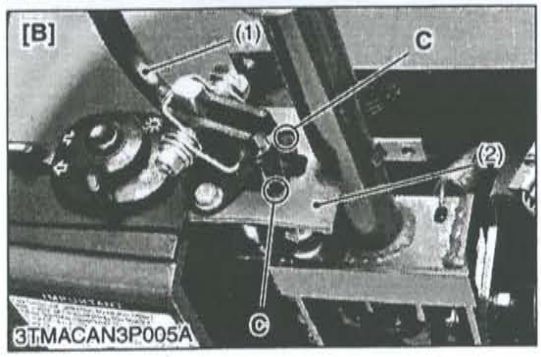

Engine Start Condition

■ **IMPORTANT**

- **Before starting the engine, make sure the gear shift lever at the neutral position.**
- **Place the PTO lever to the OFF position.**
- **Apply the parking brake.**

1. Check the engine start condition as follows :

■ **NOTE**

- **Do not touch the shuttle lever (1) when the shuttle lever (1) is at specified position as shown in figure.**

(Reference)

- Position **A** : Engine start
- Position **B** : Engine does not start
- Position **C** : Engine does not start

2. If the engine started at position **B** and/or **C**, adjust the shuttle cable with retaining nut (refer with this section).

(1) Shuttle Lever
(2) Shuttle Lever Guide

[A] Hydraulic Shuttle Model
[B] Synchro Shuttle Model

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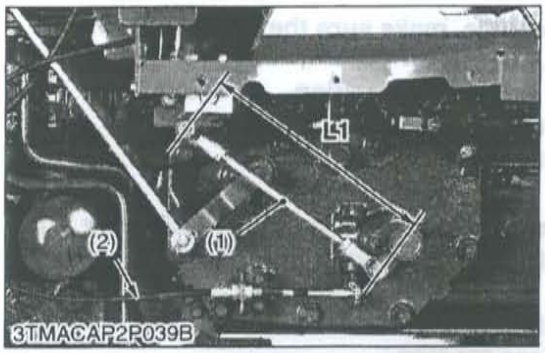
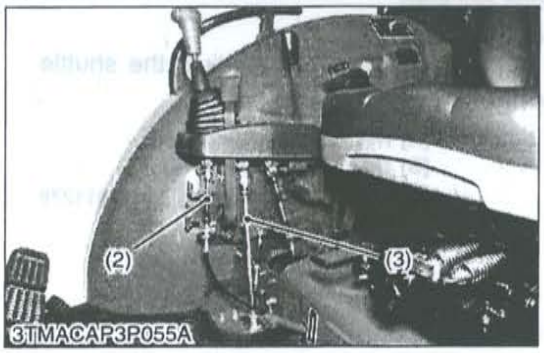
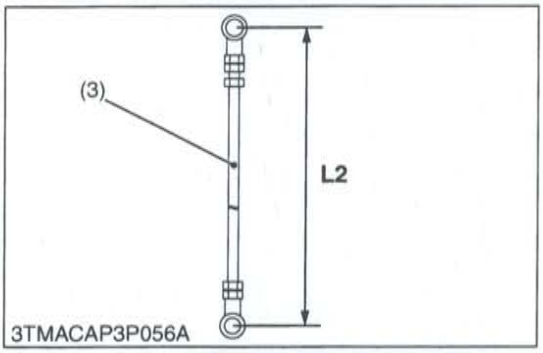
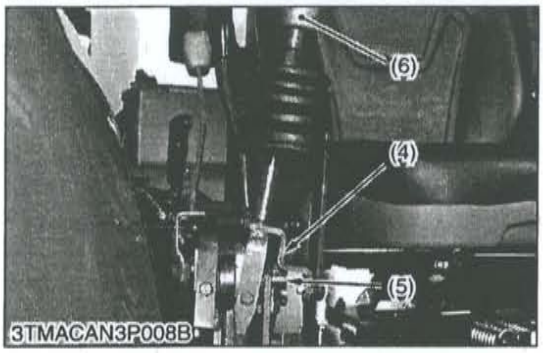
[2] MAIN GEAR SHIFTING









Checking Function of Main Gear Shift (ROPS Model)

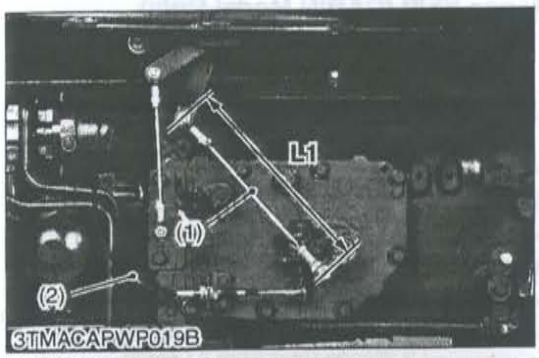
1. Check the function of the main gear shift.
   - Neutral position to 1st gear position.
   - Neutral position to 2nd gear position.
   - Neutral position to 3rd gear position.
   - Neutral position to 4th gear position.
2. If shifting is not smooth, check the length of main shift rod 1 (1) and main shift rod 2 (3). Adjust the select cable (2) so that the lever end (4) has contact with stopper (5) when main gear shift lever operates to 1st-2nd direction and the main gear shift lever is positioned in vertically at **"neutral"** position.

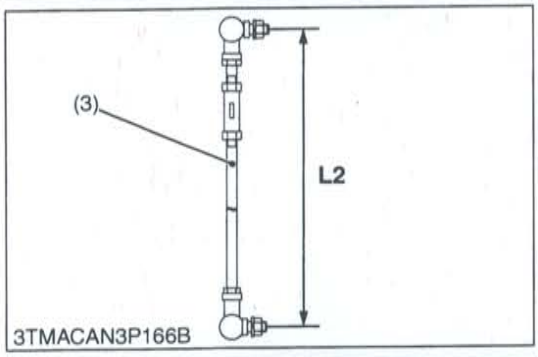
Length of main shift rod 1 (**L1**)	Initial adjustment	262 mm 10.32 in.
Length of main shift rod 2 (**L2**)	Factory spec.	359 mm 14.13 in.

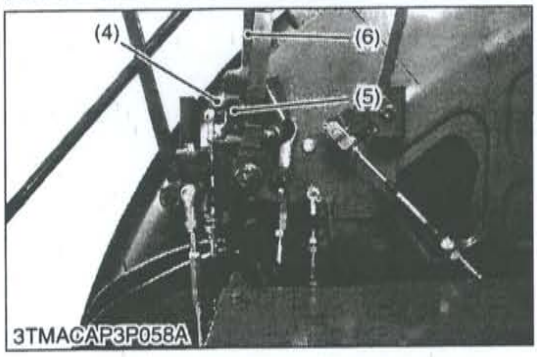
(1) Main Shift Rod 1
(2) Select Cable
(3) Main Shift Rod 2
(4) Lever End
(5) Stopper
(6) Main Gear Shift Lever

L1 :Main Shift Rod 2 Length
L2 :Main Shift Rod 1 Length

W1011767







Checking Function of Main Gear Shift (CABIN Model)

1. Check the function of the main gear shift.
   - Neutral position to 1st gear position.
   - Neutral position to 2nd gear position.
   - Neutral position to 3rd gear position.
   - Neutral position to 4th gear position.
2. If shifting is not smooth, check the length of main shift rod 2 (1) and main shift rod 1 (3). Adjust the select cable (2) so that the lever end (4) has contact with stopper (5) when main gear shift lever operates to 1st-2nd direction and the main gear shift lever is positioned in vertically at **"neutral"** position.

Length of main shift rod 2 (**L1**)	Initial adjustment	287 mm 10.95 in.
Length of main shift rod 1 (**L2**)	Factory spec.	447 mm 17.6 in.

(1) Main Shift Rod 2
(2) Select Cable
(3) Main Shift Rod 1
(4) Lever End
(5) Stopper
(6) Main Gear Shift Lever

L1 :Main Shift Rod 2 Length
L2 :Main Shift Rod 1 Length

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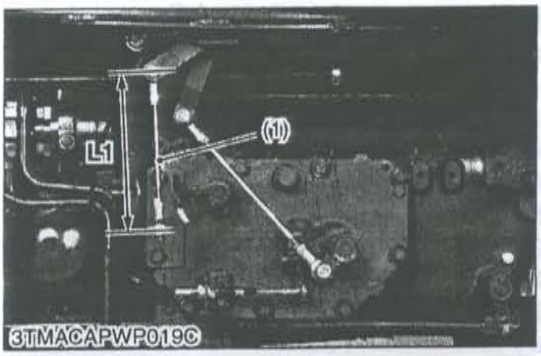

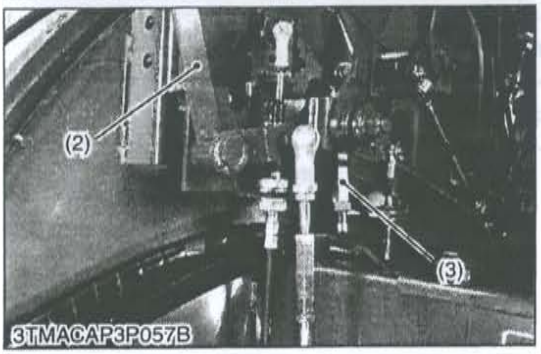

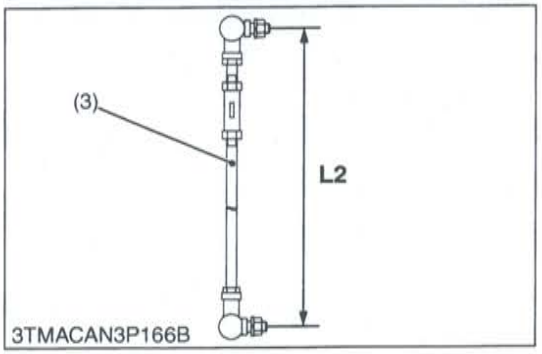

Checking Function of Range Shift (CABIN Model Only)

1. Check the function of the range gear shift.
   - **Hi** and **Lo** position.
2. If shift feels abnormal, check the length of range gear shift rod 1 (3) and 2 (1).

Length of range gear shift rod 2 (**L1**)	Factory spec.	193 mm 7.6 in.
Length of range gear shift rod 1 (**L2**)	Initial adjustment	368 mm 14.49 in.

(1) Range Gear Shift Rod 2
(2) Range Gear Shift Lever
(3) Range Gear Shift Rod 1

L1 :Range Gear Shift 1 Length
L2 :Range Gear Shift 2 Length

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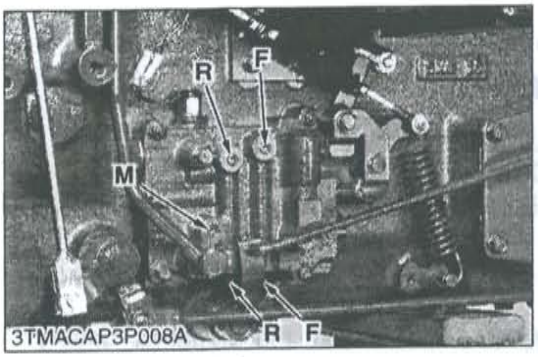
[3] SHUTTLE VALVE



Checking of Shuttle Valve System Pressure

1. Prepare a can for fuel, place in the fuel and fuel return hose into a can.
2. Remove the plugs of **F**, **R**, **M** and install the adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section), threaded joint, cable, and pressure gauge (Code No. : 07916-52961).
3. Start the engine and measure the pressure of each port and each shuttle lever position as the pressure table.

Condition

- Engine speed : Approx. 2600 min^{-1} (rpm)
- Oil temperature : 45 to 55 °C (113 to 131 °F)

Shuttle Lever	Clutch Pedal	F port pressure	R port pressure	M port pressure
Forward	Fully pressed	0	0	2.16 to 2.26 MPa 22 to 23 kgf/cm^2 312.9 to 327.1 psi
	Free	2.06 to 2.26 MPa 21 to 23 kgf/cm^2 298.7 to 327.1 psi	0	
Reverse	Fully pressed	0	0	
	Free	0	2.06 to 2.26 MPa 21 to 23 kgf/cm^2 298.7 to 327.1 psi	
Neutral	–	0	0	0.26 to 0.28 MPa 2.7 to 2.9 kgf/cm^2 38 to 41 psi

■ **NOTE**

- **Pressure gauge is 5 MPa (50 kgf/cm^2, 700 psi) full scale.**
- **Apply Three Bond 1324N or equivalent to the plugs F, R and M, when install them.**
- **Plug (F, R, M) thread size is R1/8.**

Plug F :Operation Oil Pressure (For Forward)
Plug R :Operation Oil Pressure (For Reverse)
Plug M :Operation Oil Pressure (For Modulation Valve)

W1012050

5. DISASSEMBLING AND ASSEMBLING

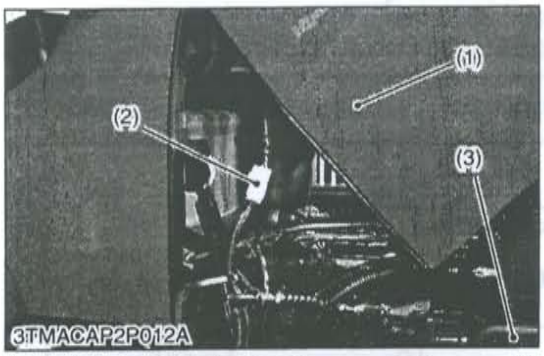
[1] PREPARATION

(1) Separating Engine and Clutch Housing Case (ROPS Model)

Draining Transmission Fluid and Fuel

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1012355



Bonnet

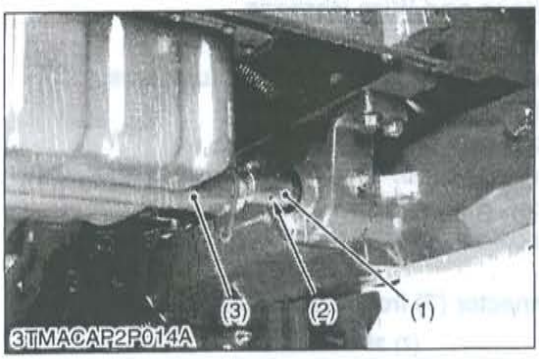
1. Open the bonnet (1) and disconnect the negative battery terminal.
2. Disconnect the connectors (2) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1) and side cover (3) (R.H) (L.H.).

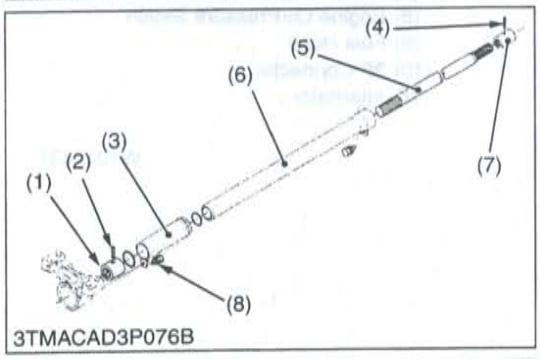
■ **IMPORTANT**

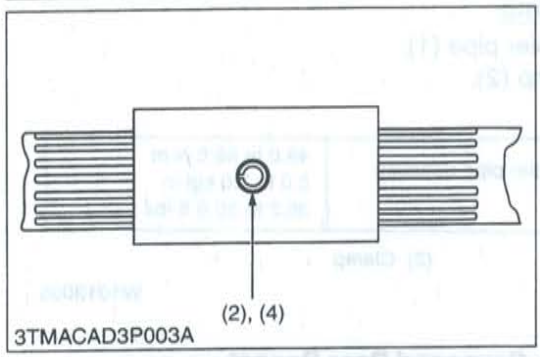
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

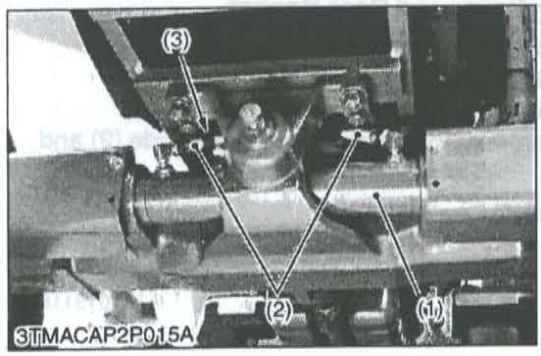
(1) Bonnet
(2) Connector
(3) Side Cover
(4) Damper

W1012419









Propeller Shaft (4WD Model)

1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1012547

Power Steering Hose

1. Disconnect both power steering hoses (2) from power steering cylinder (1).

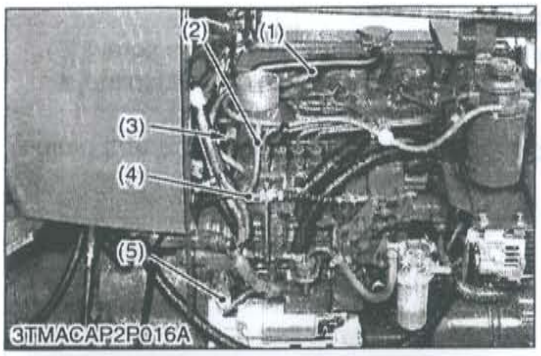
(When reassembling)

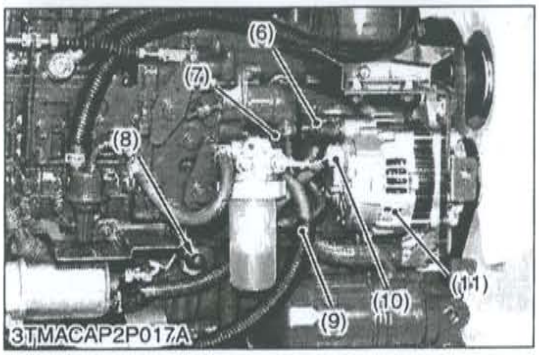
- Connect the power steering hose with blue tape (3) to the R.H..

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Power Steering Cylinder
(2) Power Steering Hose
(3) Blue Tape

W1012708



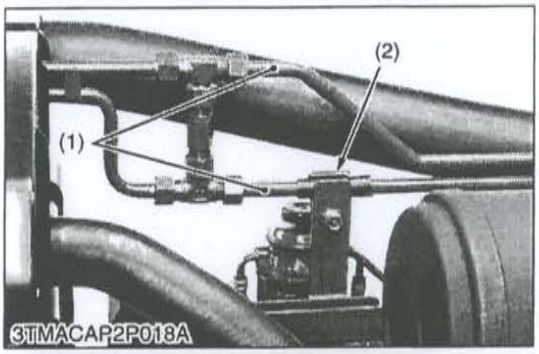


Accelerator Wire, Fuel Hose and Wire Harness

1. Disconnect the accelerator wire (4) and fuel hose (2).
2. Disconnect the wire harness from water temperature sensor (3), engine speed sensor (5) and glow plug (1).
3. Disconnect the fuel hose (9) from fuel filter.
4. Disconnect the **2P** connector (10) from alternator (11) and wire harness from alternator **B** terminal (6).
5. Disconnect the wire harness from the engine oil pressure switch (8).
6. Disconnect the **3P** connector (7) from engine stop solenoid.

(1) Glow Plug
(2) Fuel Hose
(3) Water Temperature Sensor
(4) Accelerator Wire
(5) Engine Speed Sensor
(6) Alternator **B** Terminal
(7) **3P** Connector
(8) Engine Oil Pressure Switch
(9) Fuel Hose
(10) **2P** Connector
(11) Alternator

W1012831



Oil Cooler Pipe and Clamp

1. Disconnect the oil cooler pipe (1).
2. Remove the pipe clamp (2).

(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Oil Cooler Pipe
(2) Clamp

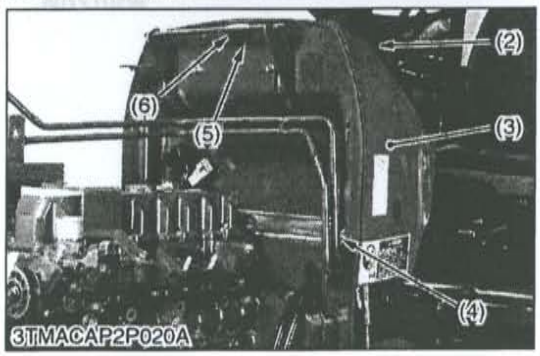
W1013005

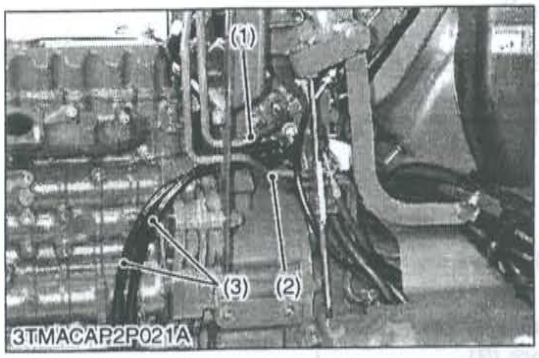
Steering Support Under Cover and Rear Bonnet

1. Remove the steering support under cover (1).
2. Loosen the rear bonnet mounting screws (4).
3. Remove the seal (6) and panel guide mounting screw (5).
4. Disconnect the wire harness and remove the panel guide (2) and rear bonnet (3).

(1) Steering Support Under Cover
(2) Panel Guide
(3) Rear Bonnet
(4) Screw
(5) Screw
(6) Seal

W1013118





Oil Cooler Pipe

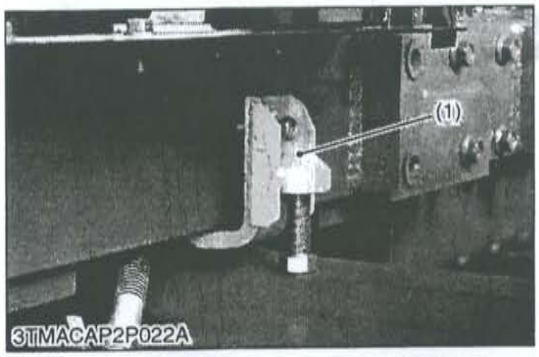
1. Remove the oil cooler pipes (1) and (2).
2. Disconnect the power steering hoses (3).

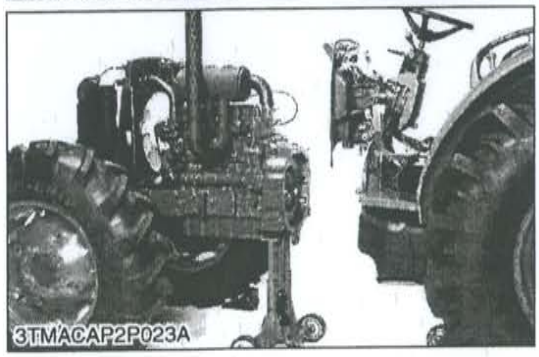
(When reassembling)

Tightening torque	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Oil Cooler Pipe
(2) Oil Cooler Pipe
(3) Power Steering Hose

W1013245





Separating Engine from Clutch Housing

1. Make sure the engine and clutch housing case are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the front axle bracket.
3. Remove the engine mounting screws and nut, and separate the engine from the clutch housing.

(When reassembling)

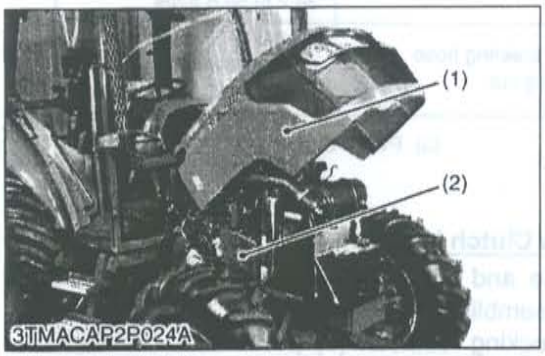
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs
	Engine and clutch housing mounting stud bolt	61.8 to 73.6 N·m 6.3 to 7.5 kgf·m 45.6 to 54.2 ft-lbs

(1) Front Axle Rocking Restrictor

W1013389

(2) Separating Engine from Clutch Housing (CABIN Model)



Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1013567

Bonnet

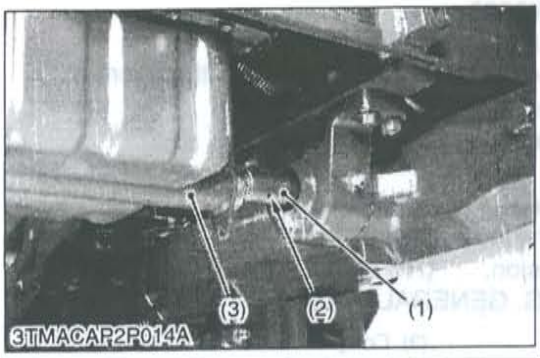
1. Open the bonnet (1) and disconnect the negative battery terminal.
2. Disconnect the connectors (4) for head lights.
3. Disconnect the dampers (3).
4. Remove the bonnet (1) and side cover (2) (R.H) (L.H.).

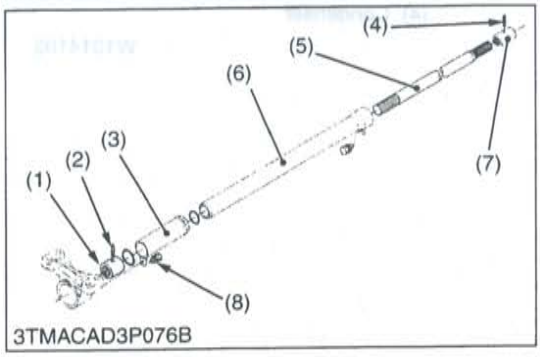
■ **IMPORTANT**

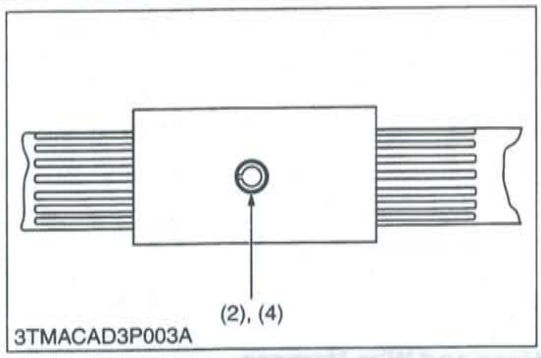
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

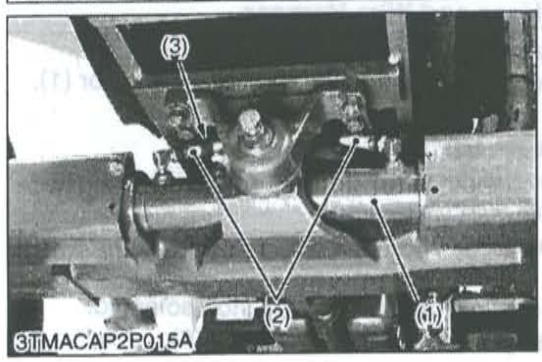
(1) Bonnet
(2) Side Cover
(3) Damper
(4) Connector

W1013679









Propeller Shaft (4WD Model)

1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

(When reassembling)

- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1013821

Power Steering Hose

1. Disconnect both power steering hoses (2) from power steering cylinder (1).

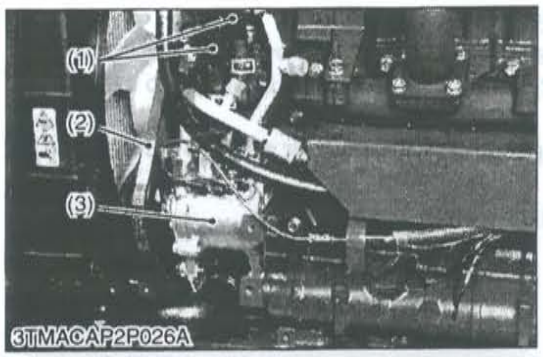
(When reassembling)

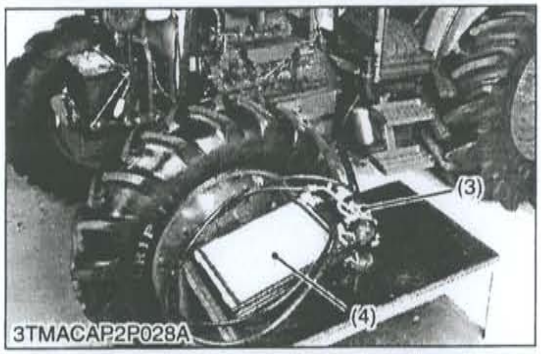
- Connect the power steering hose with blue tape (3) to the R.H..

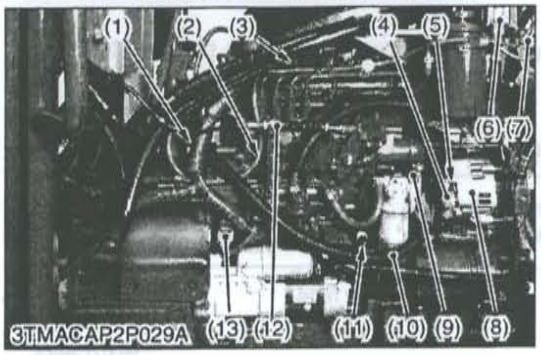
Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs

(1) Power Steering Cylinder
(2) Power Steering Hose
(3) Blue Tape

W1013982







Condenser and Compressor

1. Remove the air conditioner belt (2).
2. Remove the compressor (3) and condenser (4) without removing the air conditioner hoses.
3. Disconnect the heater hoses (1).

(When reassembling)

- Take care not to damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the air condenser belt tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)

(1) Heater Hose
(2) Belt
(3) Compressor
(4) Condenser

W1014105

Accelerator Wire, Fuel Hose and Wire Harness

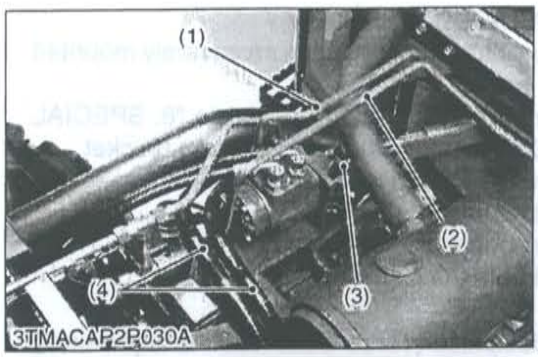
1. Disconnect the accelerator wire (12) and fuel hose (2).
2. Disconnect the wire harness from water temperature sensor (1), engine speed sensor (13) and glow plug (3).
3. Disconnect the fuel hose (10) from fuel filter.
4. Disconnect the **2P** connector (5) from alternator (8) and wire harness from alternator **B** terminal (4).
5. Disconnect the wire harness from the engine oil pressure switch (11).
6. Disconnect the **3P** connector (9) from engine stop solenoid.
7. Remove the heater relays (7) and slow blow fuse (6).

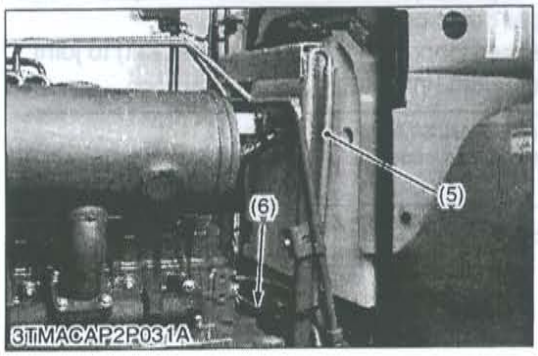
(When reassembling)

Tightening torque	Starter's **B** terminal mounting nut	9.8 to 11.8 N·m 1.0 to 1.2 kgf·m 7.2 to 8.7 ft-lbs

(1) Water Temperature Sensor
(2) Fuel Hose
(3) Glow Plug
(4) Alternator **B** Terminal
(5) **2P** Connector
(6) Slow Blow Fuse
(7) Heater Relay
(8) Alternator
(9) **3P** Connector
(10) Fuel Hose
(11) Engine Oil Pressure Switch
(12) Accelerator Wire
(13) Engine Speed Sensor

W1014257





Power Steering Pipe and Oil Cooler Pipe

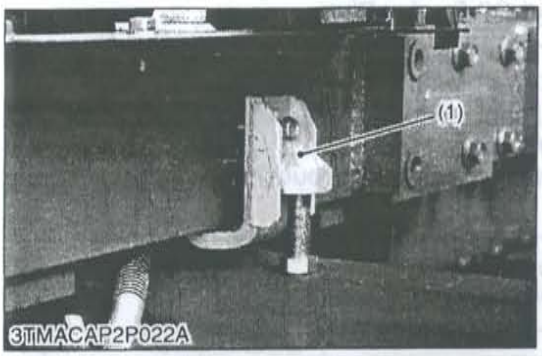
1. Disconnect the power steering pipe (1).
2. Disconnect the oil cooler pipe (2).
3. Remove the steering joint shaft (3).
4. Disconnect the heater hoses (4).
5. Disconnect the breather hose (5) and grounding wire (6).

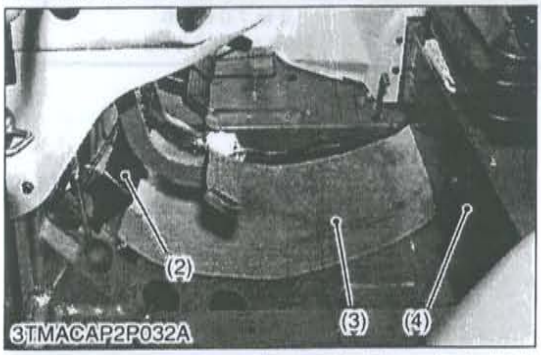
(When reassembling)

Tightening torque	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Oil Cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Power Steering Pipe
(2) Oil Cooler Pipe
(3) Steering Joint Shaft
(4) Heater Hose
(5) Breather Hose
(6) Grounding Wire

W1014474





Separating Engine from Clutch Housing

1. Check the engine and clutch housing case are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the front axle bracket.
3. Remove the floor cover and duct retainer (2).
4. Remove the seat under cover (4) and duct (3).
5. Remove the engine mounting screws and nuts.
6. Separate the engine from the clutch housing.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs

(1) Front Axle Rocking Restrictor
(2) Duct Retainer
(3) Duct
(4) Seat Under Cover

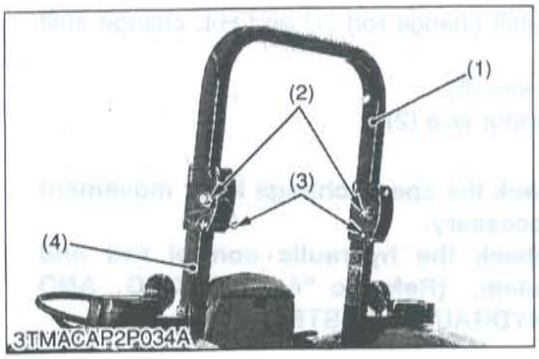
W1014655

(3) Separating Clutch Housing from Transmission Case

Removing Cabin from Body (CABIN Model)

1. Refer to "10. CABIN" section.

W1014893



Removing ROPS Upper

1. Loosen the ROPS under frame (4) mounting screws. (Do not remove screws.)
2. Remove the ROPS upper frame (1).

(When reassembling)

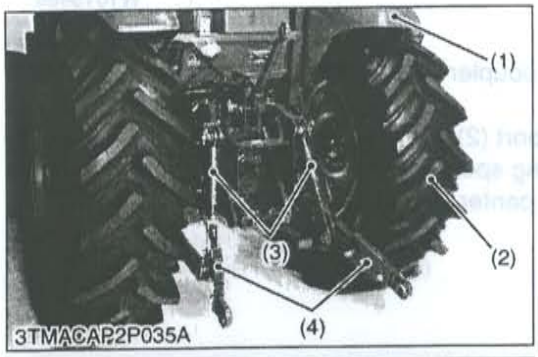
- To assemble the ROPS, fix the upper frame with screw (2) and pin (3) temporarily, then tighten the under frame screws evenly with specified torque.
- Attach the upper frame with screws (2) so not to fall down.

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

ROPS upper frame lift up force at center of upper frame	Reference value	245.2 to 284.2 N 25.0 to 29.0 kgf 55.1 to 63.9 lbs

(1) ROPS Upper Frame
(2) Screw
(3) Pin
(4) ROPS Under Frame

W1014991

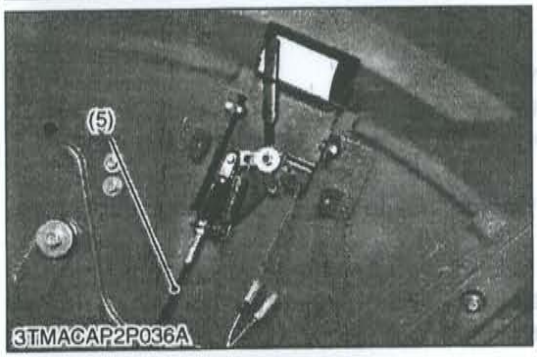


Lift Rod, Lower Link and Fender (R.H., L.H.)

1. Place the disassembling stand under the transmission case.
2. Remove the lift rod (3) and lower link (4).
3. Remove the rear wheel (2) (R.H., L.H.).
4. Disconnect the wire harness from turn signal light and PTO switch.
5. Disconnect the PTO clutch cable (5).
6. Remove the rear fender (1) (R.H., L.H.).

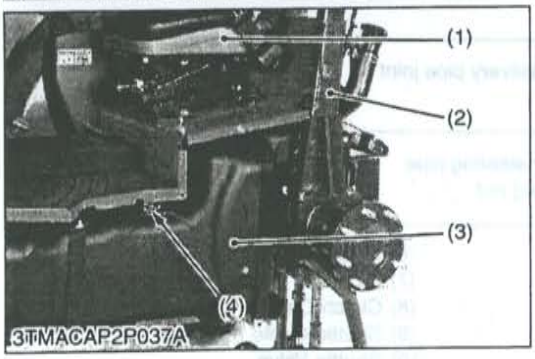
(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs



(1) Fender
(2) Rear Wheel
(3) Lift Rod
(4) Lower Link
(5) PTO Clutch Cable

W1015170



ROPS Under, Fuel Tank and Seat

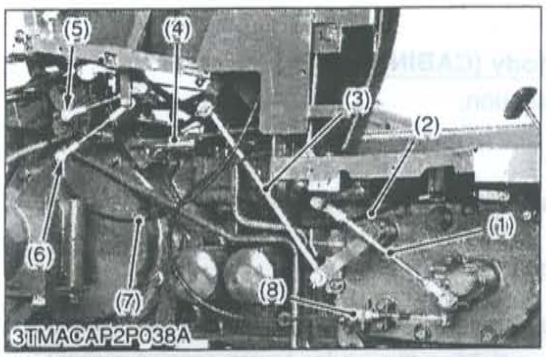
1. Disconnect the wire harness from seat and remove the seat (1).
2. Disconnect the wire harness from fuel level sensor (4).
3. Remove the fuel tank (3).
4. Remove the ROPS under frame (R.H., L.H.).

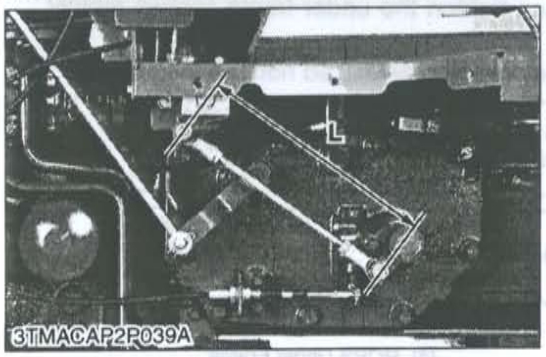
(When reassembling)

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) Seat
(2) ROPS Under Frame
(3) Fuel Tank
(4) Fuel Level Sensor

W1015345





Hydraulic Control Rod, Shift Change Rod and Wire

1. Disconnect the position control rod (6) and draft control rod (5).
2. Remove the differential lock rod (4).
3. Disconnect the auxiliary hydraulic control wire (7) from auxiliary hydraulic control valve.
4. Disconnect the main shift change rod (1) and H-L change shift rod (3).
5. Disconnect the select wire (8).
6. Disconnect the accelerator wire (2).

■ **NOTE**

- **After assembling check the speed change lever movement and adjust them if necessary.**
- **After assembling check the hydraulic control rod and auxiliary control system. (Refer to "4. CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.)**

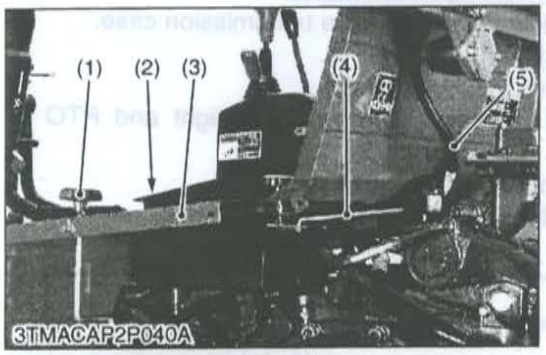
(When reassembling)

Main shift rod length (L)	Reference value	Approx. 262 mm 10.32 in.

(1) Main Shift Change Rod
(2) Accelerator Wire
(3) H-L Change Shift Rod
(4) Differential Lock Rod
(5) Draft Control Rod
(6) Position Control Rod
(7) Auxiliary Hydraulic Control Wire
(8) Select Wire

L : Length

W1015486

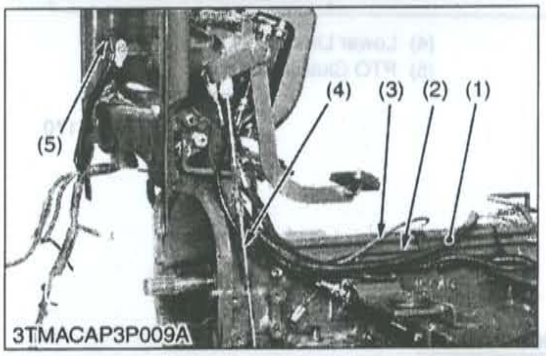


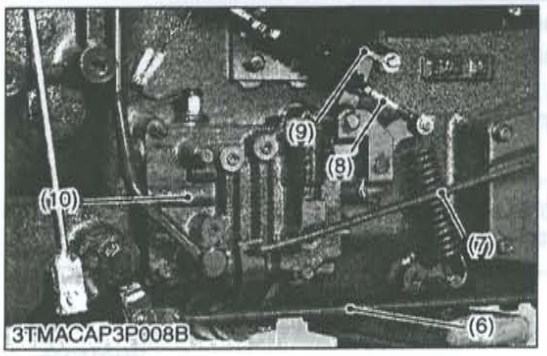
Step and Center Frame

1. Disconnect the trailer coupler harness (5).
2. Remove the grip (1).
3. Remove the seat support (2).
4. Disconnect the lowering speed rod (4).
5. Remove the step and center frame (3) as a unit.

(1) Grip
(2) Seat Support
(3) Step and Center Frame
(4) Lowering Speed Rod
(5) Trailer Coupler Harness

W1015706





Steering Support Unit

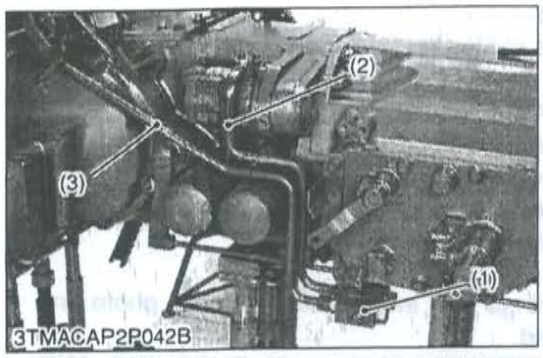
1. Remove the PTO delivery pipe (2).
2. Remove the power steering pipe (3).
3. Remove the brake rod 1 (4) (R.H.), (L.H.) and brake rod 2 (6) (R.H.), (L.H.).
4. Remove the wire harness (1) and steering support unit (7) as shown photo.
5. Disconnect the clutch cable (8) from shuttle valve (10).
6. Disconnect the shuttle cable (9) from shuttle valve (10).
7. Remove the steering support unit (5) as shown photo.

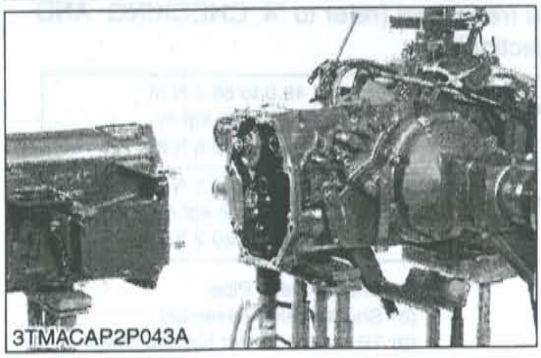
(When reassembling)

Tightening torque	PTO delivery pipe joint screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs
	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

(1) Wire Harness
(2) PTO Delivery Pipe
(3) Power Steering Pipe
(4) Brake Rod 1
(5) Steering Support Unit
(6) Brake Rod 2
(7) DT Rod
(8) Clutch Cable
(9) Shuttle Cable
(10) Shuttle Valve

W1015833





Hydraulic Pipe

1. Remove the 3-point hitch delivery pipe 2 (3).
2. Remove the 3-point hitch delivery pipe 1 (2) with outlet block (1).

(When reassembling)

Tightening torque	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 ft-lbs

(1) Outlet Block
(2) 3-point Hitch Delivery Pipe 1
(3) 3-point Hitch Delivery Pipe 2

W1016364

Separating Transmission Case

1. Make sure the clutch housing case and transmission case are securely mounted on the disassembling stands.
2. Remove the transmission case mounting screws and nuts.
3. Separate the transmission case from the clutch housing.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D, 1206C or equivalent) to joint face of transmission case and clutch housing case.

Tightening torque	Transmission case and clutch housing mounting screw, nut (M10, 9T)	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
	Transmission case and clutch housing mounting screw, nut (M14, 9T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 ft-lbs

W1016691

(4) Removing Shuttle Valve Assembly

Draining Transmission Fluid and Fuel

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1016839

Rear Wheel (L.H.) and Fender (L.H.)

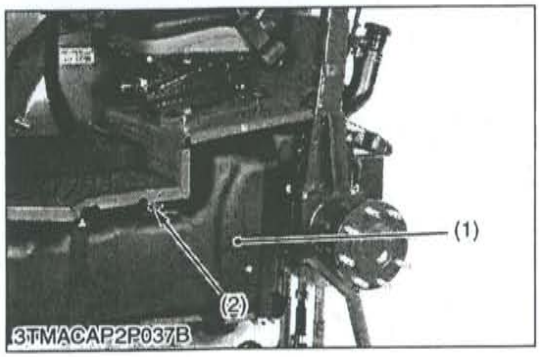
1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (2).
3. Place the disassembling stand under the rear axle case.
4. Remove the fender (1).

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fender
(2) Rear Wheel

W1016895

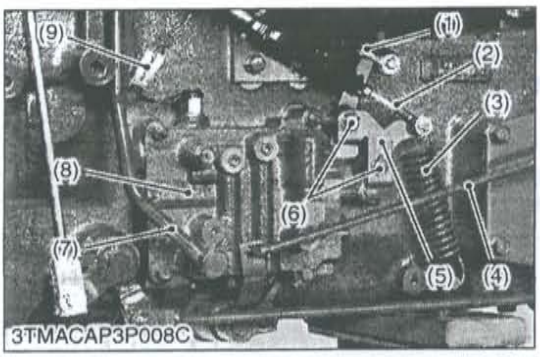


Fuel Tank

1. Disconnect the wire harness from fuel level sensor (2).
2. Remove the fuel tank (1).

(1) Fuel Tank
(2) Fuel Level Sensor

W1017026



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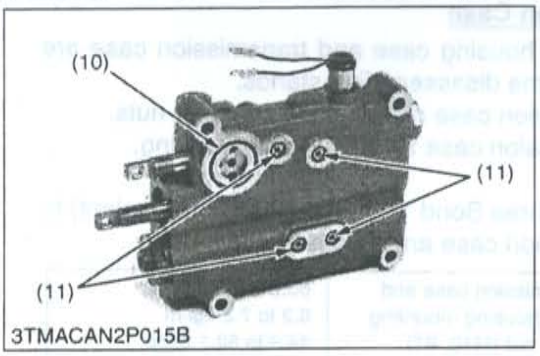


3TMACAN2P015B

Shuttle Valve Assembly

1. Disconnect the shuttle cable (1).
2. Disconnect the clutch cable (2) and spring (3).
3. Remove the DT rod (4).
4. Remove the shuttle valve pipe (7).
5. Remove the external circlips (6) and plate (5).
6. Disconnect the neutral switch **1P** connectors (9).
7. Remove the shuttle valve assembly (8).

(When reassembling)

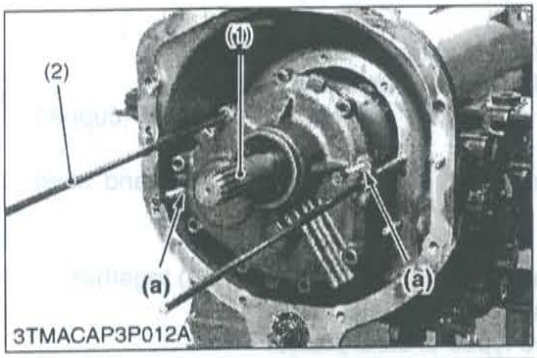
- Be sure to fix the O-rings (11) in position as shown photo and apply transmission fluid.
- Adjust the clutch pedal free travel (refer to "4. CHECKING AND ADJUSTING" in this section).

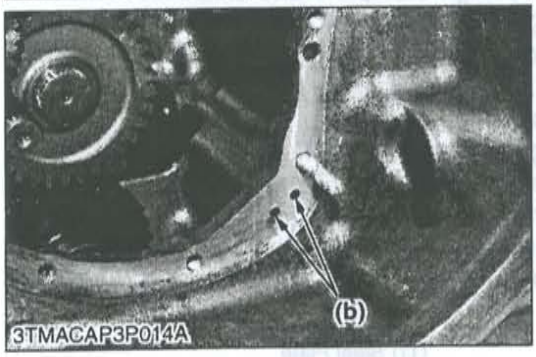
Tightening torque	Shuttle valve pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Shuttle valve mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs

(1) Shuttle Cable
(2) Clutch Cable
(3) Spring
(4) DT Rod
(5) Plate
(6) External Circlip
(7) Shuttle Valve Pipe
(8) Shuttle Valve Assembly
(9) **1P** Connector for Neutral Switch
(10) O-ring
(11) O-ring

W1030797

[2] HYDRAULIC SHUTTLE CLUTCH





Shuttle Case Assembly

1. Remove the shuttle case mounting screws and nuts.
2. Remove the shuttle case assembly (1) by using M10 x Pitch 1.25 mm screws into holes **(a)** and guide screws (2).

(When reassembling)

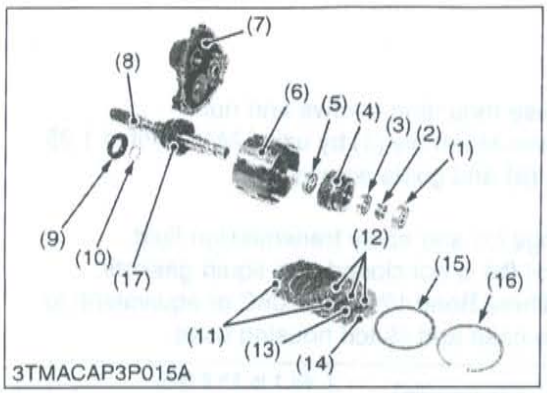
- Be sure to fit the O-rings (3) and apply transmission fluid.
- The passage hole of oil **(b)** is not closed with liquid gaskets.
- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face of the shuttle case and clutch housing case.

Tightening torque	Shuttle case mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Shuttle Case Assembly
(2) Guide Screw
(3) O-ring

(a) Threaded Hole
(b) Oil Passage Hole

W1013327



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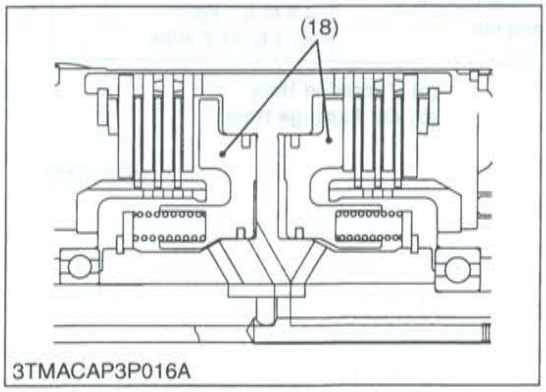

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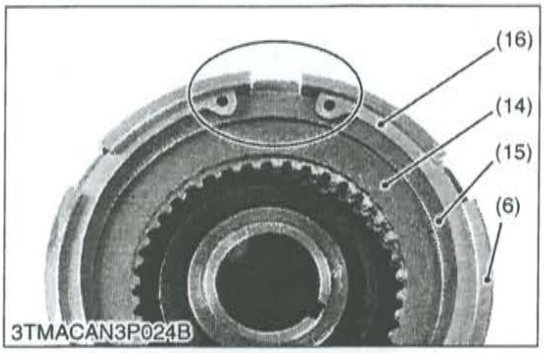

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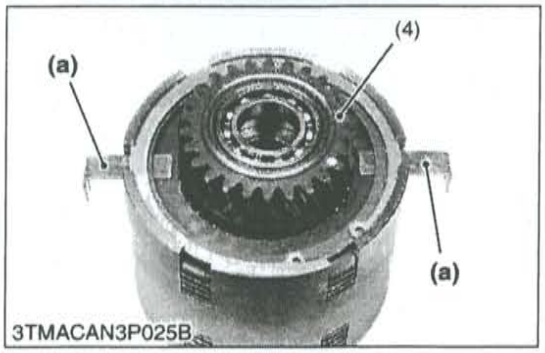

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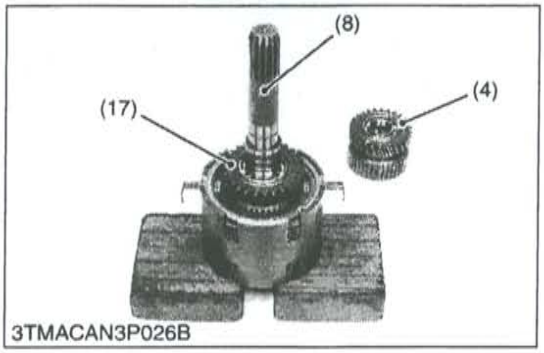


3TMACAN3P026B

Disassembling Shuttle Clutch Assembly

1. Remove the ball bearing (1) and collar (2).
2. Remove the 29T gear (4).
3. Remove the oil seal (9) and external circlip (10).
4. Tap out the input shaft (8) with shuttle clutch (6).
5. Remove the internal circlip (16) and belleville washer (cupped spring washer) (15).
6. Take out the pressure plate (14), clutch discs (12) and steel plates (11), (13).

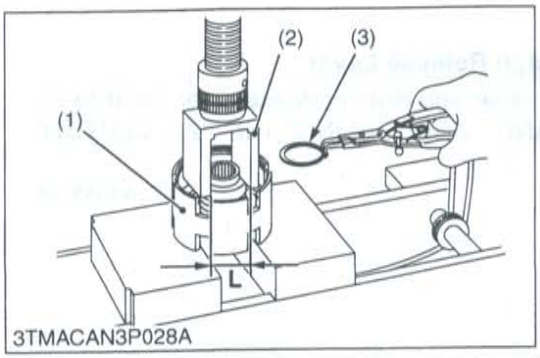
(When reassembling)

- Install the clutch discs (12) and steel plate (11), (13) together.
- Apply enough transmission fluid to the discs (12).
- Do not confuse the two types of steel plates.
  The steel plate with rubber plugs (13) and without rubber plugs (11).
- Do not confuse the pressure plates (14) and steel plate (11). The pressure plate (14) is thicker than the steel plate.
- Be sure to assemble the belleville washer (cupped spring washer) (15) direction as shown in figure.
- When installing the internal circlip (16) to the clutch body (6), align its split portion to the notched portion of clutch body as shown in photo.
- When assembling the input shaft (8) with 27T gear (17) for reverse side, temporary align the spline and clutch disc's teeth using the 29T gear (4).
  - Insert the steel piece **(a)** between belleville washer (cupped spring washer) (15) and pressure plate (14) to prevent turn the clutch discs (12) during assemble.
  - Draw out the 29T gear (4) after inserted the steel piece **(a)**. Then tap in the input shaft (8) with 27T gear (17).
  - Same procedure for forward side.
- Confirm the moving of the piston (18) smoothly when pressure air at 0.5 to 1.0 MPa (5 to 10 kgf/cm^2, 71 to 142 psi) is sent to clutch pack.

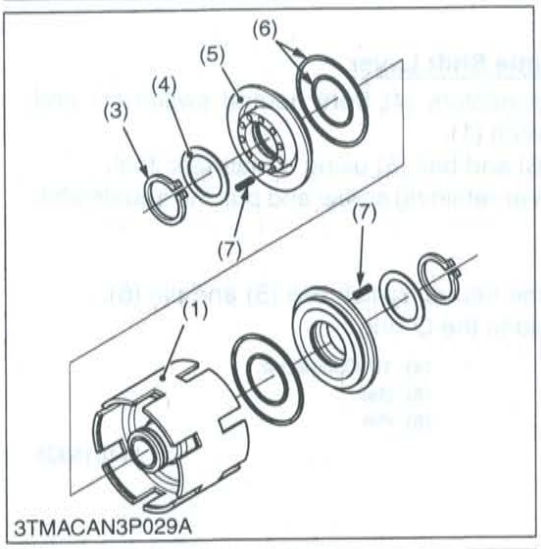
(1) Bearing
(2) Collar
(3) Bearing
(4) 29T Gear
(5) Bearing
(6) Clutch Body
(7) Shuttle Case
(8) Input Shaft
(9) Oil Seal
(10) External Circlip
(11) Steel Plate
(11) Steel Plate
(12) Clutch Disc
(13) Steel Plate
(14) Pressure Plate
(15) Belleville Washer (Cupped Spring Washer)
(16) Internal Circlip
(17) 27T Gear
(18) Piston

(a) Steel Piece

W1014270



3TMACAN3P028A



3TMACAN3P029A


3TMACAN3P088A

Piston

1. Press the washer (4) lightly by the hand press, using the hand made jig (refer to the figure left), and remove the external circlip (3).
2. Remove the springs (7).
3. Draw out the piston (5) using a air pressure.

■ **NOTE**

- **Ten springs for one side.**
- **The passage holes for the piston are beside the feather key groove.**

(When reassembling)

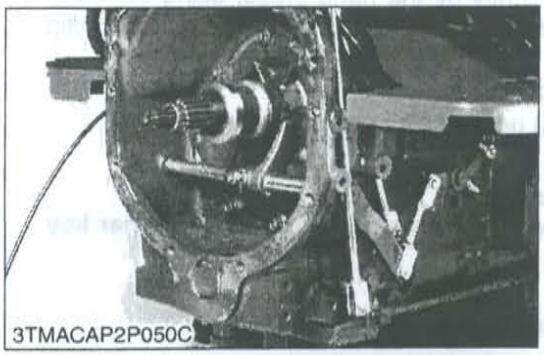
- Apply enough transmission fluid to seal rings (6).

(1) Clutch Case
(2) Jig
(3) External Circlip
(4) Washer
(5) Piston
(6) Seal Ring
(7) Spring

L : 80 mm (3.15 in.)

W1014825

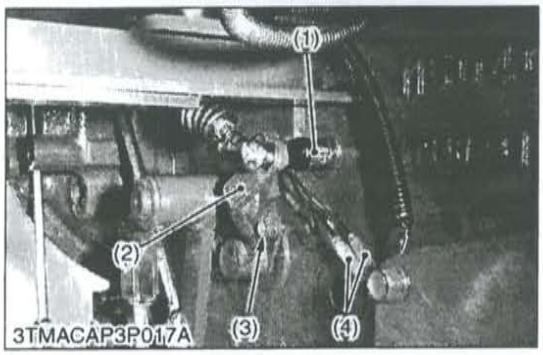
[3] SYNCHRO SHUTTLE GEAR


3TMACAP2P050C

Release Holder and Clutch Release Lever

1. Remove the release holder and clutch release lever (refer to "5. DISASSEMBLING AND ASSEMBLING" at "2. CLUTCH" section).

W1015185



3TMACAP3P017A

Neutral Switch and Shuttle Shift Lever

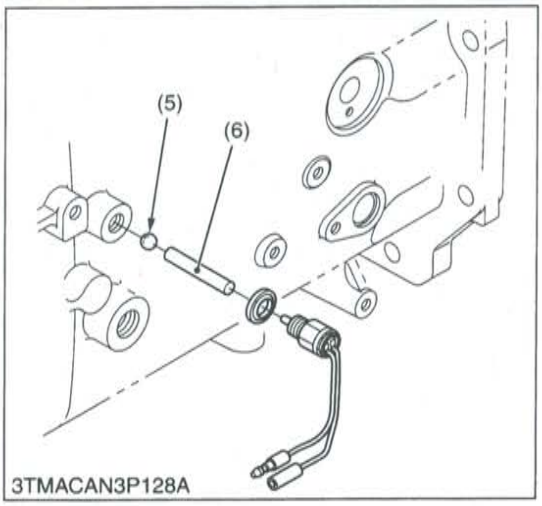
1. Disconnect the **1P** connectors (4) from neutral switch (1) and remove the neutral switch (1).
2. Draw out the roll pin (6) and ball (5) using a magnetic tool.
3. Remove the shuttle lever retaining screw and pull the shuttle shift lever (2) out.

(When reassembling)

- Be sure to assemble the neutral switch ball (5) and pin (6).
- Apply transmission fluid to the O-ring.

(1) Neutral Switch
(2) Shuttle Shift Lever
(3) Screw
(4) **1P** Connector
(5) Ball
(6) Pin

W1015305



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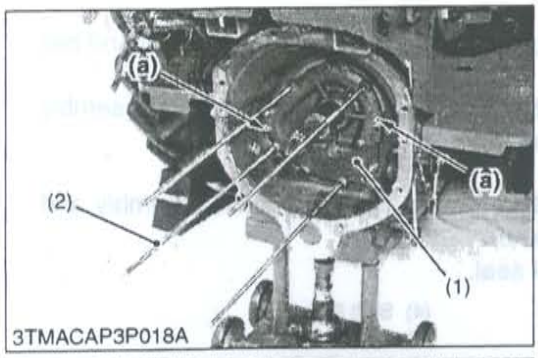

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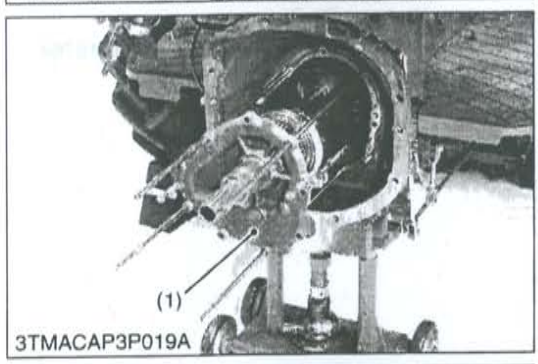

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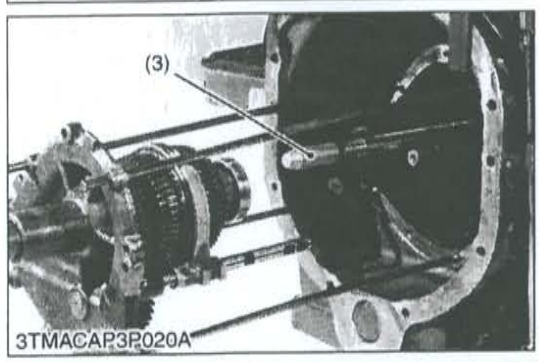

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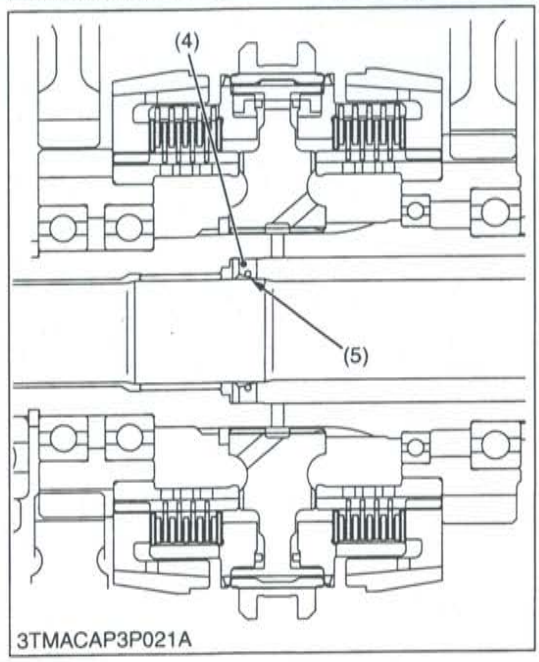


3TMACAP3P021A

Shuttle Gear Case with Shuttle Gears

1. Remove the shuttle gear case mounting screws and nuts.
2. Remove the shuttle gear case with shuttle gears as a unit by using M10 x Pitch 1.25 mm screws into threaded hole **(a)** and guide screws (2).

(When reassembling)

- Apply liquid gaskets (Three Bond 1206C, 1208D or equivalent) to the shuttle gear case (1).
- Use PTO propeller shaft guide (3) and four guide screws (2) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) when reassembling the shuttle gear case unit to prevent the oil seal (4) damaged.

■ **IMPORTANT**

- **Use four guide screws (2) and PTO propeller shaft guide (3), otherwise it may give a damage the oil seal.**

■ **NOTE**

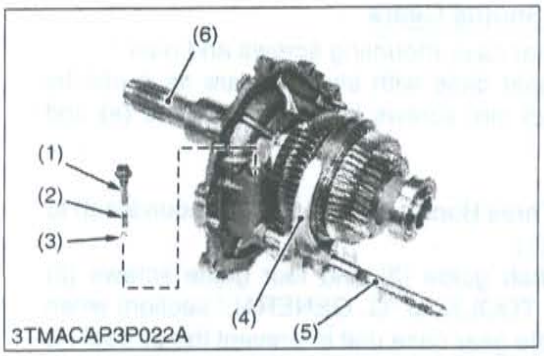
- **When replace the oil seal use input shaft oil seal install tool, refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.**
- **When install the oil seal, face the lip of oil seal to rearward as shown in figure.**

Tightening torque	Synchro shuttle gear case mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Shuttle Gear Case
(2) Guide Screw
(3) PTO Propeller Shaft Guide
(4) Oil Seal
(5) Lip

(a) Threaded Hole (M10 x Pitch 1.25 mm)

W1015598



Shuttle Gear Case

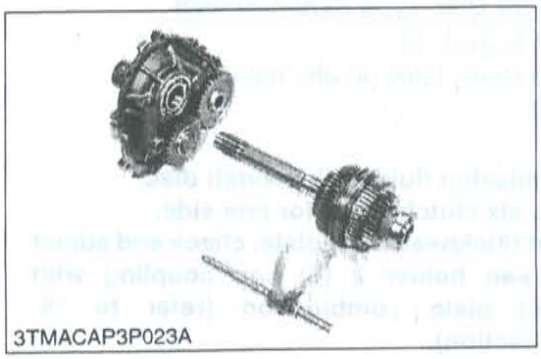
1. Unscrew the detent screw (1) and remove the spring (2) and ball (3).
2. Tap out the input shaft (6) and remove the input shaft assembly with shift fork (4) and rod (5).

(When reassembling)

- Assemble the input shaft assembly, shuttle shift assembly and shift fork with rod together.
- Apply grease to the oil seal.

(1) Detent Screw
(2) Spring
(3) Ball
(4) Shift Fork
(5) Rod
(6) Input Shaft

W1015764


3TMACAP3P023A

Input Shaft and Shuttle Shaft

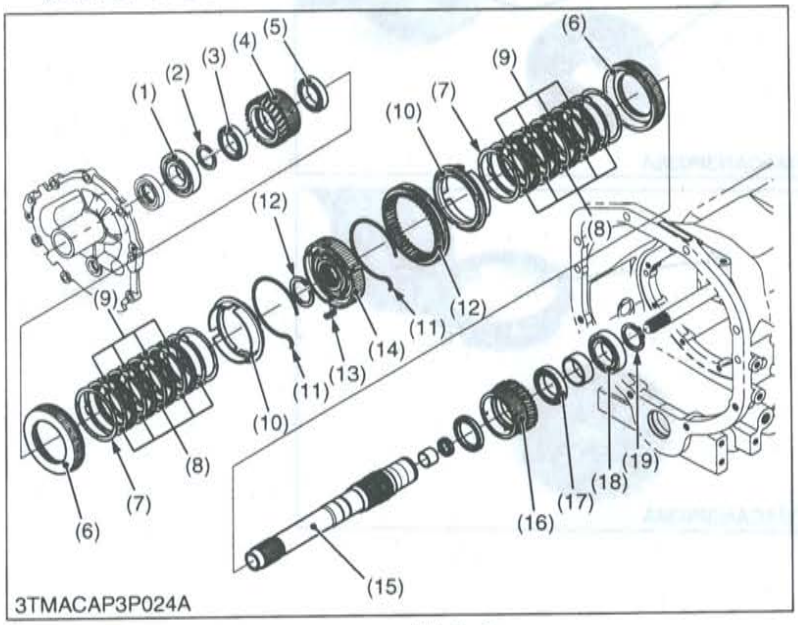
1. Remove the bearing (1) and external circlip (2) from input shaft (15).
2. Draw out the 27T gear (4) to forward.
3. Remove the external circlip (12) and draw out the coupling (14).
4. Remove the external circlip (19) and bearing (8).
5. Draw out the 29T gear (16) to rearward.

■ **NOTE**

- **Six discs and five plates for one side.**

(When reassembling)

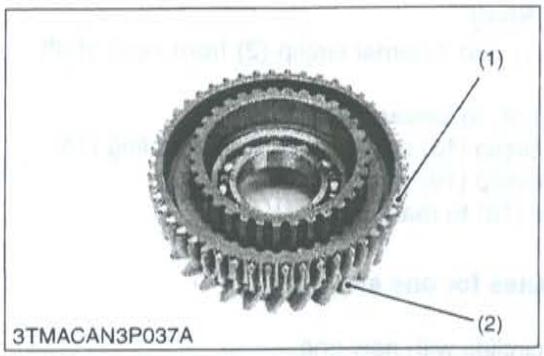
- Replace the external circlips with new one.
- Apply enough transmission fluid to the discs (11).
- Check the clearance between holder 2 and coupling both forward and reverse side with a feeler gauge.
  If the Clarence is exceeds the factory specifications, adjust it (refer to "6. SERVICING" in this section).



3TMACAP3P024A

(1) Bearing
(2) External Circlip
(3) Bearing
(4) 27T Gear
(5) Bearing
(6) Holder 1
(7) Spacer
(8) Steel Plate
(9) Disc
(10) Holder 2
(11) Spring
(12) External Circlip
(13) Key
(14) Coupling
(15) Input Shaft
(16) 29T Gear
(17) Bearing
(18) Bearing
(19) External Circlip

W1016016



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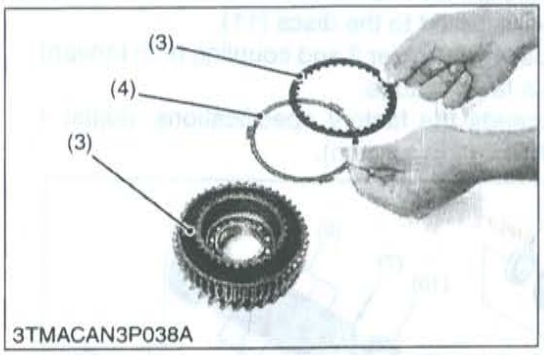

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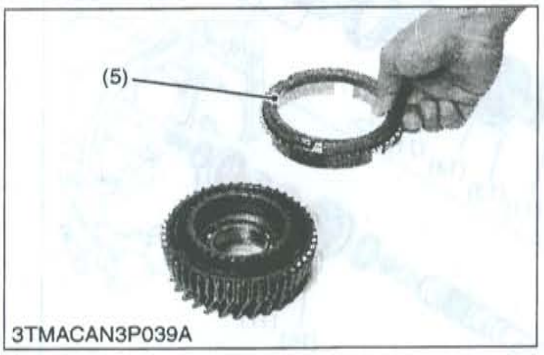


3TMACAN3P039A

Assembling Procedure for Disc Type Synchromesh

1. Install the holder 1 (1) to gear (2).
2. Install the disc (3) and steel plates (4) alternately.
3. Install the holder 2 (5).

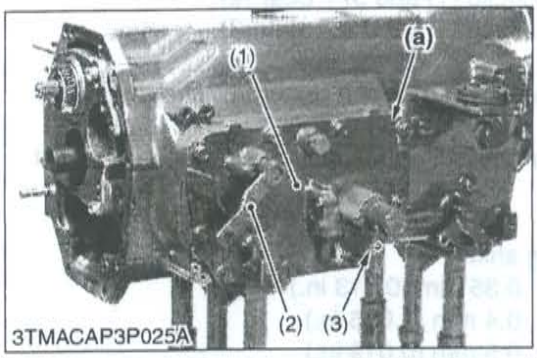
■ **NOTE**

- **Apply enough transmission fluid to the clutch disc.**
- **Five steel plates and six clutch discs for one side.**
- **There is two different thickness steel plate, check and adjust the clearance between holder 2 (5) and coupling with changing the steel plate combination (refer to "6. SERVICING" at this section).**

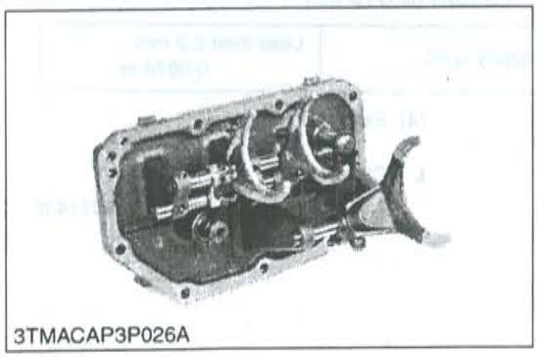
(1) Holder 1
(2) Gear
(3) Disc
(4) Steel Plate
(5) Holder 2

W1016613

[4] CLUTCH HOUSING



3TMACAP3P025A


3TMACAP3P026A

Shift Change Cover

1. Set the main change shift lever (3) and range shift lever (2) to the neutral position.
2. Remove the shift change cover (1) mounting screws.
3. Screw in a M12 x 1.25 mm screw into threaded hole **(a)** to remove the shift cover (1).
4. Remove the shift change cover (1) gently.

(When reassembling)

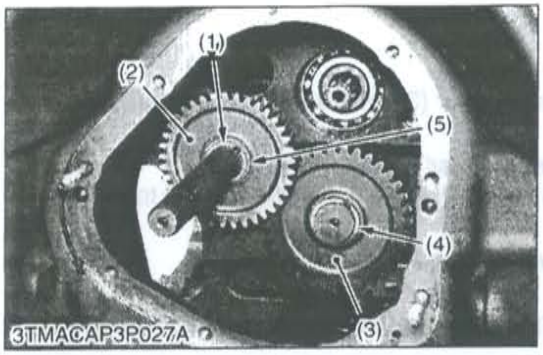
- Apply liquid gasket (Three Bond 1208D, 1206C or equivalent) to joint face.

Tightening torque	Shift change cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

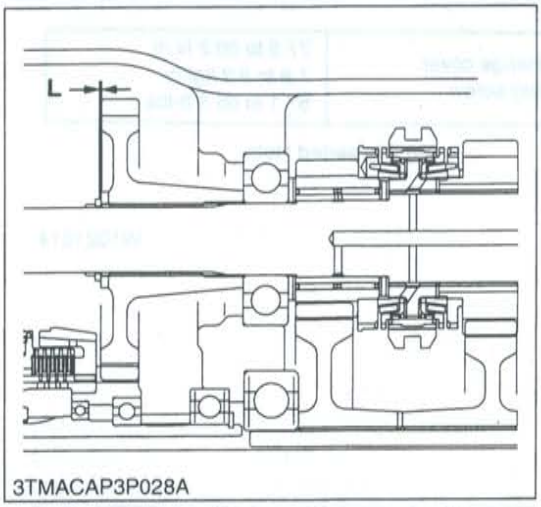
(1) Shift Change Cover
(2) Range Shift Lever
(3) Main Change Shift Lever

(a) Threaded Hole

W1021014



3TMACAP3P027A



3TMACAP3P028A


3TMACAP3P029A

37T Gear and 35T Gear

1. Remove the external circlip (1) and 37T gear (2).
2. Remove the external circlip (4) and 35T gear (3).

(When reassembling)

- Check the clearance (**L**) between external circlip (1) and adjusting collar (5).
- If the measurement is not within the factory specification, adjust with shim.

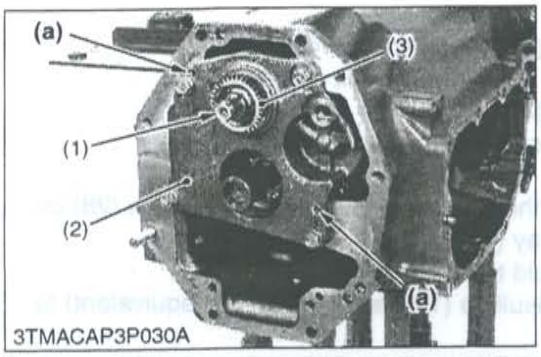
(Reference)

- Thickness of adjusting shim.
  0.2 mm (0.008 in.) 0.35 mm (0.013 in.)
  0.25 mm (0.0098 in.) 0.4 mm (0.016 in.)
  0.3 mm (0.012 in.) 0.5 mm (0.019 in.)

Clearance (**L**)	Factory spec.	Less than 0.2 mm 0.0078 in.

(1) External Circlip
(2) 37T Gear
(3) 35T Gear
(4) External Circlip
L : Clearance

W1021436



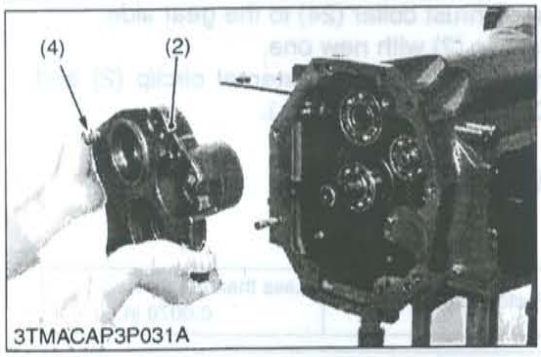
3TMACAP3P030A

PTO Shaft and Bearing Holder

1. Draw out the PTO shaft (1) with 33T gear (3).
2. Remove the bearing holder mounting screws.
3. Screw in a M12 x 1.25 mm screw (4) into threaded hole **(a)** to remove the bearing holder (2).
4. Remove the bearing holder (2).

(1) PTO Shaft
(2) Bearing Holder
(3) 33T Gear
(4) M12 x 1.25 mm Screw
(a) Threaded Hole

W1021915



3TMACAP3P031A

1st Shaft, 2nd Shaft and 3rd Shaft

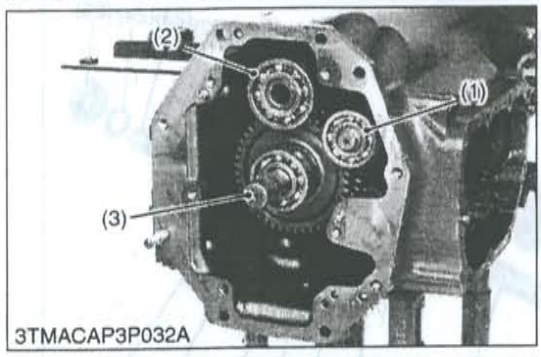
1. Slowly draw out the three shafts with gears together.
2. Take out the three shafts from clutch housing case.

■ **IMPORTANT**

- **Do not fall down the shaft when removing the shafts with gears.**

(1) 1st Shaft Assembly
(2) 2nd Shaft Assembly
(3) 3rd Shaft Assembly

W1022258



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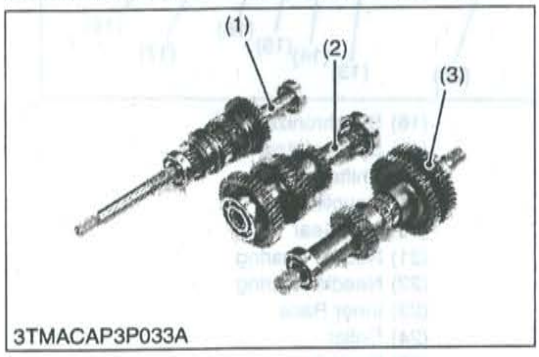

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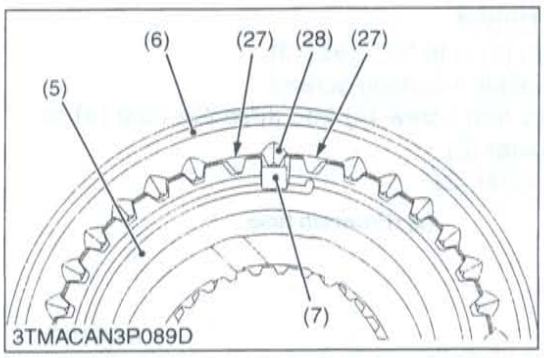
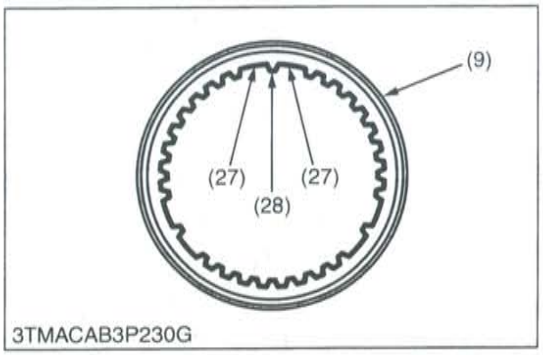
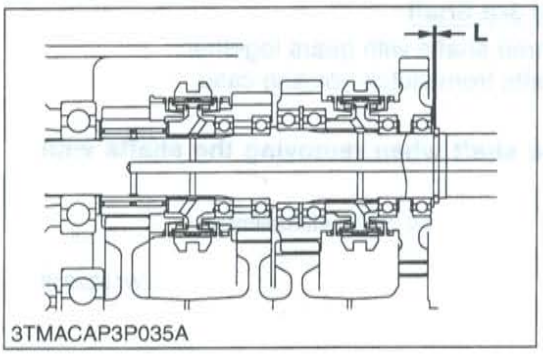


3TMACAN3P089D



3TMACAB3P230G



3TMACAP3P035A

1st Shaft Assembly

1. Remove the bearing (1) and external circlip (2).
2. Draw out the 1st-2nd synchronizer unit and gears.
3. Remove the bearing (25).
4. Draw out the 3rd-4th synchronizer unit and gears.

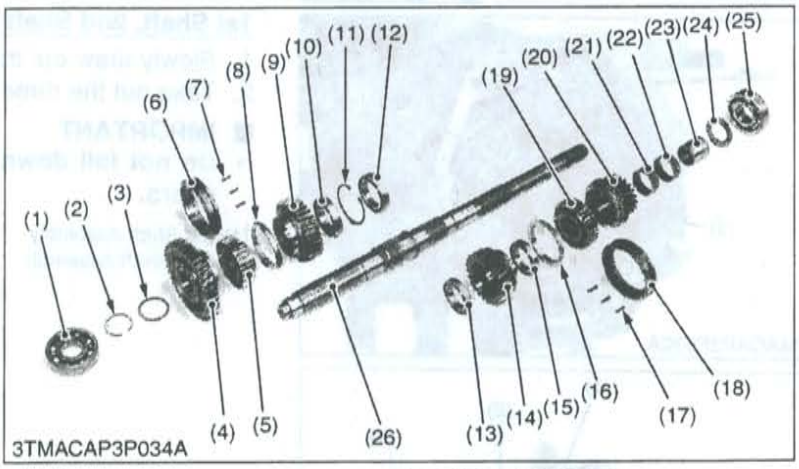
(When reassembling)

- Be sure to assemble the synchronizer unit, set the teeth (28) on the shifter (6) to the key (7) as shown in the figure.
- Apply transmission fluid to synchronizer unit.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner race (23).
- Face the grooved side of thrust collar (24) to the gear side.
- Replace the external circlip (2) with new one.
- Adjust the side clearance (**L**) between external circlip (2) and adjusting collar (3). Check the clearance (**L**).

(Reference)

- Thickness of adjusting collar.
  1.5 mm (0.059 in.) 1.9 mm (0.075 in.)
  1.7 mm (0.066 in.) 2.1 mm (0.082 in.)

Clearance (L)	Factory spec.	Less than 0.2 mm 0.0078 in.

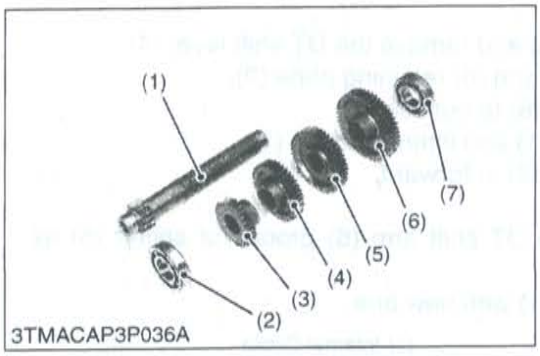


3TMACAP3P034A

(1) Bearing
(2) External Circlip
(3) Collar
(4) 37T Gear
(5) Coupling
(6) Shifter
(7) Synchronizer Key
(8) Synchronizer Ring
(9) 29T Gear
(10) Bearing
(11) Internal Circlip
(12) Bearing
(13) Bearing
(14) 24T Gear
(15) Bearing
(16) Synchronizer Ring
(17) Synchronizer Key
(18) Shifter
(19) Coupling
(20) 19T Gear
(21) Needle Bearing
(22) Needle Bearing
(23) Inner Race
(24) Collar
(25) Bearing
(26) 1st Shaft
(27) Without Teeth
(28) Teeth

L : Clearance

W1022852



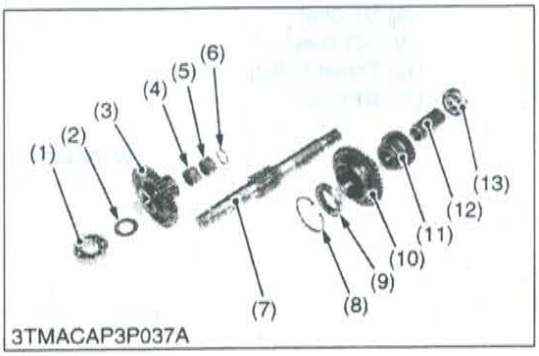
3TMACAP3P036A

2nd Shaft Assembly

1. Remove the bearing (7).
2. Draw out the gears.

(1) 2nd Shaft
(2) Bearing
(3) 29T Gear
(4) 37T Gear
(5) 41T Gear
(6) 46T Gear
(7) Bearing

W1023840



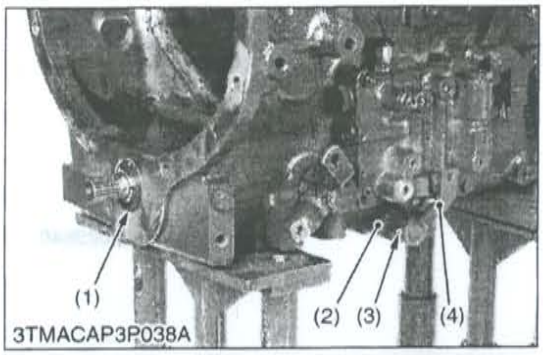
3TMACAP3P037A

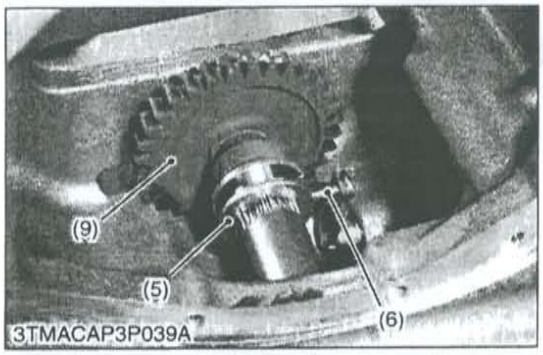
3rd Shaft Assembly

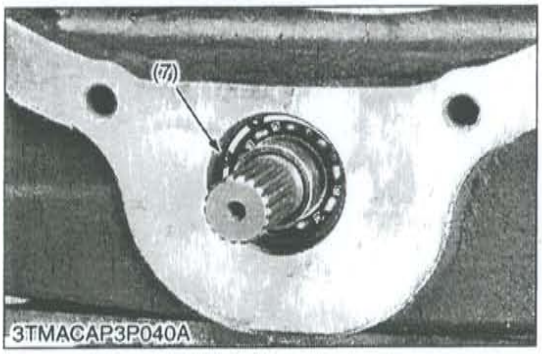
1. Remove the bearing (1), (13).
2. Draw out the gears.

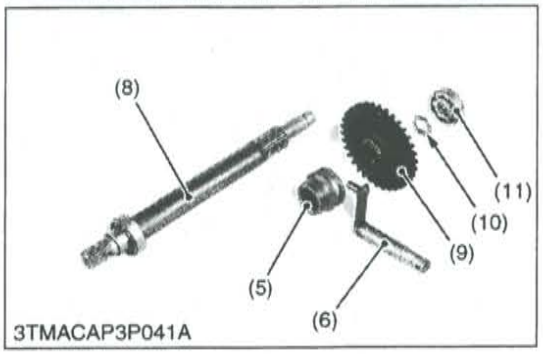
(1) Bearing
(2) Thrust Collar
(3) 44T Gear
(4) Needle Bearing
(5) Needle Bearing
(6) Collar
(7) 3rd Shaft
(8) Internal Circlip
(9) Bearing
(10) 44T Gear
(11) 30T Gear
(12) Collar
(13) Bearing

W1024124









DT Gear and Shaft

1. Tap out the roll pin (3) and remove the DT shift lever (4).
2. Remove the DT shift arm (6) retaining plate (2).
3. Pull the DT shift arm (6) to outside.
4. Remove the oil seal (1) and internal circlip (7).
5. Tap out the DT shaft (8) to forward.

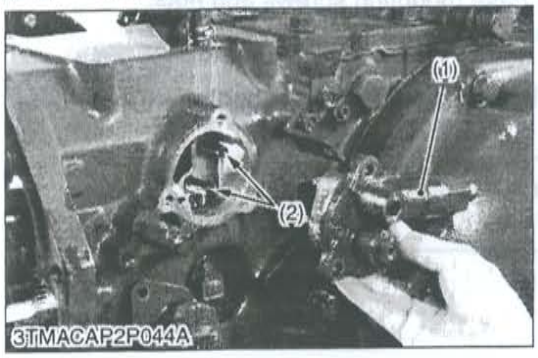
(When reassembling)

- Be sure to insert the DT shift arm (6) groove of shifter (5) as shown photo.
- Replace the oil seal (1) with new one.

(1) Oil Seal
(2) Retaining Plate
(3) Roll Pin
(4) DT Shift Lever
(5) Shifter
(6) Shift Arm
(7) Internal Circlip
(8) DT Shaft
(9) 32T Gear
(10) Thrust Collar
(11) Bearing

W1024417

[5] TRANSMISSION CASE



Removing PTO Clutch Valve

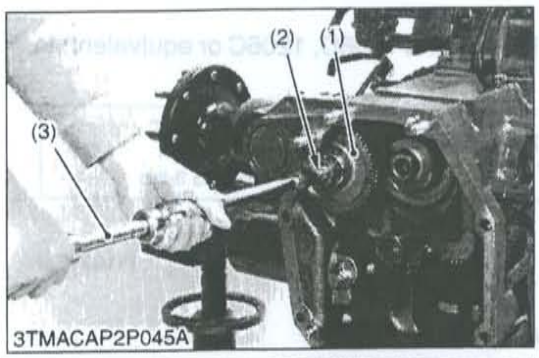
1. Remove the PTO clutch valve (1).

(When reassembling)

- Apply transmission fluid to O-ring and hydraulic pipes (2).
- Remove the two hydraulic pipes from the PTO clutch holder.
- Insert both the hydraulic pipes into the PTO clutch valve holes down to the bottom.
- Replace the hydraulic pipes with new one.
- Now while aligning the hydraulic pipe ends with the PTO clutch holder holes, assemble the PTO clutch valve (1) to the transmission case.

(1) PTO Clutch Valve
(2) Hydraulic Pipe

W1024970



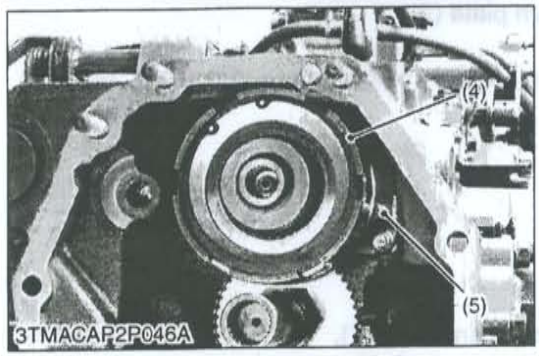
Removing PTO Clutch Pack and Holder

1. Draw out the pin (2) with sliding hammer (3). (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. Take out the hydraulic pump drive gear (1).
3. Remove the PTO clutch holder mounting screws.
4. Remove the PTO clutch (4) with holder (5).

(When reassembling)

- Take care not to damage the hydraulic pipes.

Tightening torque	PTO clutch holder mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

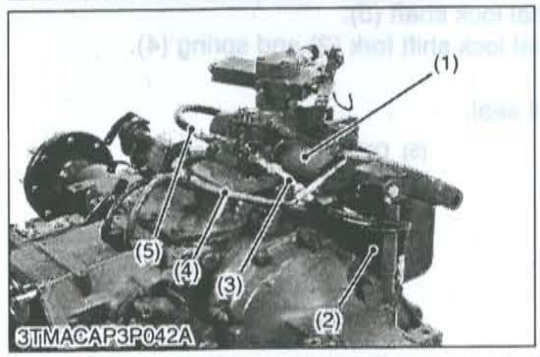


■ **IMPORTANT**

- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-pressure.**

(1) Gear
(2) Pin
(3) Sliding Hammer
(4) PTO Clutch
(5) Holder

W1025105



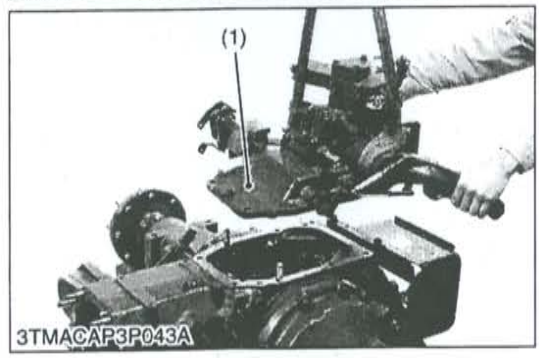
Removing 3-point Hitch Hydraulic Block

1. Disconnect the cylinder hose (3), (4) and return hose (5).
2. Remove the hydraulic cylinder (2).
3. Remove the 3-point hitch hydraulic block mounting screws and nut.
4. Remove the 3-point hitch hydraulic block (1).

(When reassembling)

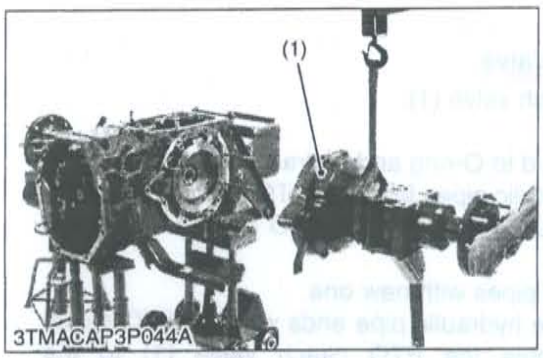
- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face.

Tightening torque	Cylinder hose retaining nut	34.3 to 48.1 N·m 3.5 to 4.9 kgf·m 25.3 to 35.4 ft-lbs
	3-point hitch hydraulic block mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.3 ft-lbs



(1) 3-point Hitch Cylinder Block
(2) Hydraulic Cylinder
(3) Cylinder Hose
(4) Cylinder Hose
(5) Return Hose

W1025282



Removing Rear Axle Case

1. Remove the rear axle case mounting screws and nuts.
2. Remove the rear axle case assembly (1).

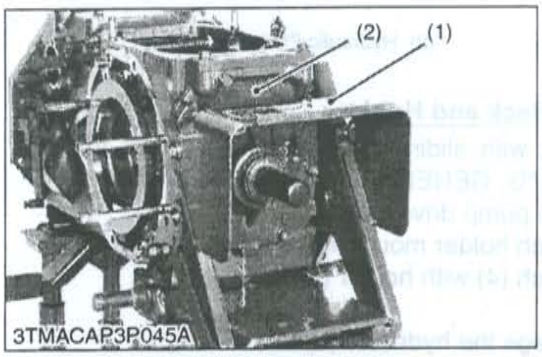
(When reassembling)

- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face.

Tightening torque	Rear axle case mounting screw and nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.3 ft-lbs

(1) Rear Axle Case Assembly

W1025554



PTO Gear Case

1. Remove the PTO cover (1).
2. Remove the PTO gear case assembly (2).

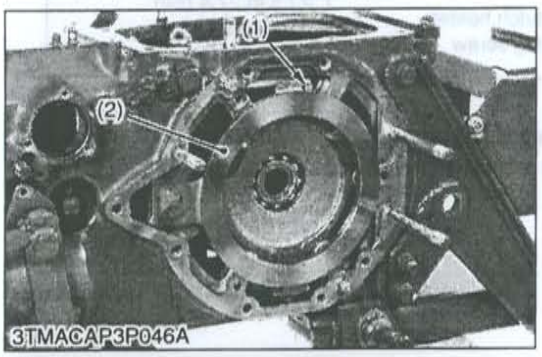
(When reassembling)

- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face.

Tightening torque	PTO gear case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) PTO Cover (2) PTO Gear Case

W1025829



Brake Cam Plate

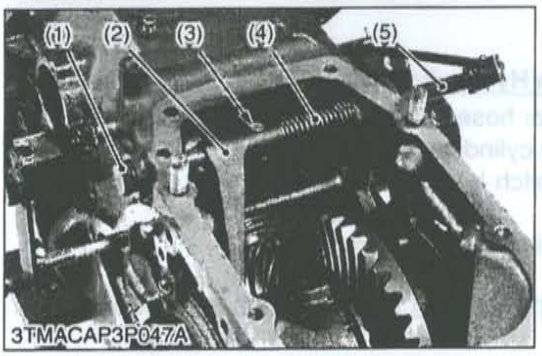
1. Remove the return spring (1).
2. Remove the brake cam plate (2).

(When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)

(1) Return Spring (2) Brake Cam Plate

W1026106



Differential Lock Fork

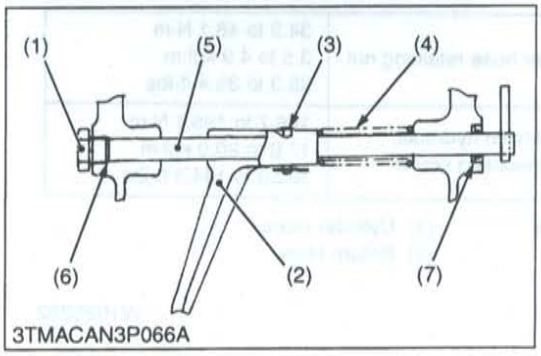
1. Remove the clevis pin (3) and plug (1).
2. Draw out the differential lock shift shaft (5).
3. Take out the differential lock shift fork (2) and spring (4).

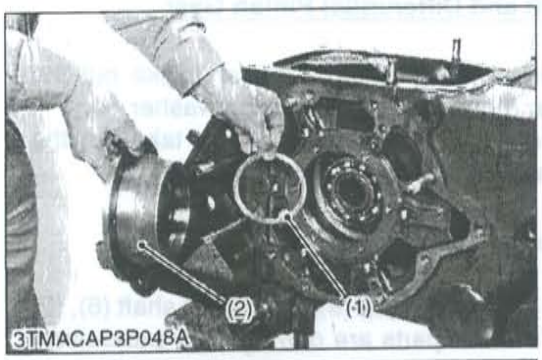
(When reassembling)

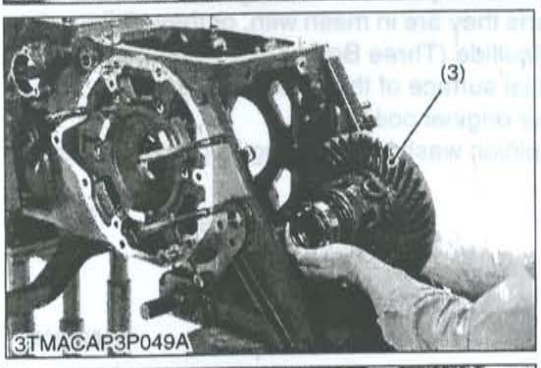
- Apply grease to the oil seal.

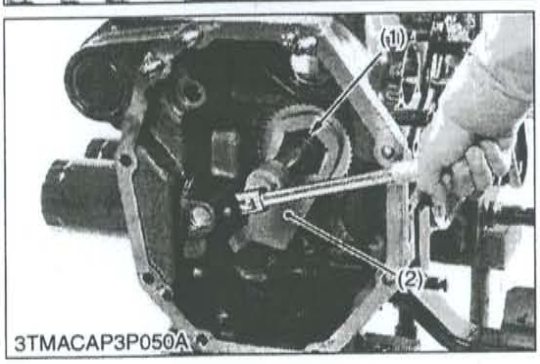
(1) Plug
(2) Differential Lock Shift Fork
(3) Clevis Pin
(4) Spring
(5) Differential Lock Shaft
(6) Shim
(7) Oil Seal

W1021807









Differential Gear Assembly

1. Remove the differential support (2), noting the number of shims (1).
2. Take out the differential gear assembly (3) from transmission case.

(When reassembling)

- Be sure to adjust the turning torque of spiral bevel pinion shaft (refer to "6. SERVICING" in this section).
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft (refer to "6. SERVICING" in this section).

Tightening torque	Differential bearing support mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(1) Shim
(2) Differential Support
(3) Differential Gear Assembly

W1022138

Spiral Bevel Pinion Shaft

1. Remove the stake of staking nut (1).
2. Set the staking nut locking wrench (2).
3. Set the spiral bevel pinion shaft turning wrench.
4. Turn the spiral bevel pinion shaft turning wrench to the counterclockwise, then remove it.
5. Tap out the shaft to the rear.

(When reassembling)

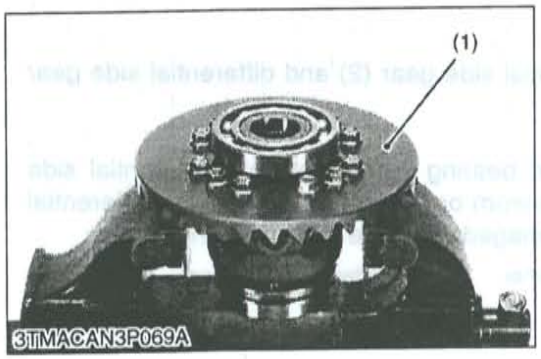
- Replace the staking nut with a new one, and be sure to adjust the turning torque of spiral bevel pinion shaft itself (refer to "6. SERVICING" in this section).
- Stake the staking nut after installing the differential gear assembly.

Tightening torque	Spiral bevel pinion shaft staking nut	117.7 N·m 12.0 kgf·m 86.8 ft-lbs

(1) Staking Nut
(2) Locking Wrench

W1023487

[6] DIFFERENTIAL GEAR



Spiral Bevel Gear

1. Remove the spiral bevel gear (1).

(When reassembling)

- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion shaft.
- Apply liquid lock (Three Bond 1324N or equivalent) to the spiral bevel gear mounting UBS screws.

Tightening torque	Spiral bevel gear mounting UBS screw	142.2 to 161.8 N·m 14.5 to 16.5 kgf·m 104.9 to 119.3 ft-lbs

(1) Spiral Bevel Gear

W1022465

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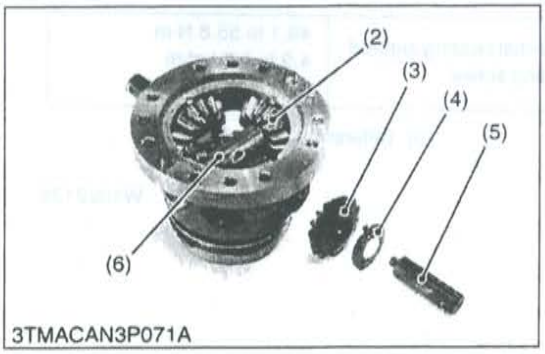

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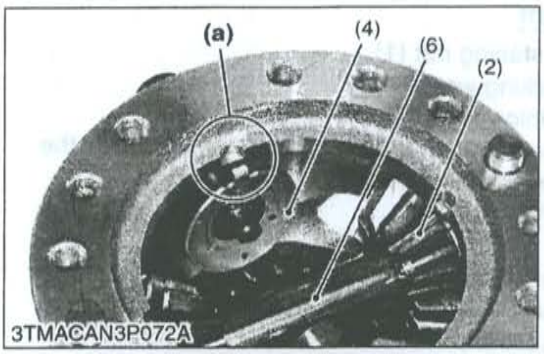

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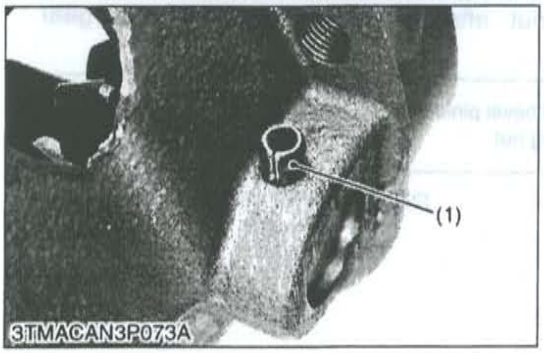

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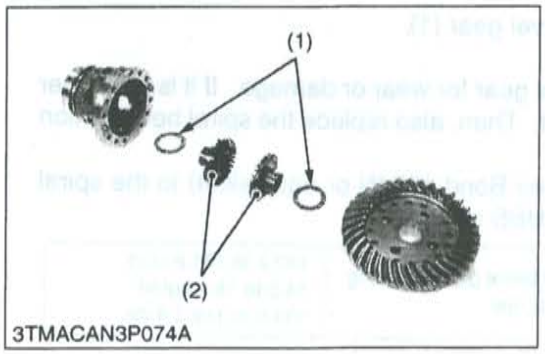


3TMACAN3P074A

Differential Pinion Shaft and Differential Pinion Gear

1. Tap out the roll pin (1).
2. Draw out the differential pinion shaft 2 (5), and take out the differential pinion gear (3) and differential pinion washer (4).
3. Draw out the differential pinion shaft 1 (6), and take out the differential pinion gear (2) differential pinion washer (4).

■ **NOTE**

- **Arrange the parts to know their original position.**

(When reassembling)

- Check the differential pinion gear (2), (3), and pinion shaft (6), (5) for excessive wear. If these parts are damaged or excessively worn, replace their parts they are in mesh with, or they sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions.
- Install the parts to their original position.
- Install the differential pinion washer (4), noting its groove position **(a)**.

(1) Roll Pin
(2) Differential Pinion Gear
(3) Differential Pinion Gear
(4) Differential Pinion Washer
(5) Differential Pinion Shaft 2
(6) Differential Pinion Shaft 1
(a) Fitting Groove

W1022609

Differential Side Gear

1. Take out the differential side gear (2) and differential side gear washer (1).

(When reassembling)

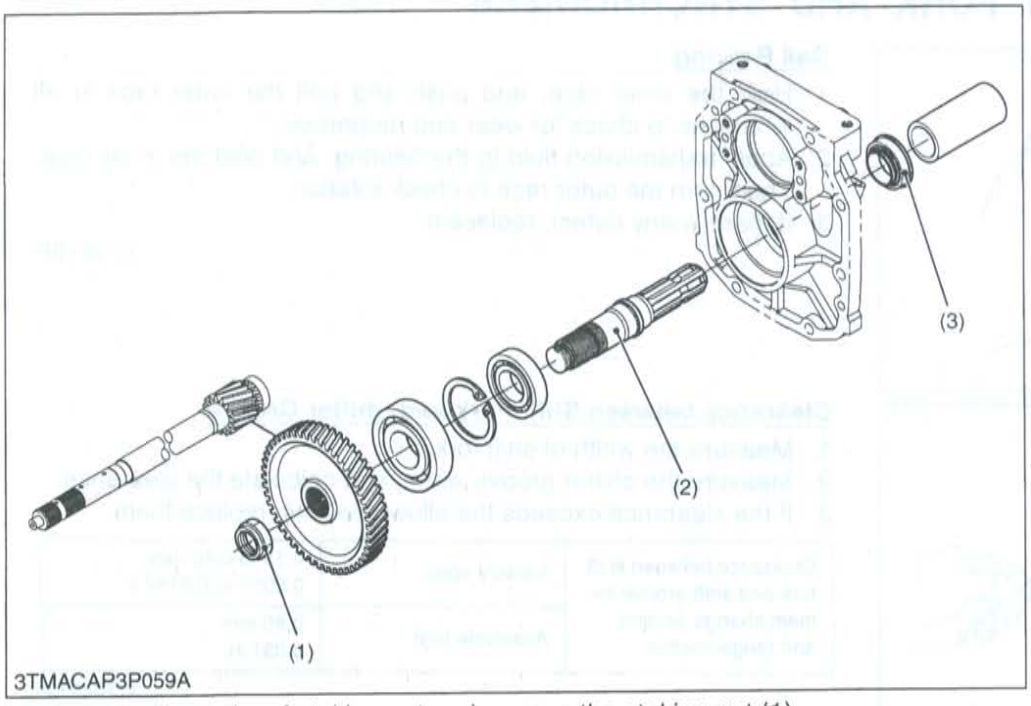
- Check the thrust and bearing surface of both differential side gears (2). If they are worn or damaged, bores in the differential case may also be damaged. Be sure to replace their parts.

(1) Differential Side Gear Washer
(2) Differential Side Gear

W1023050

[7] PTO GEAR CASE

Disassembling PTO Gear Case



(1) Staking Nut
(2) PTO Shaft
(3) Oil Seal

W1021401

1. Remove the stake of staking nut and remove the staking nut (1).
2. Tap out the PTO shaft (2) to the rear side.

(When reassembling)

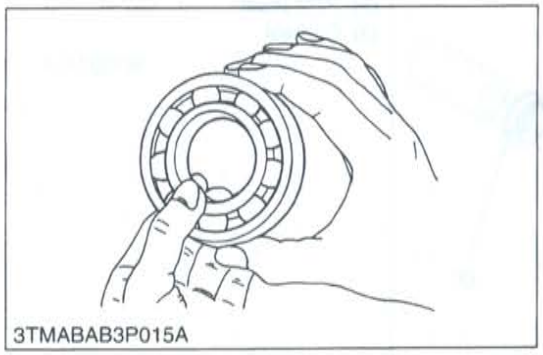
- Replace the PTO shaft staking nut (1) with new one, and stake it firmly after tightening.
- Apply grease to the oil seal (3).

Tightening torque	PTO shaft staking nut	225.5 to 264.8 N·m 23 to 27 kgf·m 166.4 to 195.3 ft-lbs

W1021609

6. SERVICING

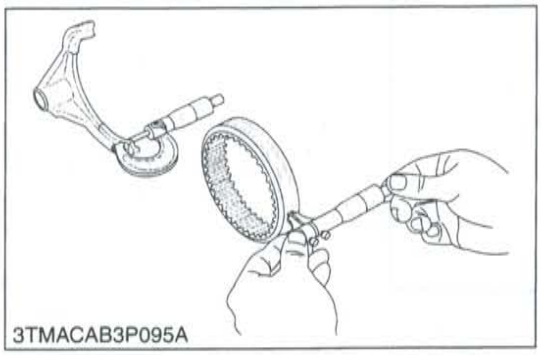
[1] BEARING, SHIFT FORK AND SYNCHRONIZER


3TMABAB3P015A

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.

W1024200

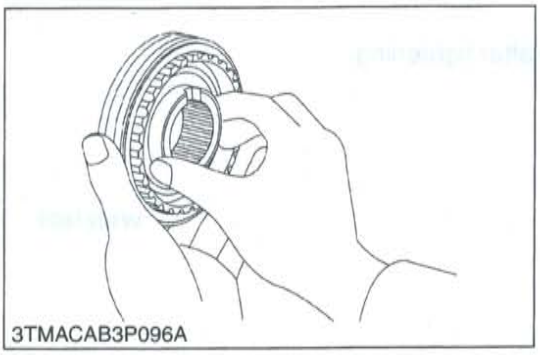

3TMACAB3P095A

Clearance between Shift Fork and Shifter Groove

1. Measure the width of shift fork.
2. Measure the shifter groove width, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between shift fork and shift groove for main change section and range section	Factory spec.	0.15 to 0.40 mm 0.0059 to 0.0157 in.
	Allowable limit	0.80 mm 0.031 in.

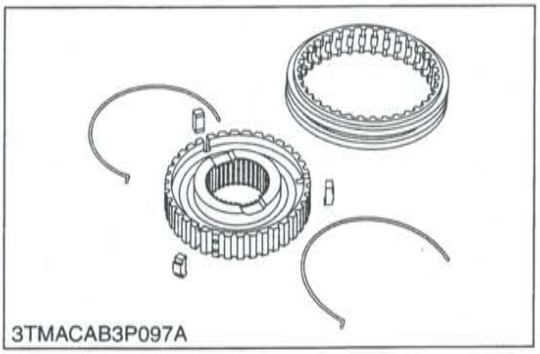
W1025154


3TMACAB3P096A

Checking Contact between Coupling and Shifter

1. Check to see if there is flaw or wear on the spline of the coupling and shifter, and the key groove on the coupling.
2. Engage the shifter with the coupling, and check that they slide smoothly.
3. Similarly, check that there is any flaw or wear on the gear splines.
4. If there is any defect, replace them.

W1025396

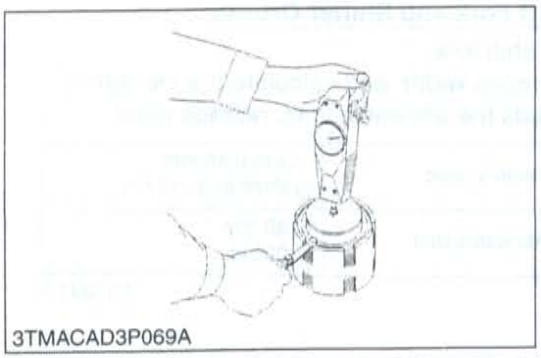

3TMACAB3P097A

Flaw on Synchronizer Key and Spring

1. Check the projection in the center of the synchronizer key for wear.
2. Check the spring for fatigue or wear on the area where the spring contacts with the keys.
3. If there is any defect, replace them.

W1025323

[2] SHUTTLE CLUTCH PACK (HYDRAULIC SHUTTLE MODEL)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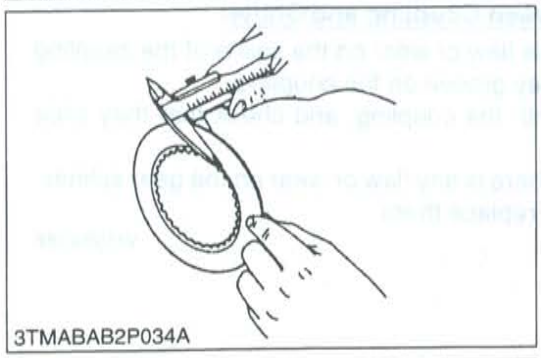
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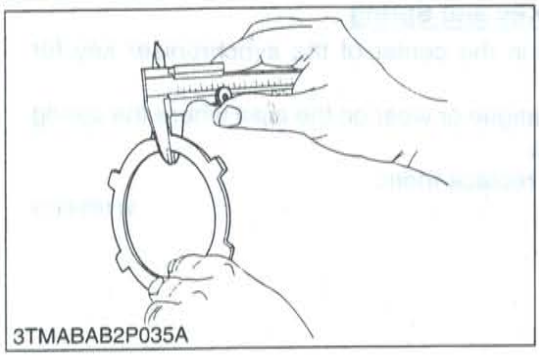

3TMABAB2P035A

Clearance between Internal Circlip and Belleville Washer (Cupped Spring Washer)

1. Measure the clearance between internal circlip and belleville washer (cupped spring washer) with a feeler gauge while applying specified force.
   Specified force : 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbs)
2. 3-points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

■ **NOTE**

- **Clearance between internal circlip and belleville washer (cupped spring washer) is adjusted by two kinds of clutch discs with different thickness. Therefore, use the one of the same thickness when you change clutch disc.**

Clearance between internal circlip and belleville washer (cupped spring washer)	Factory spec.	1.8 to 2.0 mm 0.071 to 0.079 in.
	Allowable limit	3.6 mm 0.142 in.

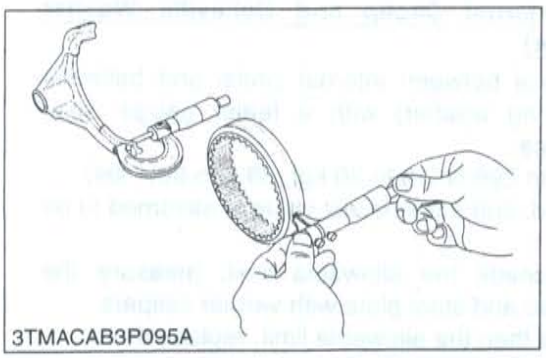
(Reference)

- There are two kinds of thickness of clutch discs.
- Thickness of plate, disc and piston.

Steel plate	Factory spec.	3.1 to 3.3 mm 0.122 to 0.130 in.
Pressure plate	Factory spec.	4.42 to 4.58 mm 0.174 to 0.180 in.
Clutch disc (3C291-23130)	Factory spec.	2.85 to 2.95 mm 0.112 to 0.116 in.
Clutch disc (3C291-23030)	Factory spec.	3.0 to 3.1 mm 0.118 to 0.122 in.

W1023707

[3] SHUTTLE CLUTCH PACK (SYNCHRO SHUTTLE MODEL)

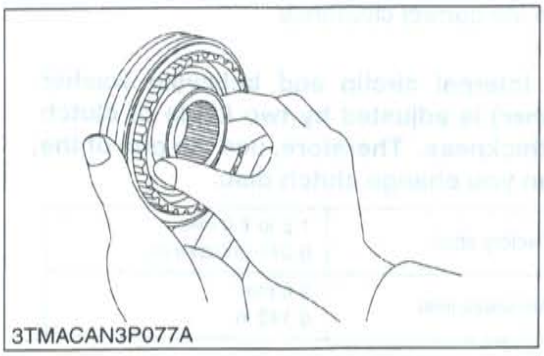

3TMACAB3P095A

Clearance between Shift Fork and Shifter Groove

1. Measure the width of shift fork.
2. Measure the shifter groove width, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between shift fork and shift groove	Factory spec.	0.2 to 0.45 mm 0.0078 to 0.0177 in.
	Allowable limit	0.80 mm 0.031 in.

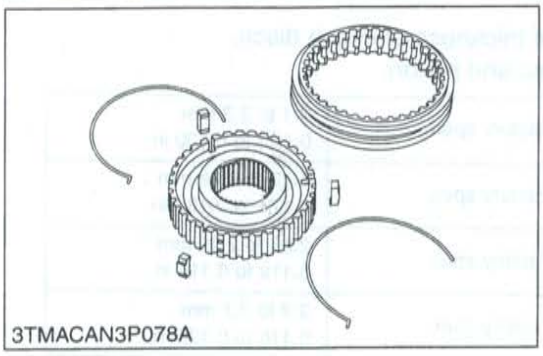
W1024276


3TMACAN3P077A

Checking Contact between Coupling and Shifter

1. Check to see if there is flaw or wear on the spline of the coupling and shifter, and the key groove on the coupling.
2. Engage the shifter with the coupling, and check that they slide smoothly.
3. Similarly, check that there is any flaw or wear on the gear splines.
4. If there is any defect, replace them.

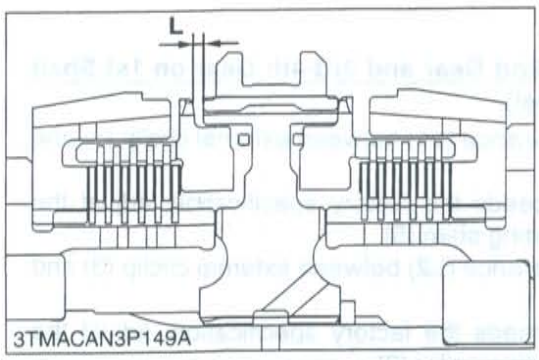
W1024386


3TMACAN3P078A

Flaw on Synchronizer Key and Spring

1. Check the projection in the center of the synchronizer key for wear.
2. Check the spring for fatigue or wear on the area where the spring contacts with the keys.
3. If there is any defect, replace them.

W1024619



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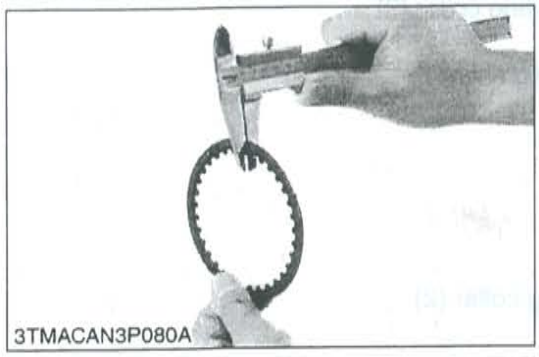
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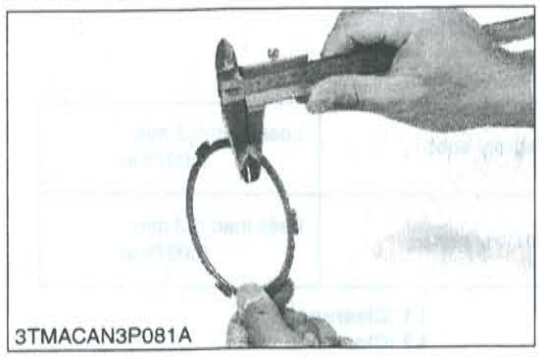
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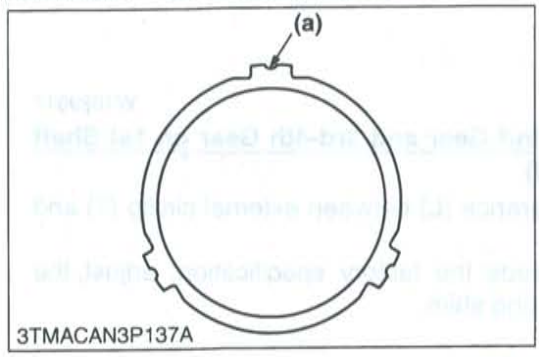


3TMACAN3P137A

Clearance between Holder 2 and Coupling

1. Measure the clearance (**L**) between holder 2 and coupling with a feeler gauge.
2. If the clearance (**L**) exceeds the factory specification, adjust the clearance using different thickness of steel plate.
3. Remeasure to confirm the correct clearance (**L**).

■ **NOTE**

- **Clearance between holder 2 and coupling is adjusted by two kinds of steel plates with different thickness. Therefore, use the one of the same thickness when you change steel plates.**

Clearance (**L**) between holder 2 and coupling (F and R side)	Factory spec.	1.8 to 2.0 mm 0.071 to 0.079 in.

(Reference)

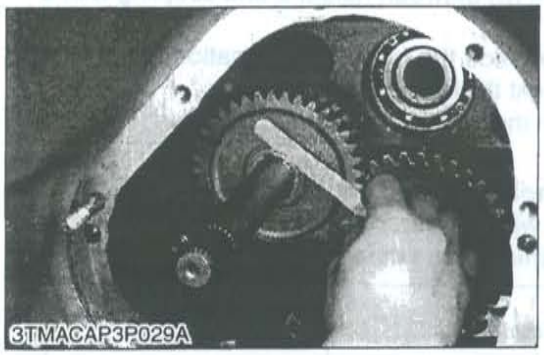
- There are two kinds of thickness steel plates.
- Thickness of clutch disc and steel plate.

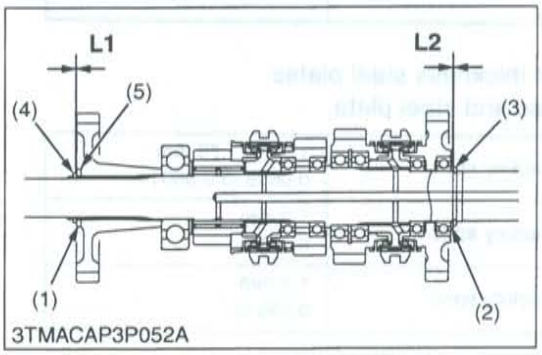
Clutch disc	Factory spec.	1.57 to 1.73 mm 0.0618 to 0.0681 in.
Steel plate (3C081-23490)	Factory spec.	1.2 mm 0.047 in.
Steel plate (3C081-23571)	Factory spec.	1.4 mm 0.055 in.

(a) Plate Thickness I.D. for 1.4 mm (0.055 in.) **L : Clearance**

W1024703

[4] SHIFT AND GEAR





Side Clearance of 1st-2nd Gear and 3rd-4th Gear on 1st Shaft (Hydraulic Shuttle Model)

1. Measure the side clearance (**L1**) between external circlip (4) and collar (1).
2. If clearance (**L1**) exceeds the factory specification, adjust the clearance using adjusting shim (5).
3. Measure the side clearance (**L2**) between external circlip (3) and collar (2).
4. If clearance (**L2**) exceeds the factory specification, adjust the clearance using adjusting collar (2).

(Reference)

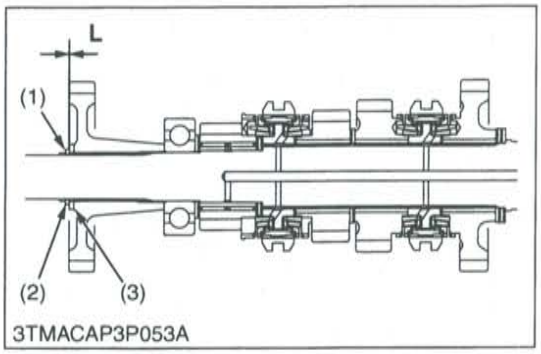
- Thickness of adjusting shim
  0.2 mm (0.008 in.)
  0.25 mm (0.0098 in.)
  0.3 mm (0.012 in.)
  0.35 mm (0.013 in.)
  0.4 mm (0.016 in.)
  0.5 mm (0.019 in.)
- Thickness of adjusting collar (2)
  1.5 mm (0.059 in.)
  1.7 mm (0.066 in.)
  1.9 mm (0.075 in.)
  2.1 mm (0.082 in.)

Clearance (**L1**) between external circlip and collar	Factory spec.	Less than 0.2 mm 0.0078 in.
Clearance (**L2**) between external circlip and collar	Factory spec.	Less than 0.2 mm 0.0078 in.

(1) Collar
(2) Adjusting Collar
(3) External Circlip
(4) External Circlip
(5) Adjusting Shim

L1 :Clearance
L2 :Clearance

W1029017



Side Clearance of 1st-2nd Gear and 3rd-4th Gear on 1st Shaft (Synchro Shuttle Model)

1. Measure the side clearance (**L**) between external circlip (1) and adjusting collar (2).
2. If clearance (**L**) exceeds the factory specification, adjust the clearance using adjusting shim.

(Reference)

- Thickness of adjusting shim
  0.2 mm (0.008 in.)
  0.25 mm (0.0098 in.)
  0.3 mm (0.012 in.)
  0.35 mm (0.013 in.)
  0.4 mm (0.016 in.)
  0.5 mm (0.019 in.)

Clearance (**L**) between external circlip and collar	Factory spec.	Less than 0.2 mm 0.0078 in.

(1) External Circlip
(2) Collar
(3) Adjusting Shim

L : Clearance

W1029361

[5] DIFFERENTIAL GEAR

■ **IMPORTANT**

- **When reassembling spiral bevel pinion shaft and differential assembly, be sure to adjust the following.**
- **Turning torque of spiral bevel pinion shaft only.**
- **Backlash and tooth contact between spiral bevel pinion shaft and spiral bevel gear.**

Turning Torque of Spiral Bevel Pinion Shaft Only

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut (1) with locking wrench and turning wrench.
2. After tapping the bevel pinion shaft to the front and rear, retighten the staking nut (1) to specified torque.
3. Measure the turning torque of spiral bevel pinion shaft.
4. If the measurement is not within the factory specifications, adjust the tightening torque of staking nut (1).

Turning torque of spiral bevel pinion shaft only	Factory spec.	2.94 to 3.43 N·m 0.3 to 0.35 kgf·m 2.2 to 2.5 ft-lbs

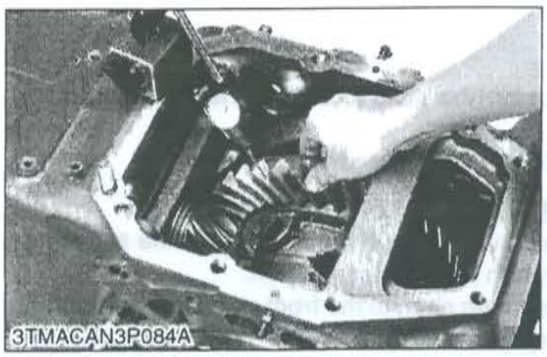
Tightening torque	Staking nut	117.7 N·m 12.0 kgf·m 86.8 ft-lbs

■ **NOTE**

- **Stake the staking nut after performing adjustment described in the following pages.**

(1) Staking Nut

W1025551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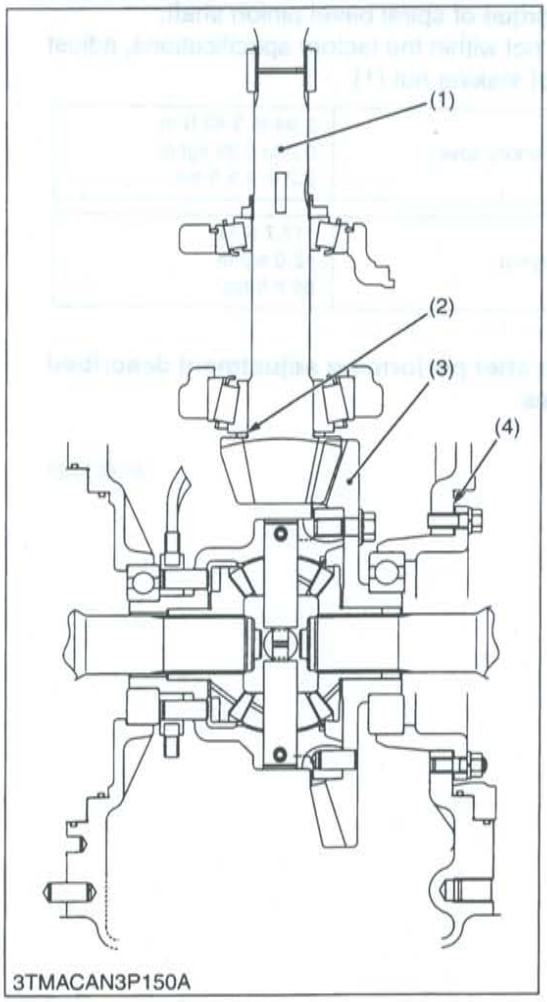


3TMACAN3P150A

Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft

1. Set the dial indictor (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the spiral bevel pinion shaft (1) and moving the spiral bevel gear (3) by hand.
3. When the backlash is too large, decrease the number of shims (4).
   When the backlash is too small, increase the number of shims (4).
4. Adjust the backlash properly by repeating the above procedure.
5. Apply red lead lightly over several teeth at three positions equally spaced on the spiral bevel gear.
6. Turn the spiral bevel pinion shaft, while pressing a wooden piece against the periphery on the spiral bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions next page.

Backlash between spiral bevel gear and spiral bevel pinion shaft	Factory spec.	0.2 to 0.3 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

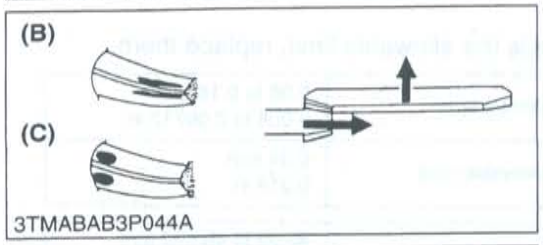
(Reference)

- Thickness of adjusting shim (4)
  0.1 mm (0.004 in.)
  0.3 mm (0.012 in.)
  1.4 mm (0.055 in.)
  1.6 mm (0.063 in.)
- Thickness of adjusting collar (2)
  0.8 mm (0.031 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)
  1.4 mm (0.055 in.)
  1.6 mm (0.063 in.)

(1) Spiral Bevel Pinion Shaft
(2) Adjusting Collar
(3) Spiral Bevel Gear
(4) Shim

W1072839

3TMABAB3P043A



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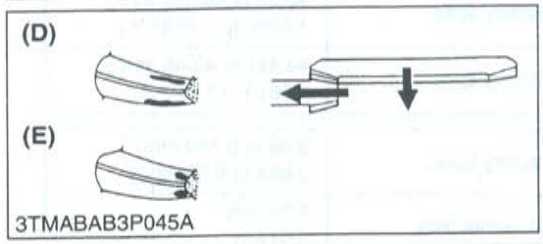

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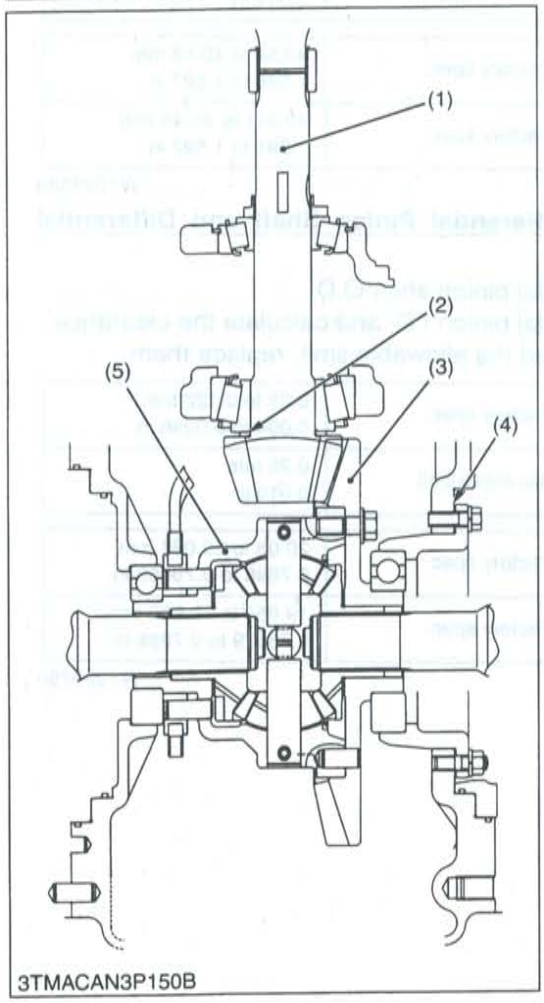


3TMACAN3P150B

Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft (Continued)

- **Proper Contact**

  More than 35 % red lead contact area on the gear tooth surface.

  The center of tooth contact at 1/3 of the entire width from the small end.

- **Shallow or Heel Contact**

  Replace the adjusting collar (2) with thicker one to move the spiral bevel pinion shaft backward.

  And reduce the shim (4) to move the spiral bevel gear rightward.

  Repeat above until the proper tooth contact and backlash are achieved.

- **Deep or Toe Contact**

  Replace the adjusting collar (2) with a thinner one to move the spiral bevel pinion shaft forward.

  And increase the shim (4) to move the spiral bevel gear leftward.

  Repeat above until the proper tooth contact and backlash are achieved.

(1) Spiral Bevel Pinion Shaft
(2) Adjusting Collar
(3) Spiral Bevel Gear
(4) Shim
(5) Differential Case

(A) Proper Contact
(B) Shallow Contact
(C) Heel Contact
(D) Deep Contact
(E) Toe Contact

W1076897


3TMACAN3P085A

Clearance between Differential Case Bore (39T Bevel Gear Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and 39T bevel gear.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

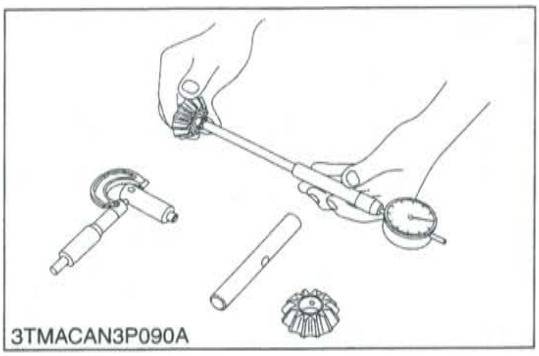
Clearance between differential case bore and differential side gear boss	Factory spec.	0.08 to 0.181 mm 0.004 to 0.00712 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case bore I.D.	Factory spec.	40.53 to 40.592 mm 1.5960 to 1.5981 in.
Differential side gear boss O.D.	Factory spec.	40.411 to 40.45 mm 1.5910 to 1.592 in.

Clearance between 39T bevel gear bore and differential side gear boss	Factory spec.	0.09 to 0.169 mm 0.004 to 0.00665 in.
	Allowable limit	0.35 mm 0.014 in.

39T bevel gear bore I.D.	Factory spec.	40.54 to 40.58 mm 1.596 to 1.597 in.
Differential side gear boss O.D.	Factory spec.	40.411 to 40.45 mm 1.591 to 1.592 in.

W1029389


3TMACAN3P090A

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 exceed the allowable limit, replace them.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.08 to 0.122 mm 0.004 to 0.0048 in.
	Allowable limit	0.25 mm 0.010 in.

Differential pinion shaft O.D.	Factory spec.	20.06 to 20.081 mm 0.7898 to 0.79059 in.
Differential pinion I.D.	Factory spec.	19.959 to 19.980 mm 0.78579 to 0.7866 in.

W1029788

3TMACAN3P086A

Backlash between Differential Pinion and Differential Side Gear

1. Set a dial indicator (lever type) on the tooth of the differential pinion.
2. Hold the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement is not within the factory specifications, adjust with the differential side gear washer.

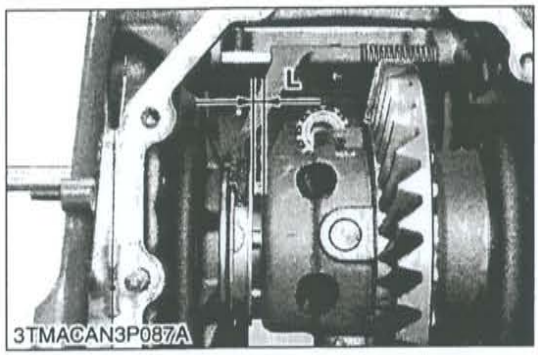
Backlash between differential pinion and differential side gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of differential side gear washer :
  1.5 mm (0.059 in.)
  1.6 mm (0.063 in.)
  1.7 mm (0.067 in.)
  1.8 mm (0.071 in.)
  2.0 mm (0.078 in.)

(1) Side Gear Washer

W1030074



3TMACAN3P087A

Clearance of Differential Lock Shifter

1. Measure the clearance (**L**) between differential lock shifter and differential case when the differential lock pedal **OFF** position.
2. If the measurement is not within the factory specifications, adjust with adjusting shim (2).

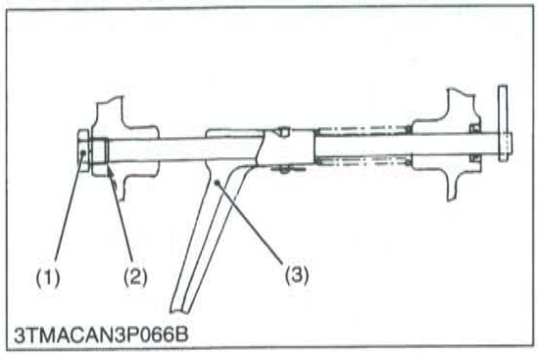
Clearance (**L**)	Factory spec.	6.0 to 8.0 mm 0.236 to 0.315 in.

(Reference)

- Thickness of adjusting shim :
  0.5 mm (0.020 in.)
  1.0 mm (0.039 in.)

(1) Plug
(2) Adjusting Shim (0.5 mm, 0.0197 in.)
(3) Shift Fork

W1030398



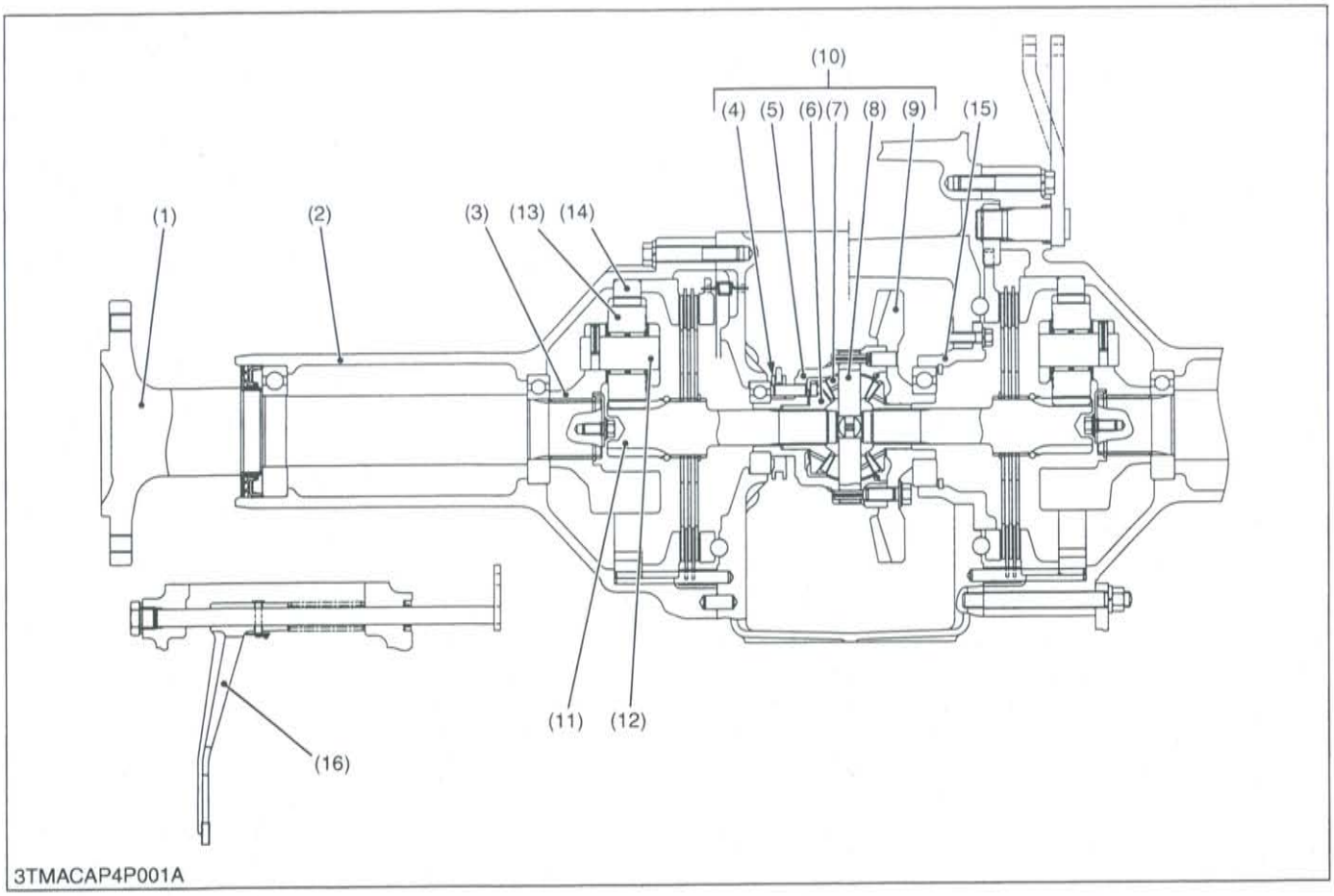
3TMACAN3P066B

4 REAR AXLE

MECHANISM

CONTENTS

1. STRUCTURE



3TMACAP4P001A

(1) Rear Axle
(2) Rear Axle Case
(3) Planetary Gear Support
(4) Differential Lock Shifter
(5) Differential Case
(6) Differential Side Gear
(7) Differential Pinion Gear
(8) Differential Pinion Shaft
(9) 39T Bevel Gear
(10) Differential Gear
(11) Brake Shaft (12T Gear)
(12) Planetary Gear Pin
(13) 27T Planetary Gear
(14) 66T Internal Gear
(15) Differential Bearing Support
(16) Differential Lock Shift Fork

The rear axles are the final mechanism which transmit power from the transmission to the rear wheels. Direction of power transmitted is changed at a right angle by the differential gear (10) and, at the same time, speed is reduced. It is further reduced by the planetary gear to drive the rear axles.

The rear axles (1) are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Nose at All Time	Improper backlash between planetary gear and internal gear	Replace	4-S5, 7
	Bearing worn	Replace	4-S5, 7
	Insufficient or improper type of transmission fluid used	Replace	G-10

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.2 to 0.4 mm 0.0078 to 0.0157 in.	0.5 mm 0.020 in.
Thrust Collar	Thickness	1.55 to 1.65 mm 0.0610 to 0.0650 in.	1.2 mm 0.047 in.
Planetary Gear to Planetary Gear Shaft	Clearance	0.009 to 0.046 mm 0.00035 to 0.00180 in.	0.30 mm 0.0118 in.
Planetary Gear Shaft	O.D.	29.991 to 30.000 mm 1.18075 to 1.18110 in.	–
Planetary Gear	I.D.	38.009 to 38.025 mm 1.4965 to 1.4970 in.	–
Needle	O.D.	3.994 to 4.000 mm 0.1573 to 0.1574 in.	–

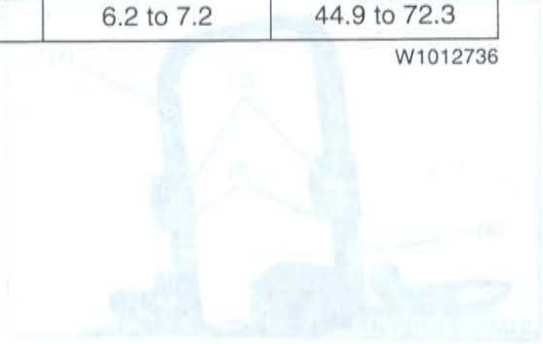
W1013874

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

Item	N·m	kgf·m	ft-lbs
ROPS under frame mounting screw (M16, 9T)	259.9 to 304.6	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
Cylinder hose retaining nut	34.3 to 48.1	3.5 to 4.9	25.3 to 35.4
Rear axle case mounting screw and nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Retainer plate mounting screw	60.8 to 70.6	6.2 to 7.2	44.9 to 72.3

W1012736



4. DISASSEMBLING AND SERVICING

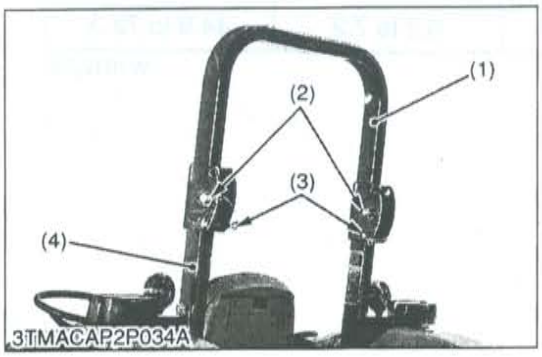
[1] PREPARATION

(1) Separating Rear Axle Case from Transmission Case

Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1011246



ROPS Upper

1. Loosen the ROPS under frame (4) mounting screws. (Do not remove screws.)
2. Remove the ROPS upper frame (1).

(When reassembling)

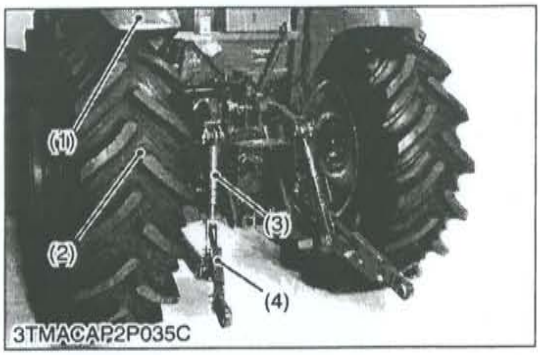
- To assemble the ROPS, fix the upper frame with screw (2) and pin (3) temporarily, then tighten the under frame screws evenly with specified torque.
- Attach the upper frame with screws (2) so not to fall down .

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

ROPS upper frame lift up force at center of upper frame	Reference value	245.2 to 284.2 N 25.0 to 29.0 kgf 55.1 to 63.9 lbs

(1) ROPS Upper Frame
(2) Screw
(3) Pin
(4) ROPS Under Frame

W1011287



Lift Rod, Lower Link, Rear Wheel (L.H.) and Fender (L.H.)

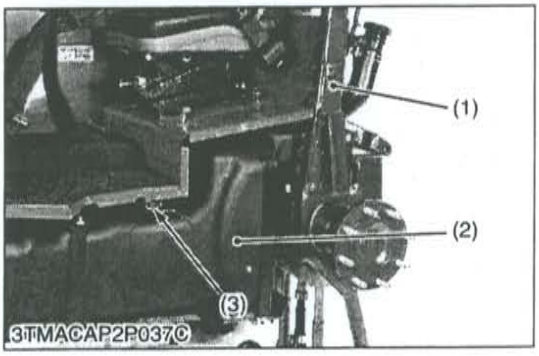
1. Place the disassembling stand under the transmission case.
2. Remove the lift rod (3) and lower link (4).
3. Remove the rear wheel (2) (L.H.).
4. Remove the rear fender (1).

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fender
(2) Rear Wheel
(3) Lift Rod
(4) Lower Link

W1011448



Fuel Tank and ROPS Under (L.H.)

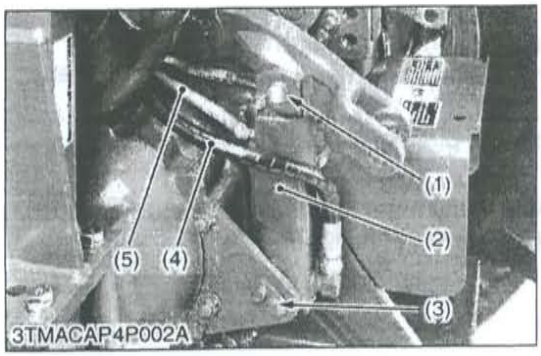
1. Remove the ROPS under (1) (L.H.).
2. Disconnect the wire harness from fuel level sensor (3).
3. Remove the fuel tank (2).

(When reassembling)

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) ROPS Under (L.H.)
(2) Fuel Tank
(3) Fuel Level Sensor

W1011666



Hydraulic Cylinder

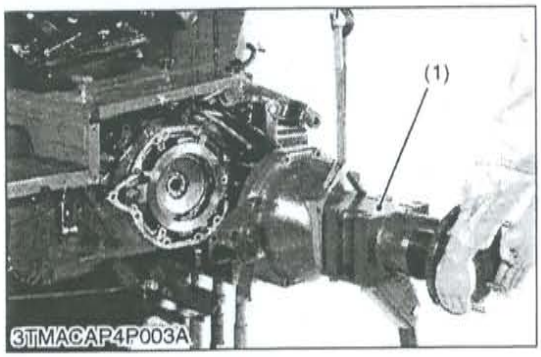
1. Disconnect the cylinder hose (4) and return hose (5).
2. Remove the pin 1 (1), pin 2 (3) and hydraulic cylinder (2).

(When reassembling)

Tightening torque	Cylinder hose retaining nut	34.3 to 48.1 N·m 3.5 to 4.9 kgf·m 25.3 to 35.4 ft-lbs

(1) Pin 1
(2) Hydraulic Cylinder
(3) Pin 2
(4) Cylinder Hose
(5) Return Hose

W1011888



Rear Axle Case

1. Remove the rear axle case mounting screws and nuts.
2. Remove the rear axle assembly (1).

(When reassembling)

- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face.

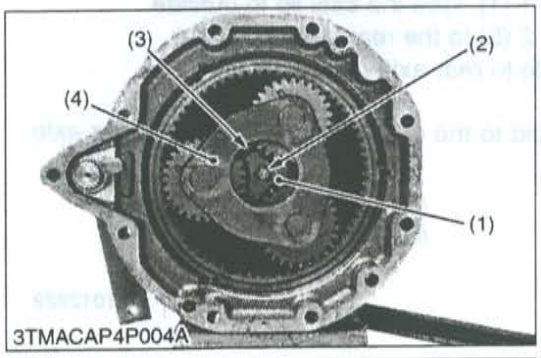
Tightening torque	Rear axle case mounting screw and nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.3 ft-lbs

(1) Rear Axle Case Assembly

W1012185

[2] DISASSEMBLING AND ASSEMBLING

(1) Rear Axle Case



Planetary Gear Support

1. Remove the retainer plate mounting screw (2) and retainer (1).
2. Remove the external circlip (3).
3. Carefully remove the planetary gear support (4).
4. Remove the internal gear (6) and pins (5).

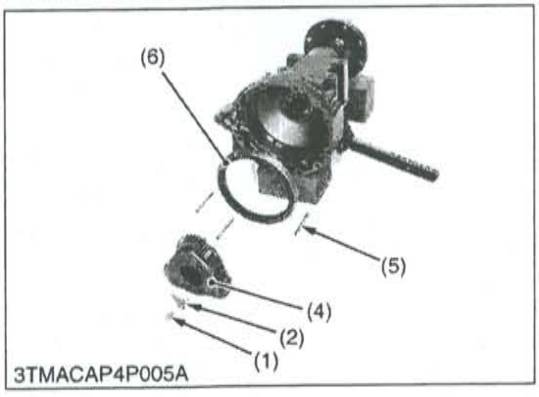
(When reassembling)

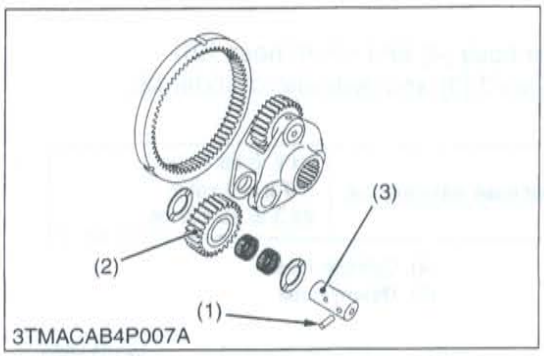
- Be sure to insert the retainer plate (1).

Tightening torque	Retainer plate mounting screw	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.9 to 72.3 ft-lbs

(1) Retainer Plate
(2) Screw
(3) External Circlip
(4) Planetary Gear Support
(5) Pin
(6) Internal Gear

W1012424





3TMACAB4P007A

Planetary Gear

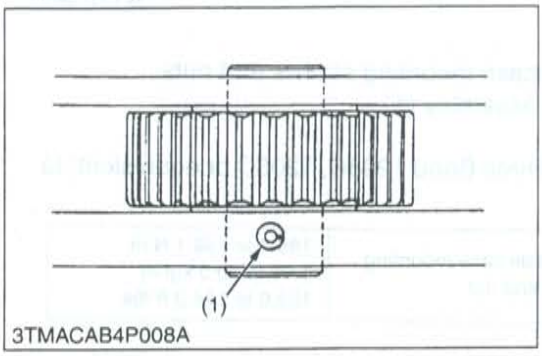
1. Tap the roll pin (1) into the planetary gear shaft (3).
2. Draw out the planetary gear shaft (3), and remove the planetary gear (2).
3. Tap out the roll pin from the planetary gear shaft.

(When reassembling)

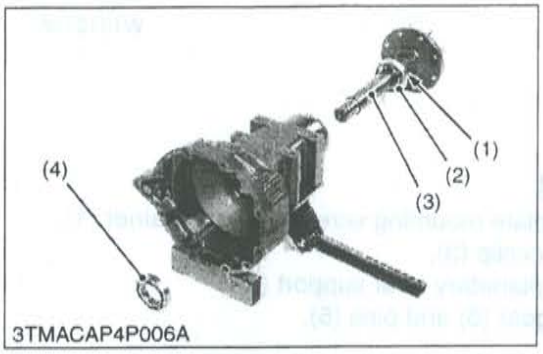
- Apply transmission fluid to the inner surface of planetary gear (2).
- Tap in the roll pin (1) as shown in the figure.

(1) Roll Pin
(2) Planetary Gear
(3) Planetary Gear Shaft

W1012932



3TMACAB4P008A



3TMACAP4P006A

Rear Axle

1. Tap out the rear axle (3) from the rear axle case.
2. Remove the bearing (2) and oil seal (1).

(Assembling Procedure for Rear Axle)

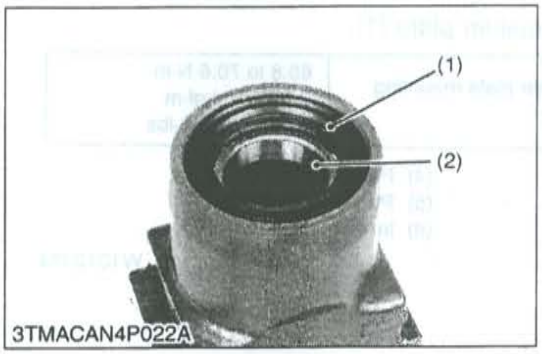
1. Assemble the ball bearing (2) to the rear axle case.
2. Assemble the oil seal 1 (1), face the seal lip to outside.
3. Assemble the oil seal 2 (5) to the rear axle.
4. Assemble the rear axle to rear axle case.

(When reassembling)

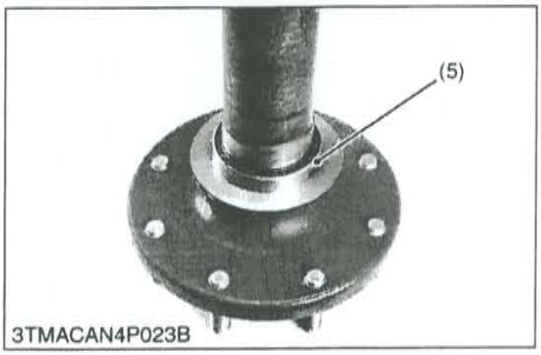
- Apply transmission fluid to the oil seal when insert the rear axle to rear axle case.

(1) Oil Seal 1
(2) Ball Bearing
(3) Ball Bearing
(4) External Circlip
(5) Oil Seal 2

W1012829

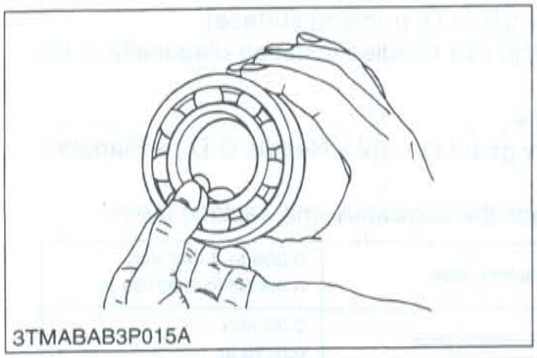


3TMACAN4P022A



3TMACAN4P023B

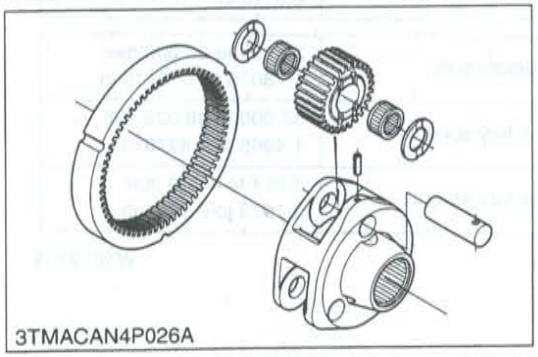
[3] SERVICING


3TMABAB3P015A

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.

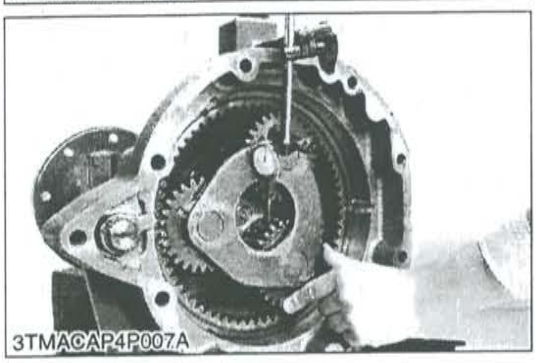
W1024200


3TMACAN4P026A

Needle Bearing

1. Check the needle bearing for abrasion, color, change or other damage.
2. If there is any doubt as to the condition of a needle bearing, replace it.

W1018975

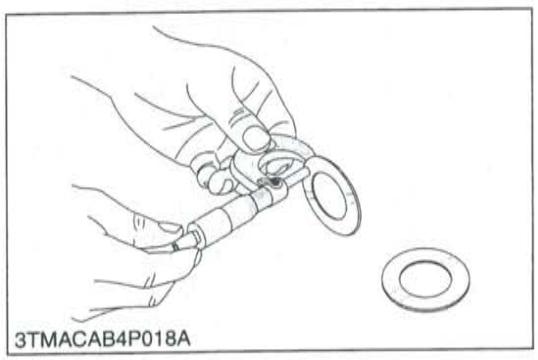

3TMACAP4P007A

Backlash between Internal Gear and Planetary Gear

1. Set a dial indicator (lever type) on the tooth of the planetary gear.
2. Hold the planetary gear support and move only the planetary gear to measure the backlash.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gear and planetary gear	Factory spec.	0.2 to 0.4 mm 0.0078 to 0.0157 in.
	Allowable limit	0.5 mm 0.020 in.

W1013592

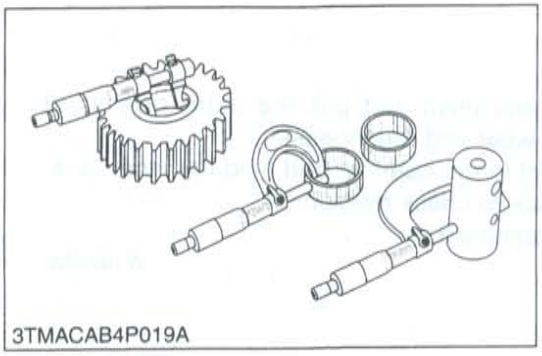

3TMACAB4P018A

Thrust Collar Thickness

1. Measure the thickness of the thrust collar.
2. If the measurement is less than the allowable limit, replace it.

Thrust collar thickness	Factory spec.	1.55 to 1.65 mm 0.0610 to 0.0650 in.
	Allowable limit	1.2 mm 0.047 in.

W1013700


3TMACAB4P019A

Clearance between Planetary Gear and Planetary Gear Shaft

1. Measure the planetary gear shaft O.D. (rubbing surface).
2. Measure the planetary gear I.D. (rubbing surface).
3. Measure the O.D. of the two needles installed diagonally in the needle bearing.
4. Calculate the clearance.
5. (Clearance = Planetary gear I.D. – {(2 × Needle O.D.) + Planetary gear shaft O.D.}).
6. If the clearance exceeds the allowable limit, replace them.

Clearance between planetary gear and planetary gear shaft	Factory spec.	0.009 to 0.046 mm 0.00035 to 0.00180 in.
	Allowable limit	0.30 mm 0.0118 in.

Planetary gear shaft O.D.	Factory spec.	29.991 to 30.000 mm 1.18075 to 1.18110 in.
Planetary gear I.D.	Factory spec.	38.009 to 38.025 mm 1.4965 to 1.4970 in.
Needle O.D.	Factory spec.	3.994 to 4.000 mm 0.1573 to 0.1674 in.

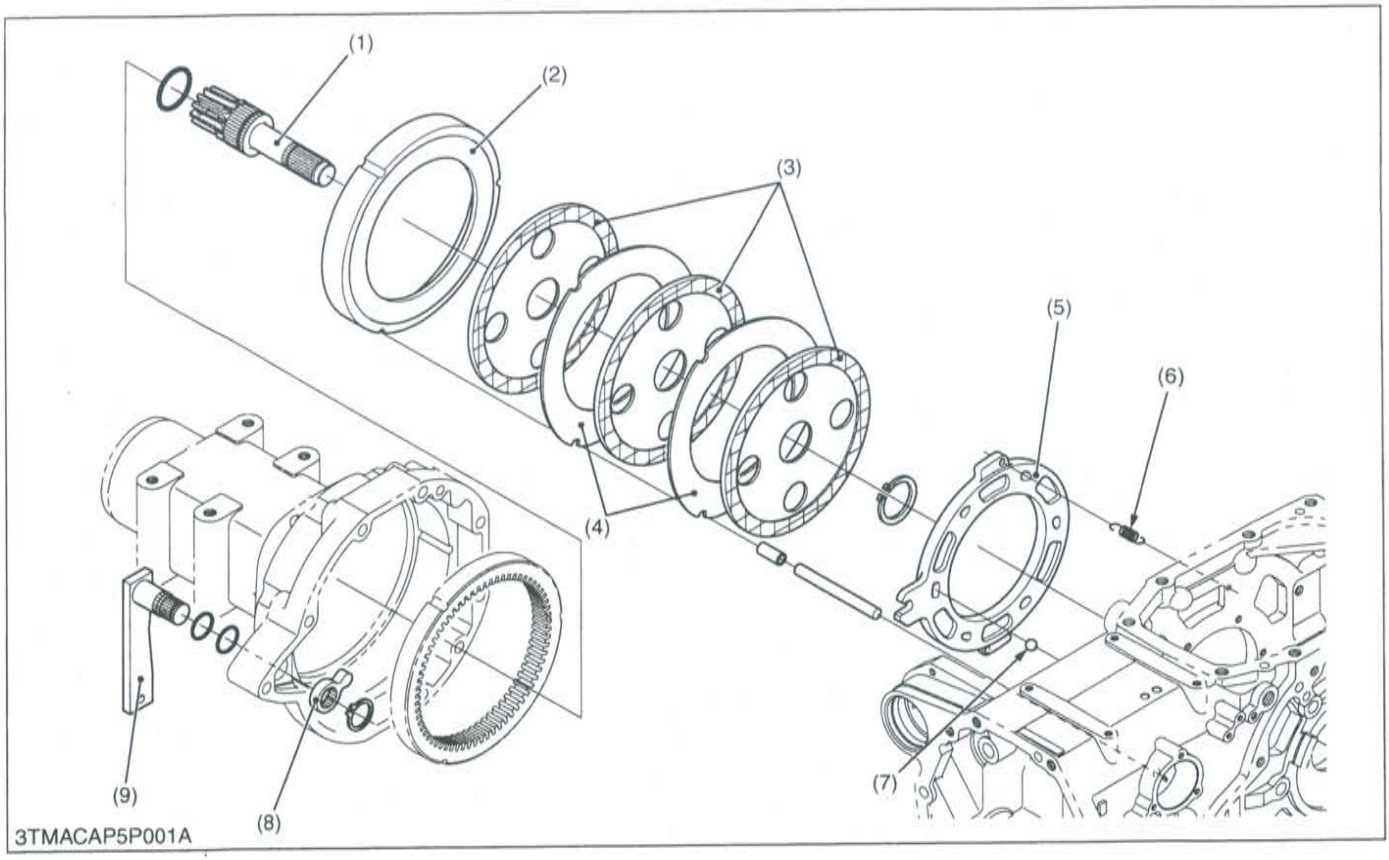
W1013795

5 BRAKES

MECHANISM

CONTENTS

1. STRUCTURE



(1) Brake Shaft
(2) Brake Plate
(3) Brake Disc
(4) Plate
(5) Cam Plate
(6) Spring
(7) Ball
(8) Brake Cam
(9) Brake Cam Lever

These tractors are used hanging type brake pedals to have wider space of the platform.

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.

The parking brake is a mechanical type which is designed to actuate the traveling brakes.

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-S6, 7
	Cam plate warped	Replace	5-S6, 7
Brake Drags	Brake pedal free travel too small	Adjust	5-S4
	Ball holes of cam plate for uneven wear	Replace	5-S5
	Brake pedal return spring weaken or broken	Replace	–
	Brake cam rusted	Repair	5-S5
Poor Braking Force	Brake pedal free travel excessive	Adjust	5-S4
	Brake disc worn	Replace	5-S6, 7
	Cam plate warped	Replace	5-S6, 7
	Brake cam or lever damaged	Replace	5-S6
	Transmission fluid improper	Change	G-10

W1014322

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	40 to 45 mm 1.6 to 1.8 in.	–
Cam Plate	Flatness	–	0.3 mm 0.012 in.
Cam Plate and Ball	Height	25.45 to 25.55 mm 1.002 to 1.0059 in.	25.00 mm 0.9843 in.
Brake Disc	Thickness	4.15 to 4.35 mm 0.1634 to 0.1713 in.	3.3 mm 0.130 in.
Plate	Thickness	2.10 to 2.50 mm 0.0827 to 0.0984 in.	1.5 mm 0.059 in.
Brake Plate	Flatness	–	0.3 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 : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

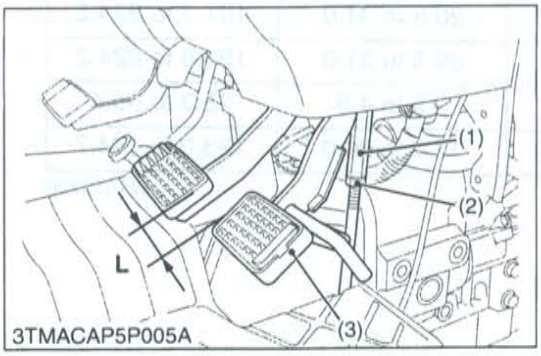
Item	N·m	kgf·m	ft-lbs
ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
Cylinder hose retaining nut	34.3 to 48.1	3.5 to 4.9	25.3 to 35.4
Rear axle case mounting screw and nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Brake Pedal



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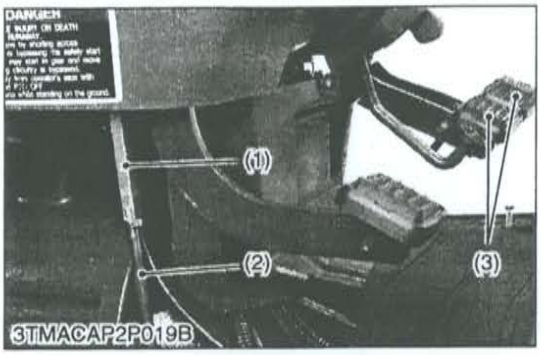


3TMACAP2P019B

Brake Pedal Free Travel

CAUTION

- **Stop the engine and remove the key, then choke the wheel before checking brake pedal.**

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel (**L**) at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut (2) and turn the turnbuckle (1) to adjust the rod length within acceptable limits.

Brake pedal free travel (L)	Factory spec.	40 to 45 mm 1.6 to 1.8 in.

IMPORTANT

- **Keep the free travel in the right and left brake pedals equal.**

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

L : Free Travel

W1011350

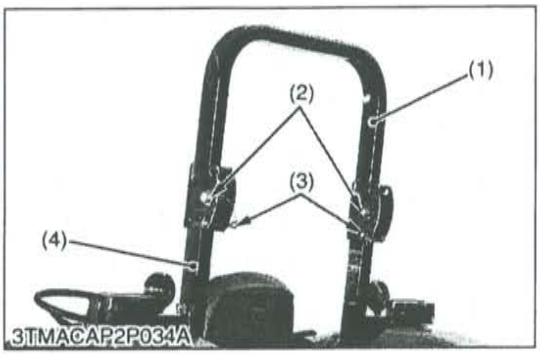
[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case from Transmission Case

Draining Fuel and Transmission Fluid

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1011874



3TMACAP2P034A

ROPS Upper

1. Loosen the ROPS under frame (4) mounting screws. (Do not remove screws.)
2. Remove the ROPS upper frame (1).

(When reassembling)

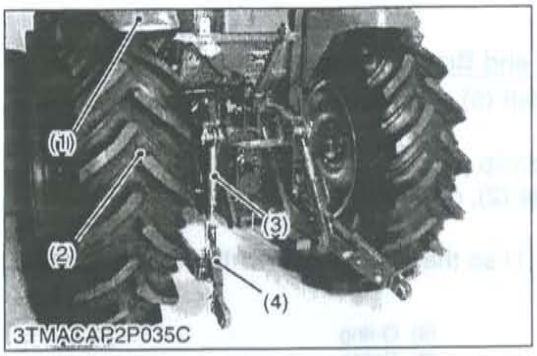
- To assemble the ROPS, fix the upper frame with screw (2) and pin (3) temporarily, then tighten the under frame screws evenly with specified torque.
- Attach the upper frame with screws (2) so not to fall down .

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

ROPS upper frame lift up force at center of upper frame	Reference value	245.2 to 284.2 N 25.0 to 29.0 kgf 55.1 to 63.9 lbs

(1) ROPS Upper Frame
(2) Screw
(3) Pin
(4) ROPS Under Frame

W1011915



Lift Rod, Lower Link, Rear Wheel (L.H.) and Fender (L.H.)

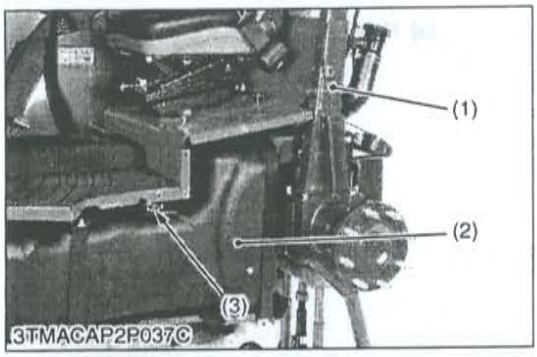
1. Place the disassembling stand under the transmission case.
2. Remove the lift rod (3) and lower link (4).
3. Remove the rear wheel (2) (L.H.).
4. Remove the rear fender (1).

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fender
(2) Rear Wheel
(3) Lift Rod
(4) Lower Link

W1012075



Fuel Tank and ROPS Under (L.H.)

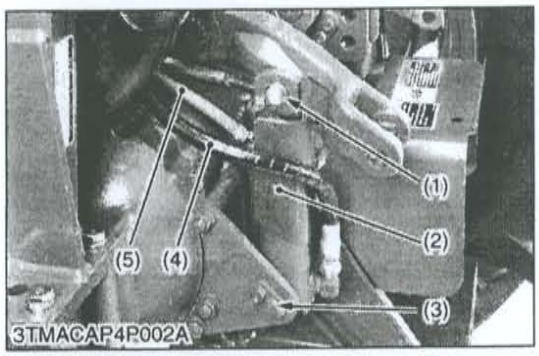
1. Remove the ROPS under (1) (L.H.).
2. Disconnect the wire harness from fuel level sensor (3).
3. Remove the fuel tank (2).

(When reassembling)

Tightening torque	ROPS under frame mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) ROPS Under (L.H.)
(2) Fuel Tank
(3) Fuel Level Sensor

W1012222



Hydraulic Cylinder

1. Disconnect the cylinder hose (4) and return hose (5).
2. Remove the pin 1 (1), pin 2 (3) and hydraulic cylinder (2).

(When reassembling)

Tightening torque	Cylinder hose retaining nut	34.3 to 48.1 N·m 3.5 to 4.9 kgf·m 25.3 to 35.4 ft-lbs

(1) Pin 1
(2) Hydraulic Cylinder
(3) Pin 2
(4) Cylinder Hose
(5) Return Hose

W1012351

Rear Axle Case

1. Remove the rear axle case mounting screws and nuts.
2. Remove the rear axle assembly (1).

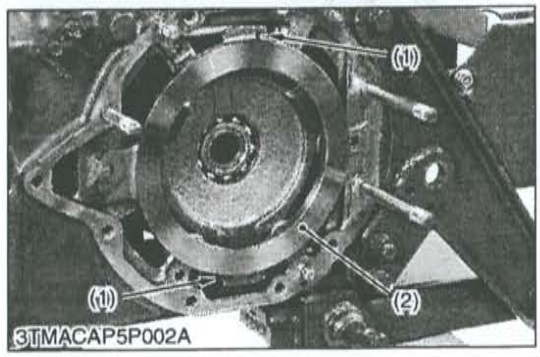
(When reassembling)

- Apply liquid gaskets (Three Bond 1208D, 1206C or equivalent) to joint face.

Tightening torque	Rear axle case mounting screw and nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.3 ft-lbs

(1) Rear Axle Case Assembly

W1012475



Brake Cam Plate

1. Remove the return spring (1).
2. Remove the brake cam plate (2).

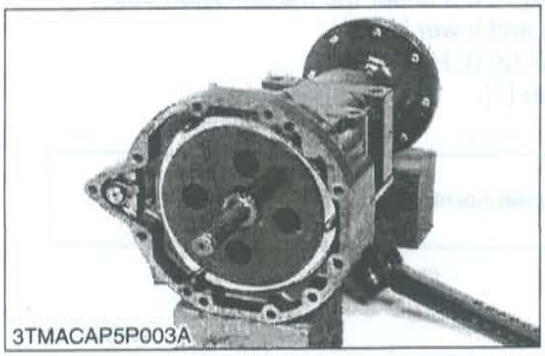
(When reassembling)

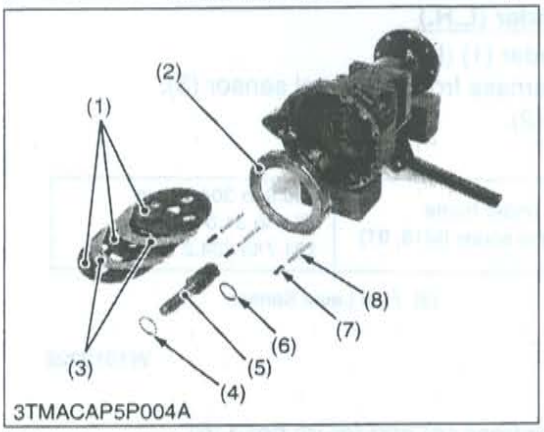
- Apply grease to the brake ball seats. (Do not grease excessively.)

(1) Return Spring
(2) Brake Cam Plate

W1013212

(2) Removing Brake Disc and Plate


3TMACAP5P003A



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Brake Shaft, Brake Disc and Brake Plate

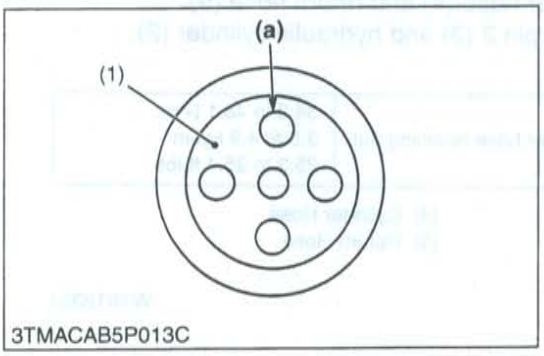
1. Draw out the brake shaft (5) with brake disc (1) and steel plate (3).
2. Remove the external circlip (4).
3. Remove the brake plate (2), collars (7) and pins (8).

(When reassembling)

- Place the brake discs (1) so that the hole **(a)** of the second disc should be overlapped.

(1) Brake Disc
(2) Brake Plate
(3) Steel Plate
(4) External Circlip
(5) Brake Shaft
(6) O-ring
(7) Collar
(8) Pin
(a) Hole

W1012102



3TMACAB5P013C

Brake Cam and Brake Cam Lever

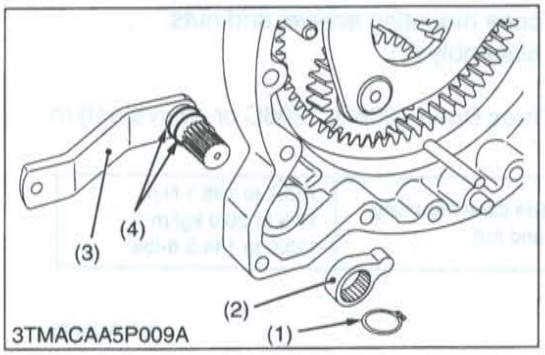
1. Remove the external circlip (1).
2. Remove the brake cam (2) and brake cam lever (3).

(When reassembling)

- Apply grease to the O-ring (4) and take care not to damage the O-ring.

■ **IMPORTANT**

- **Install the brake cam (2) to brake cam lever, aligning the marks on them.**



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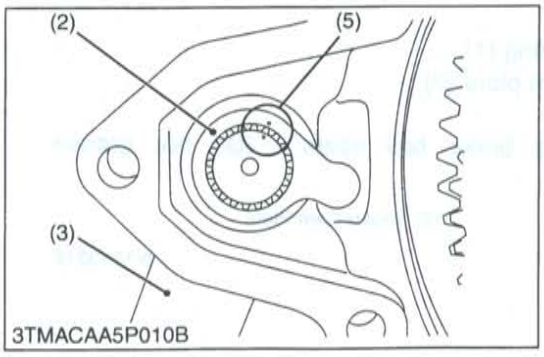
(1) External Circlip
(2) Brake Cam
(3) Brake Cam Lever
(4) O-ring
(5) Aligning Mark

W1012335



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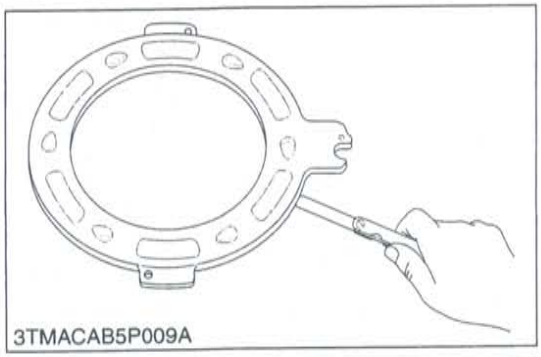
[3] SERVICING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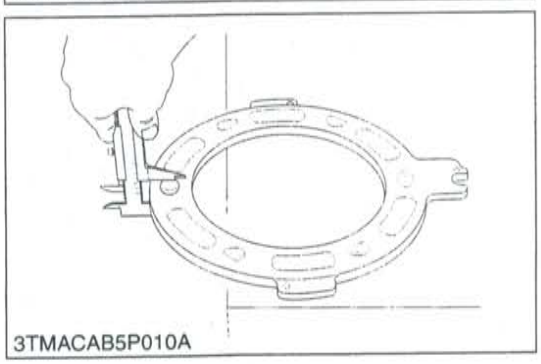
Cam Plate Flatness

1. Place the cam plate on the surface plate.
2. Measure the flatness of cam plate with a feeler gauge at four points on a diagonal line.
3. If the measurement exceeds the allowable limit, replace it.

Cam plate flatness	Allowable limit	0.3 mm 0.012 in.

W1012658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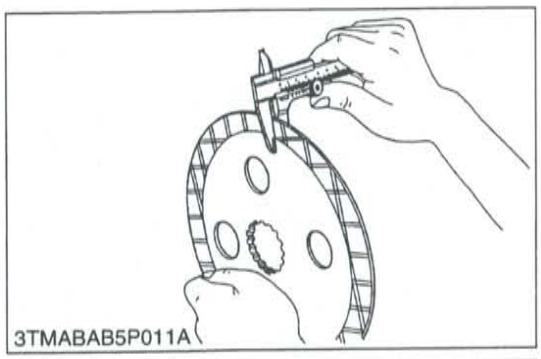
Height of Cam Plate and Ball

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. If the uneven wear is found, replace it.

Height of cam plate and ball	Factory spec.	25.45 to 25.55 mm 1.002 to 1.0059 in.
	Allowable limit	25.00 mm 0.9843 in.

W1012756

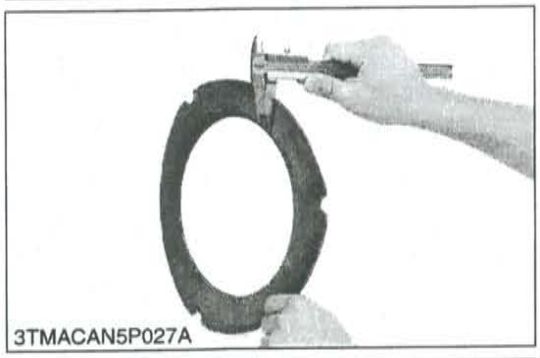

3TMABAB5P011A

Brake Disc Wear

1. Measure the brake disc thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake disc thickness	Factory spec.	4.15 to 4.35 mm 0.1634 to 0.1713 in.
	Allowable limit	3.3 mm 0.130 in.

W1012945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Brake Plate Wear

1. Measure the brake plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake plate wear	Factory spec.	2.1 to 2.5 mm 0.0827 to 0.0984 in.
	Allowable limit	1.5 mm 0.059 in.

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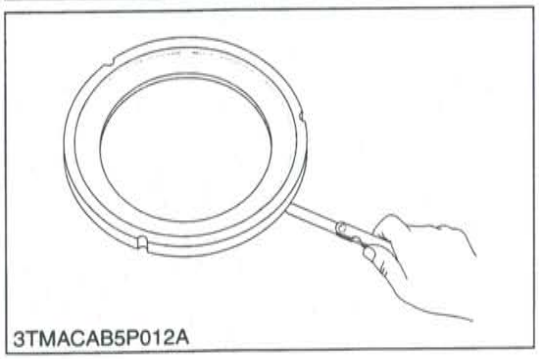

3TMACAB5P012A

Brake Plate Flatness

1. Place the brake plate on the surface plate.
2. Measure the flatness of brake plate with a feeler gauge at four points on a diagonal line.
3. If the measurement exceeds the allowable limit, replace it.

Brake plate flatness	Allowable limit	0.3 mm 0.012 in.

W1013149

6 FRONT AXLE

MECHANISM

CONTENTS

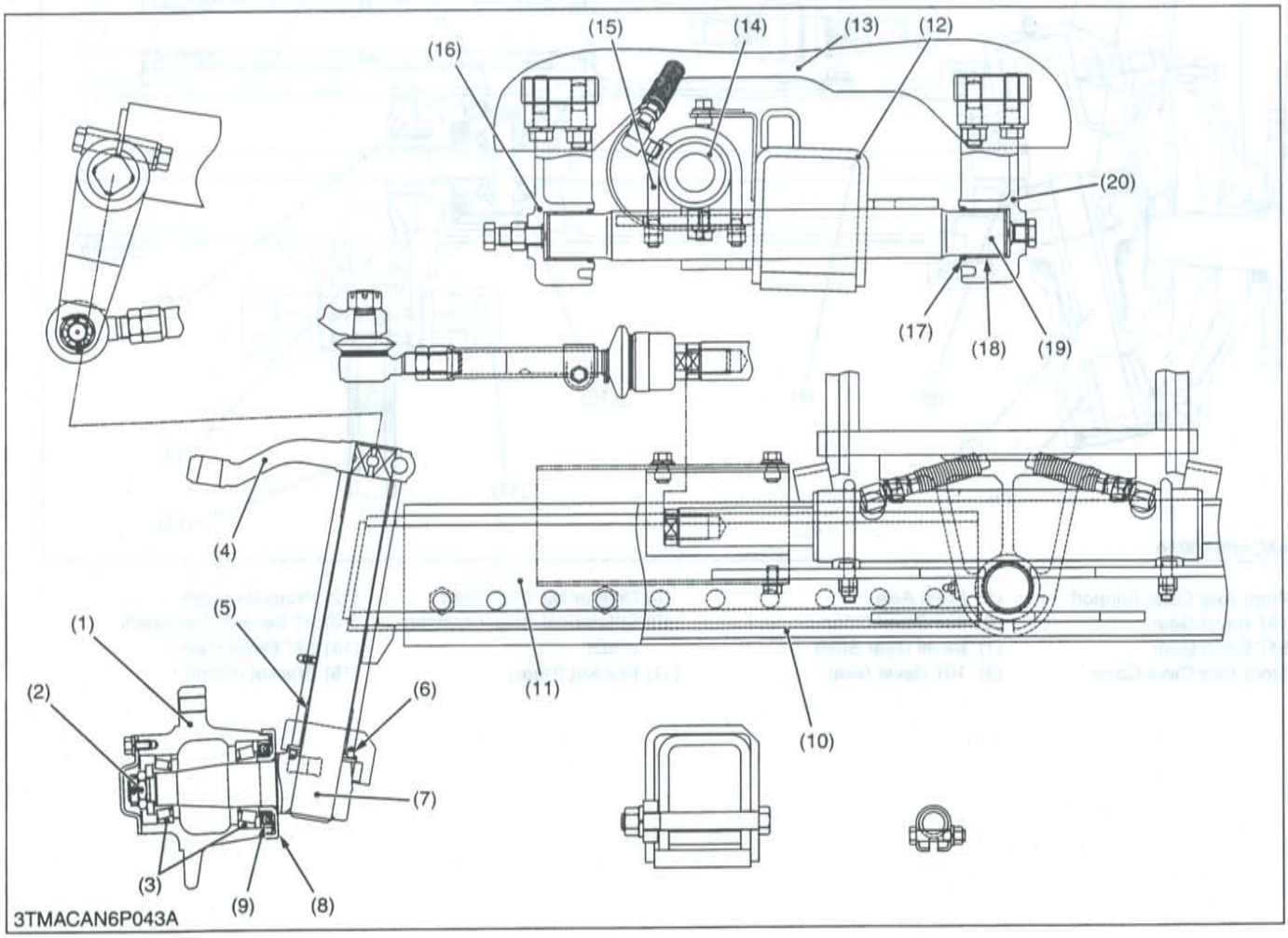
1. STRUCTURE

The front axle supports the front of tractor and facilitates steering.
There are two kinds of front axles.
The two-wheel drive axle has free-running front wheels and four-wheel drive axle has powered front wheels.

■ **NOTE**

- **Refer to "6. FRONT AXLE" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

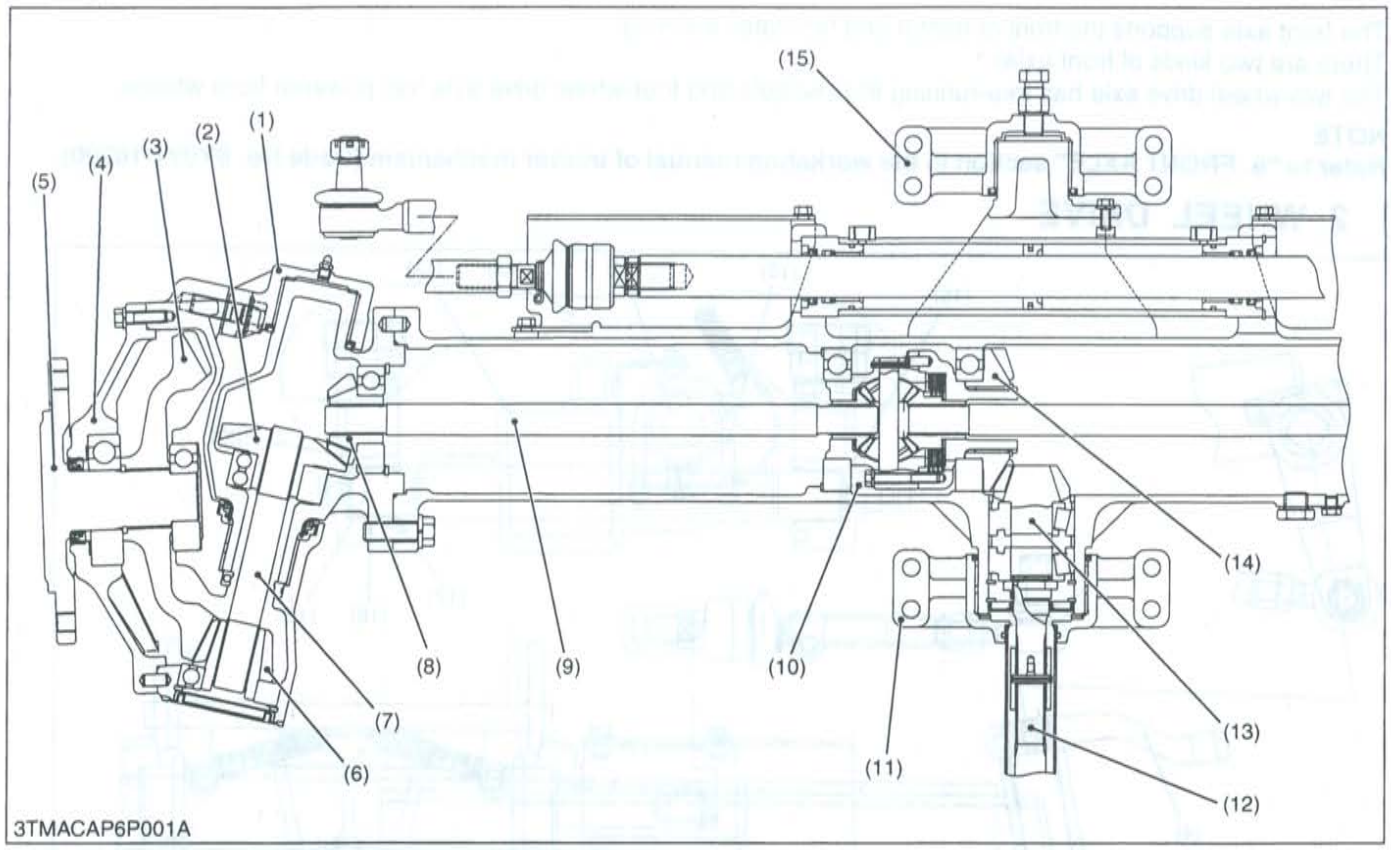
[1] 2 WHEEL DRIVE



(1) Front Wheel Hub
(2) Slotted Nut
(3) Taper Roller Bearing
(4) Knuckle Arm
(5) Knuckle Shaft Bushing
(6) Knuckle Shaft Dowel Pin
(7) Knuckle Shaft
(8) Knuckle Dust Proof Cover
(9) Knuckle Stub Gasket
(10) Front Axle Middle
(11) Front Axle
(12) Front Axle Support
(13) Front Axle Bracket
(14) Power Steering Cylinder
(15) Power Steering Cylinder Bracket
(16) Bracket (Front)
(17) Oil Seal
(18) Bushing
(19) Center Pin
(20) Bracket (Rear)

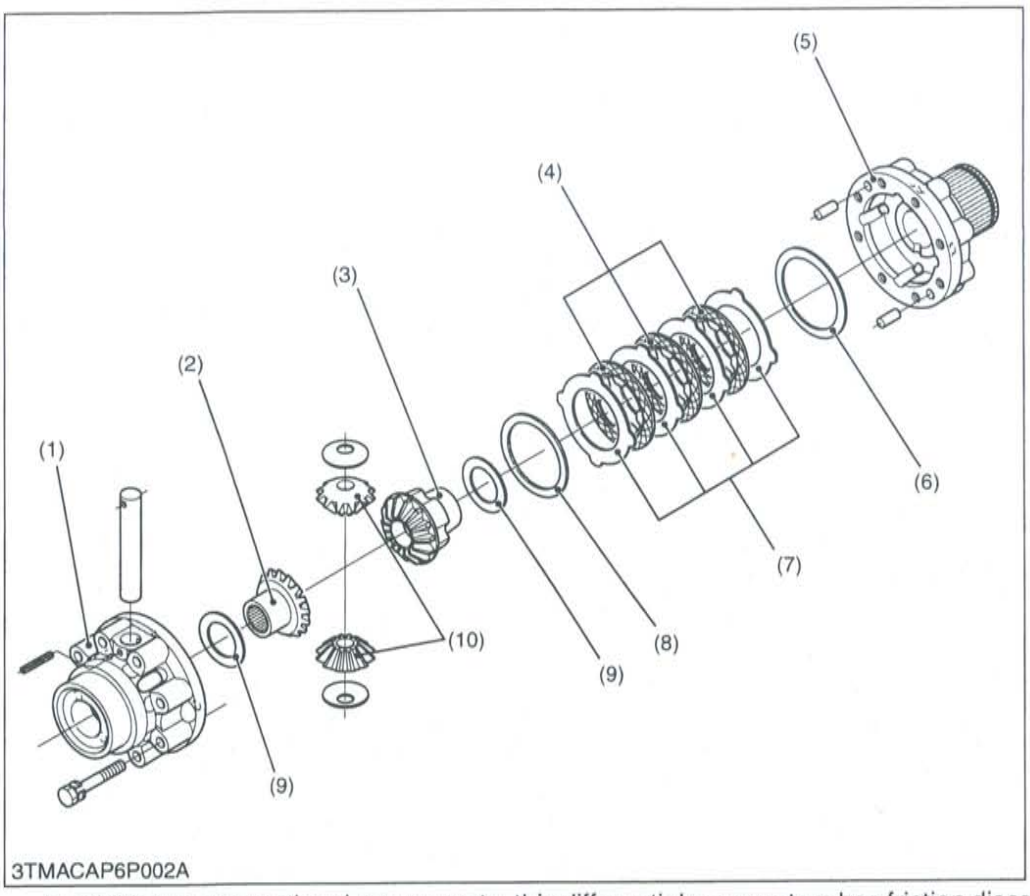
The front axle of the 2WD model is constructed as shown above.
The knuckle shaft (7) is installed to the front axle (11) by the **"RUMOAN"** method.
With this method, the shape of the front axle is relatively simple, and front axle is supported at its center with the front axle support (12) on the front axle bracket (13), so that steering operation is stable even on an uneven ground encountered in a farm field.

[2] 4 WHEEL DRIVE



(1) Front Axle Case Support
(2) 18T Bevel Gear
(3) 51T Bevel Gear
(4) Front Axle Case Cover
(5) Front Axle
(6) 10T Bevel GEar
(7) Bevel Gear Shaft
(8) 10T Bevel Gear
(9) Differential Yoke Shaft
(10) Differential Gear Assembly (LSD)
(11) Bracket (Rear)
(12) Propeller Shaft
(13) 9T Bevel Pinion Shaft
(14) 21T Bevel Gear
(15) Bracket (Front)

[3] LIMITED SLIP DIFFERENTIAL (LSD) [M7040]



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(1) Differential Case
(2) Side Gear
(3) Side Gear (LSD)
(4) Friction Disc
(5) Case Cover
(6) Belleville Washer (Cupped Spring Washer)
(7) Steel Plate
(8) Adjustment Shim (LSD)
(9) Adjustment Shim (Side Gear)
(10) Pinion Gear

W1013358

In addition to conventional components, this differential gear system has friction discs (4) on one side of a side gear (LSD) (3), steel plates (7) on the differential gear case cover (5), belleville washer (cupped spring washer) (6), and an adjustment shim (LSD) (8).

The steel plates (7) and the friction discs (4) are coupled and pressed against each other with the belleville washer (cupped spring washer) (6), which assembles the side gear (LSD) (3) and the differential case (1) into one.

Therefore, this differential gear system is always differential lock condition under normal conditions.

When a tractor is driving straight ahead, the differential gear is in differential lock condition and the right and left wheels rotate at the same speed, allowing stable running in a straight line.

When the tractor takes a turn, the right and left wheels are forced to rotate in different speeds, and the difference in rotation makes the right and left side gears rotate in different speeds.

At this point, if a torque higher than a specified load level is applied the belleville washer (cupped spring washer) (6), the spring operates and the steel plate is released from the friction disc.

As a result, the right and left side gears rotate differently just as usual differential gear, allowing smooth cornering.

A load specified on the spring is adjusted by changing thickness of the adjustment shim (LSD) (8).

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Tire pressure uneven	Adjust	G-78
	Improper toe-in adjustment (improper alignment)	Adjust	6-S6
	Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive	Replace	6-S18, 26
	Front axle rocking force too small	Adjust	6-S7
	Front wheel sway excessive	Replace	6-S6
	Tie-rod end loose	Tighten	6-S6
	Aeration of the hydraulic fluid in power steering circuit	Bleed	–
	Knuckle shaft bushings worn [2WD model]	Replace	6-S18
Front Wheels Can Not Be Driven [4WD Type]	Propeller shaft broken	Replace	6-S9
	Front wheel drive gears in transmission broken	Replace	–
	Front differential gear broken	Replace	6-S15
	Coupling displaced	Reassemble	6-S9
Noise [4WD Type]	Gear backlash excessive	Adjust or replace	–
	Oil insufficient	Replenish	G-10
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–

W1014322

2. SERVICING SPECIFICATIONS

[2WD]

Item		Factory Specification	Allowable Limit
Toe-in		1.0 to 5.0 mm 0.04 to 0.20 in.	–
Front Wheel	Steering Angle	0.925 to 0.960 rad 53 to 55 °	–
	Axial Sway (Face Runout of Wheel at Bead)	Less than 5.0 mm 0.197 in.	–
Front Axle	Swing Angle	0.157 to 0.227 rad 9 to 13 °	–
Front Wheel Hub	Turning Torque	2.94 to 4.90 N·m 0.3 to 0.5 kgf·m 2.17 to 3.62 ft-lbs	–
Front Axle Middle Boss to Bracket Bushing	Clearance	0.050 to 0.150 mm 0.00197 to 0.00590 in.	0.35 mm 0.0138 in.
Front Axle Middle Boss	O.D.	39.938 to 40.000 mm 1.57236 to 1.57480 in.	–
Bracket Bushing	I.D.	40.050 to 40.088 mm 1.57677 to 1.57827 in.	–
Knuckle Shaft (Kingpin) to Bushing	Clearance	0.020 to 0.125 mm 0.00079 to 0.00492 in.	0.35 mm 0.0138 in.
Knuckle Shaft	O.D.	37.975 to 38.000 mm 1.49508 to 1.49606 in.	–
Bushing	I.D.	38.020 to 38.100 mm 1.49685 to 1.50000 in.	–

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[4WD]

Item		Factory Specification	Allowable Limit
Toe-in		2.0 to 8.0 mm 0.078 to 0.315 in.	–
Front Wheel	Steering Angle	0.925 to 0.960 rad 53 to 55 °	–
	Axial Sway (Face Runout of Wheel at Bead)	Less than 5.0 mm 0.197 in.	–
Bevel Gear Case to Stopper	Clearance	Below 0.5 mm 0.02 in.	–
Front Axle	Swing Angle	0.157 to 0.227 rad 9 to 13 °	–
Bevel Gear to Bevel Pinion Shaft	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Differential Case to Differential Side Gear	Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	32.025 to 32.050 mm 1.26083 to 1.26181 in.	–
Differential Side Gear Boss	O.D.	31.959 to 31.975 mm 1.25823 to 1.25886 in.	–
Differential Pinion Shaft to Pinion Gear	Clearance	0.016 to 0.052 mm 0.00063 to 0.00205 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	O.D.	15.966 to 15.984 mm 0.62858 to 0.62929 in.	–
Differential Pinion Gear	I.D.	16.000 to 16.018 mm 0.62992 to 0.63063 in.	–
Pinion Gear to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.0039 to 0.0118 in.	0.4 mm 0.016 in.
Pinion Gear to LSD Side Gear	Backlash	0.1 to 0.3 mm 0.0039 to 0.0118 in.	0.4 mm 0.016 in.
Spiral Bevel Pinion Shaft (Pinion Shaft Only)	Turning Torque	1.43 to 1.56 N·m 0.145 to 0.16 kgf·m 1.05 to 1.15 ft-lbs	–
LSD Disc	Slip Torque	34 to 44 N·m 3.5 to 4.5 kgf·m 25.4 to 32.5 ft-lbs	–
Front Bracket to Rear Bracket Bushing	Alloy Thickness	0.57 mm 0.0224 in.	–
Rear Differential Case Boss	O.D.	89.965 to 90.000 mm 3.5420 to 3.5433 in.	–
Front Differential Case Boss	O.D.	59.97 to 60.000 mm 2.3611 to 2.3622 in.	–

W1029325

Item		Factory Specification	Allowable Limit
Front Wheel Case Support Bushing	Alloy Thickness	0.57 mm 0.0224 in.	–
Bearing Retainer	O.D.	59.97 to 60.00 mm 2.36102 to 2.36220 in.	–
Front Wheel Case Bushing	Alloy Thickness	0.57 mm 0.0224 in.	–
Bevel Gear Case	O.D.	54.97 to 55.00 mm 2.1642 to 2.1653 in.	–
Bevel Gear in Bevel Gear Case	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Bevel Gear in Front Wheel Case	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 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 : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

[2WD]

Item	N·m	kgf·m	ft-lbs
Tie-rod end lock nut	167.7 to 196.1	17.1 to 20.0	123.7 to 144.7
Front axle rocking force adjusting screw	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.3 to 108.5
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Front wheel mounting nut (M14)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Bracket mounting nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Bracket mounting screw	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Front wheel hub slotted nut	29.4 to 39.2	3.0 to 4.0	21.7 to 28.9
Front wheel mounting stud bolt	83.3 to 98.0	8.5 to 10.0	61.5 to 72.3
Tie-rod end slotted nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Knuckle arm mounting screw and nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5

W1012736

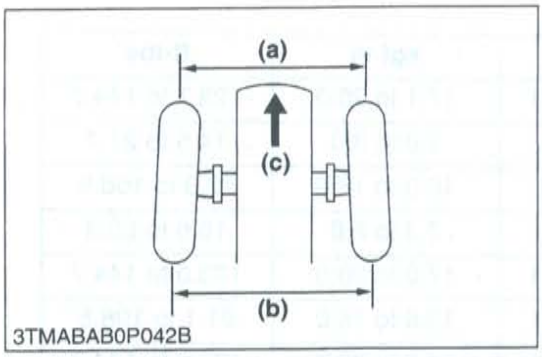
[4WD]

Tie-rod end lock nut	167.7 to 196.1	17.1 to 20.0	123.7 to 144.7
Front axle rocking force adjusting screw	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.3 to 108.5
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Front wheel mounting nut (M16)	259 to 304	26.5 to 31.0	191.7 to 224.2
Bracket mounting nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Bracket mounting screw	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Tie-rod end slotted nut	156.9 to 176.5	16.0 to 18.0	115.7 to 130.2
Tie-rod joint lock nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Bevel gear case mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Front wheel case support mounting screw (M16, 9T)	259.9 to 304.0	26.5 to 31.0	191.7 to 224.2
Front wheel case cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Differential case cover mounting screw (M8, 9T)	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3

W1012736

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



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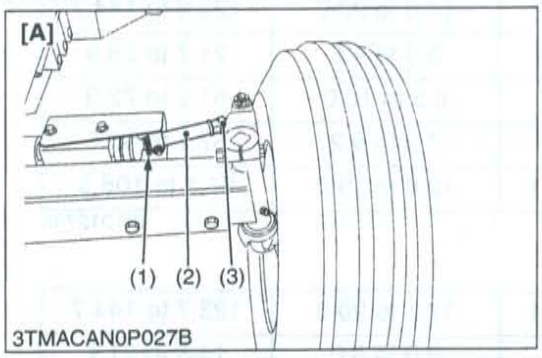

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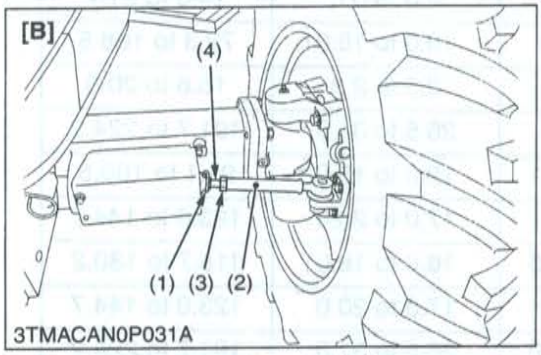

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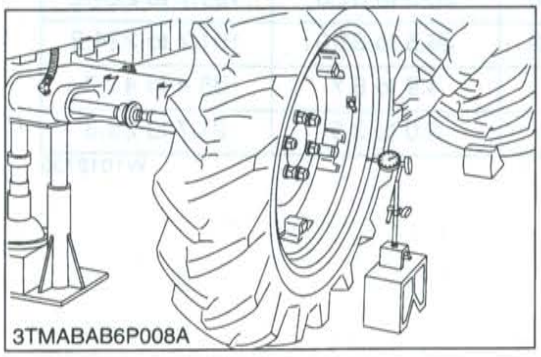

3TMABAB6P008A

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 shorter than rear distance.
7. If not, adjust tie-rod length.

Toe-in (**b–a**)	Factory spec.	2WD	1.0 to 5.0 mm 0.04 to 0.20 in.
		4WD	2.0 to 8.0 mm 0.078 to 0.315 in.

■ Toe-in Adjustment

1. Remove the cylinder covers.
2. Detach the snap ring (1).
3. Loosen the tie-rod end lock nut (3).
4. Turn the tie-rod joint (2) to adjust until the proper toe-in measurement is obtained. (2WD model)
   Turn the rod end (4) to adjust until the proper toe-in measurement is obtained. (4WD model)
5. Retighten the tie-rod nut (3).
6. Attach the snap ring (1) of the tie-rod joint.

Tightening torque	Tie-rod end lock nut	167.7 to 196.1 N·m 17.1 to 20.0 kgf·m 123.7 to 144.7 ft-lbs

(1) Snap Ring
(2) Tie-rod Joint
(3) Tie-rod End Lock Nut
(4) Rod End

(a) Wheel-to-wheel distance at front
(b) Wheel-to-wheel distance at rear
(c) "FRONT"
[A] 2WD Model
[B] 4WD Model

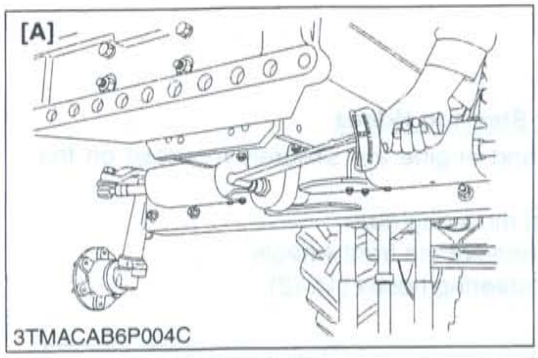
W1022542

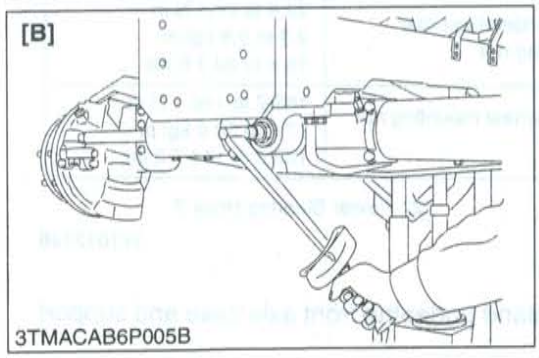
Axial Sway of Front Wheel

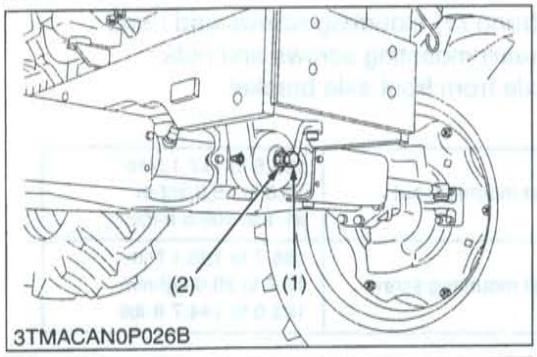
1. Jack up the front side of tractor.
2. Set a dial gauge on the outside of rim.
3. Turn the wheel slowly and rear the runout of rim.
4. If the measurement exceeds the factory specifications, check the bearing, rim and front wheel hub.

Axial sway of front wheel (Face runout of wheel at bead)	Factory spec.	Less than 5.0 mm 0.197 in.

W1012092







Adjusting Front Axle Pivot

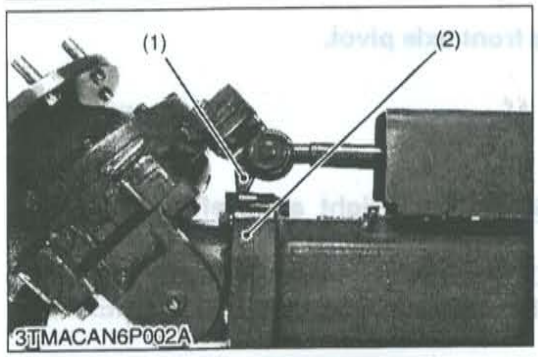
1. Jack up the tractor body, then loosen the front axle rocking force adjusting lock nut (2).
2. Measure the adjusting screw tightening torque.
3. If tightening torque is not within the factory specifications, adjust the front axle rocking force adjusting screw (1).
4. After adjustment, tighten the lock nut firmly.

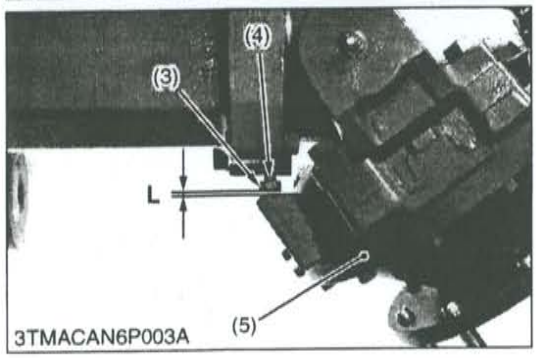
Tightening torque	Front axle rocking force adjusting screw	19.6 to 29.4 N·m 2.0 to 3.0 kgf·m 14.5 to 21.7 ft-lbs
	Front axle rocking force adjusting lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 ft-lbs

(1) Front Axle Rocking Force Adjusting Screw
(2) Front Axle Rocking Force Adjusting Lock Nut

[A] 2WD Model
[B] 4WD Model

W1012203





Adjusting between Bevel Gear Case and Stopper [4WD Model]

1. Inflate the tires to the specified pressure.
2. Steer the wheels to the extreme right until the knuckle arm (1) contacts with the bevel gear case (2).
3. If the knuckle arm (1) can not be contacted with the bevel gear case (2), shorten the length of stopper (3).
4. Keeping the knuckle arm (1) contact with the bevel gear case (2), make a specified length as shown in the table.
5. After adjustment, secure the stopper with the lock nut (4).
6. For adjusting the left steering angle, perform the same procedure as mentioned in right steering angle.

Clearance between bevel gear case and stopper (L)	Factory spec.	Below 0.5 mm 0.02 in.

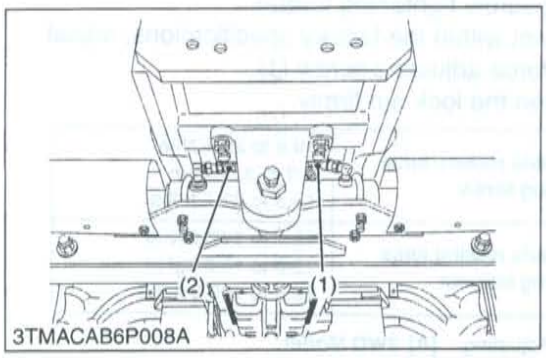
(1) Knuckle Arm
(2) Bevel Gear Case
(3) Stopper
(4) Lock Nut
(5) Front Gear Case

L : Clearance

W1012461

[2] PREPARATION

(1) Separating Front Axle [2WD Model]



Front Wheel and Power Steering Hoses

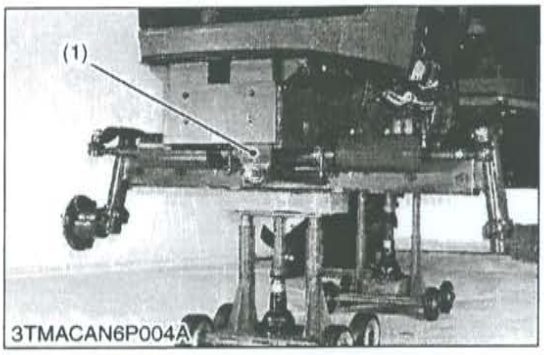
1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Loosen the front wheel mounting nuts.
3. Lift the front axle and remove the front wheels.
4. Disconnect the power steering hoses (1), (2).

(When reassembling)

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Front wheel mounting nut (M14)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

(1) Power Steering Hose 1 (2) Power Steering Hose 2

W1012746



Front Axle

1. Place a disassembly stand under the front axle case and support it with a jack.
2. Remove the bracket (front) (1) mounting screws and nuts.
3. Remove the bracket (rear) mounting screws and nuts.
4. Separating the front axle from front axle bracket.

(When reassembling)

Tightening torque	Bracket mounting nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs
	Bracket mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

■ **IMPORTANT**

- **Be sure to adjust the front axle pivot.**

(1) Front Bracket

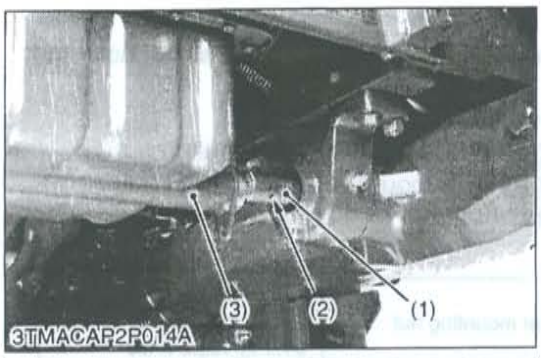
W1012918

(2) Separating Front Axle [4WD Model]

Draining Front Axle Gear Case (Right and Left) and Front Differential Case Oil

1. Refer to "7. CHECK AND MAINTENANCE" and "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

W1013103



Propeller Shaft

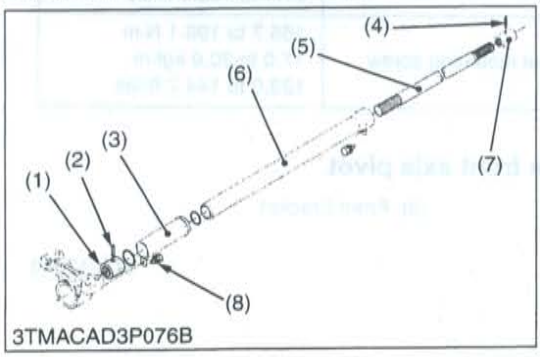
1. Slide the propeller shaft cover (3) after removing the screw (8).
2. Tap out the roll pins (2) and then slide the coupling (1) to the rear.

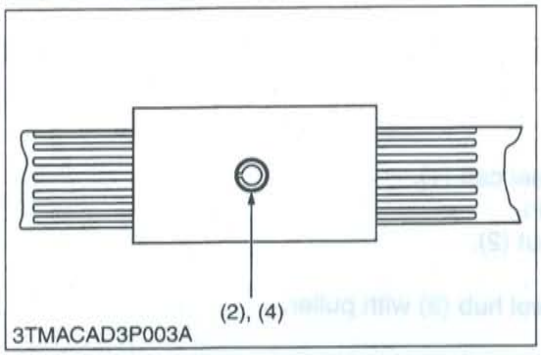
(When reassembling)

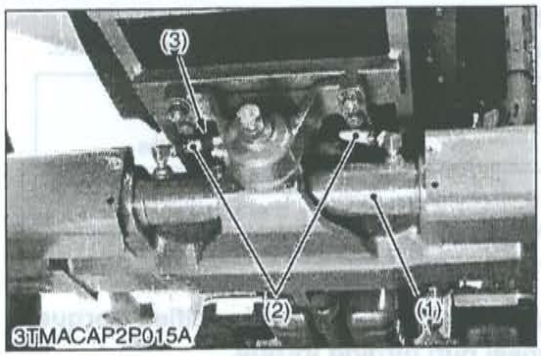
- Apply grease to the splines of the propeller shaft (5) and pinion shaft.
- Tap in the roll pins (2) as shown in figure.

(1) Coupling
(2) Roll Pin
(3) Propeller Shaft Cover
(4) Roll Pin
(5) Propeller Shaft
(6) Cover
(7) Coupling
(8) Screw

W1018497







Front Wheel and Power Steering Hoses

1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Remove the front wheel.
3. Lift the front axle and remove the front wheels.
4. Disconnect the power steering hoses (1), (2).

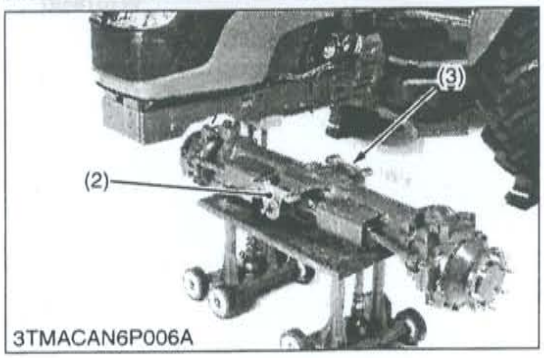
(When reassembling)

- Connect the power steering hose with blue tape to the R.H..

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Front wheel mounting nut (M16)	259 to 304 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs

(1) Power Steering Hose 1
(2) Power Steering Hose 2
(3) Blue Tape

W1013645



Front Axle

1. Place a disassembling stand under the front axle case and support it with a jack.
2. Disconnect the breather hose (1).
3. Remove the bracket (front) (3) mounting screws and nuts.
4. Remove the bracket (rear) (2) mounting screws and nuts.
5. Separate the front axle from front axle bracket.

(When reassembling)

Tightening torque	Bracket mounting nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs
	Bracket mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

■ **IMPORTANT**

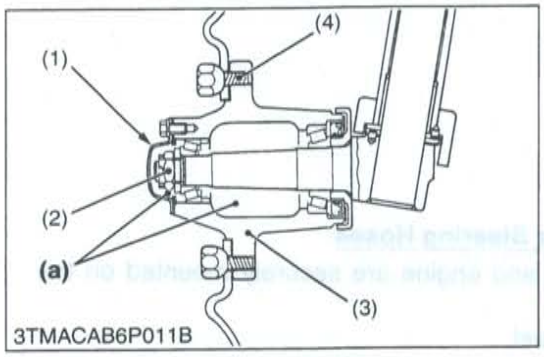
- **Be sure to adjust the front axle pivot.**

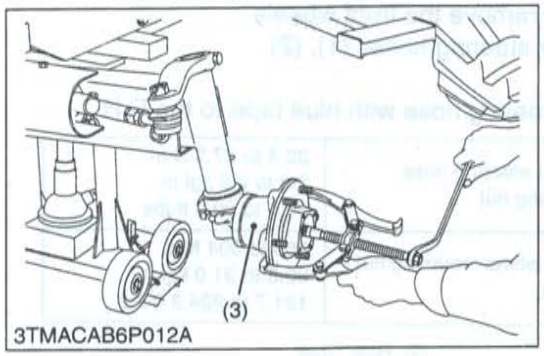
(1) Breather Hose
(2) Rear Bracket
(3) Front Bracket

W1013843

[3] DISASSEMBLING AND ASSEMBLING

(1) Disassembling Front Axle [2WD Model]





Front Wheel Hub

1. Remove the front wheel cap (1).
2. Draw out the cutter pin.
3. Remove the slotted nut (2).
4. Remove the collar.
5. Remove the front wheel hub (3) with puller.

(When reassembling)

- Replace cotter pin with a new one.
- Apply grease to the oil seal and bearing in the front wheel hub.

Tightening torque	Front wheel hub slotted nut	29.4 to 39.2 N·m 3.0 to 4.0 kgf·m 21.7 to 28.9 ft-lbs
	Front wheel mounting stud bolt (M14)	83.3 to 98.0 N·m 8.5 to 10.0 kgf·m 61.5 to 72.3 ft-lbs

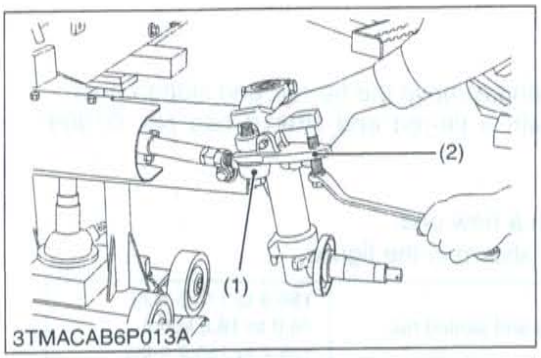
■ **IMPORTANT**

- **After tightening the slotted nut to the specified torque, measure the front wheel hub turning torque.**
- **If the measurement is not within the factory specifications, adjust with the slotted nut.**

Front wheel hub turning torque	Factory spec.	2.94 to 4.90 N·m 0.3 to 0.5 kgf·m 2.17 to 3.62 ft-lbs

(1) Front Wheel Cap
(2) Slotted Nut
(3) Front Wheel Hub
(4) Stud Bolt
(a) Grease

W1014230



3TMACAB6P013A

Tie-rod

1. Pull out the cotter pin and loosen the tie-rod end nut.
2. Disconnect the tie-rod (1) with a tie-rod end lifter (2) (Code No. 07909-39051).
3. Remove the tie-rod end nut and tie-rod end.

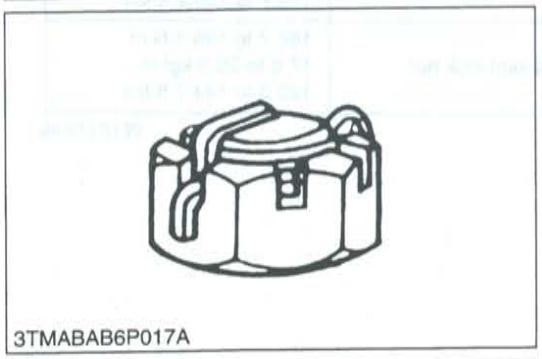
(When reassembling)

- Replace cotter pin with a new one.
- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure.

Tightening torque	Tie-rod end slotted nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

(1) Tie-rod
(2) Tie-rod End Lifter

W1014520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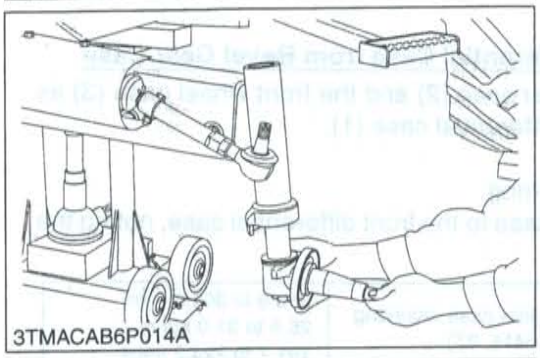

3TMACAB6P014A

Knuckle Shaft

1. Remove the knuckle arm and remove the knuckle shaft from the front axle.

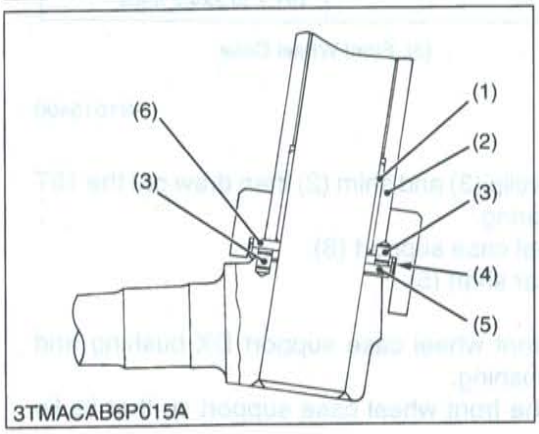
(When reassembling)

- Assemble the knuckle shaft, making sure that the hole of the thrust collars (5), (6) at properly fitted to the knuckle shaft dowel pins (3).
- When lift the knuckle shaft, the knuckle arms must be mounted so that the clearance between the knuckle arms and front axle is 0.3 to 1.0 mm (0.012 to 0.039 in.).

Tightening torque	Knuckle arm mounting screw and nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

(1) Knuckle Shaft Bushing
(2) Front Axle
(3) Dowel Pin
(4) Thrust Collar Cap
(5) Thrust Collar 1
(6) Thrust Collar 2

W1014768



3TMACAB6P015A

(2) Disassembling Front Axle [4WD Model]


3TMACAP6P003A

Tie-rod

1. Pull out the cotter pin and remove the tie-rod end slotted nuts.
2. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(When reassembling)

- Replace cotter pin with a new one.
- Bend the cotter pin as shown in the figure.

Tightening torque	Tie-rod end slotted nut	156.9 to 176.5 N·m 16.0 to 18.0 kgf·m 115.7 to 130.2 ft-lbs
	Tie-rod joint lock nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

W1015246


3TMABAB6P017A

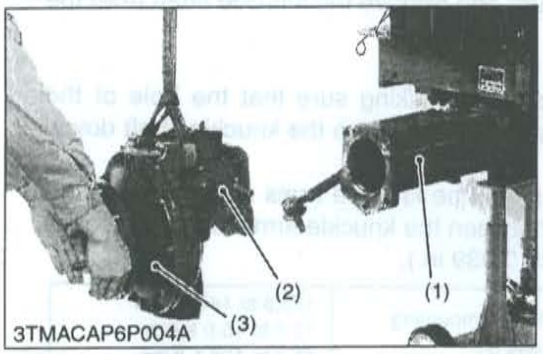
Separating of Front Differential Case from Bevel Gear Case

1. Remove the bevel gear case (2) and the front wheel case (3) as a unit from the front differential case (1).

(When reassembling)

- Apply grease to the O-ring.
- Install the bevel gear case to the front differential case, noting the O-ring.

Tightening torque	Bevel gear case mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs



3TMACAP6P004A

(1) Front Differential Case
(2) Bevel Gear Case
(3) Front Wheel Case

W1015400

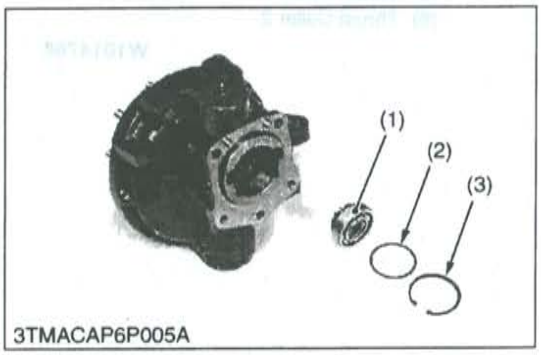
Bevel Gear Case

1. Remove the internal circlip (3) and shim (2) then draw out the 18T bevel gear (1) with bearing.
2. Remove the front wheel case support (8).
3. Draw out the bevel gear shaft (5).

(When reassembling)

- Apply grease to the front wheel case support DX bushing and front wheel case DX bushing.
- Install the oil seal to the front wheel case support so that its lip faces the outward.
- Apply gear oil to the bearing.

Tightening torque	Front wheel case support mounting screw (M16, 9T)	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 ft-lbs



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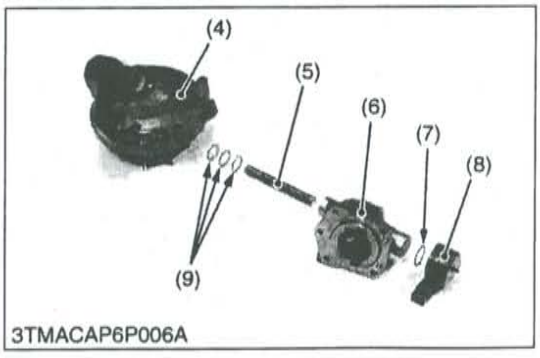
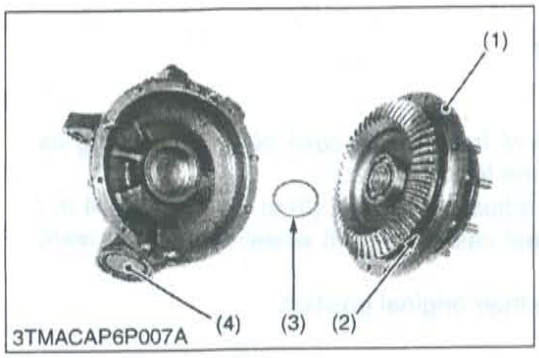


3TMACAP6P006A

(1) 18T Bevel Gear
(2) Shim
(3) Internal Circlip
(4) Front Wheel Case
(5) Bevel Gear Shaft
(6) Bevel Gear Case
(7) Collar
(8) Front Wheel Case Support
(9) Thrust Ball Bearing

W1015548



Front Wheel Case Cover

1. Remove the front wheel case cover (1) from the front wheel case (4).

(When reassembling)

- Apply transmission fluid to the O-ring.
- Install the shim (3) to its original position.

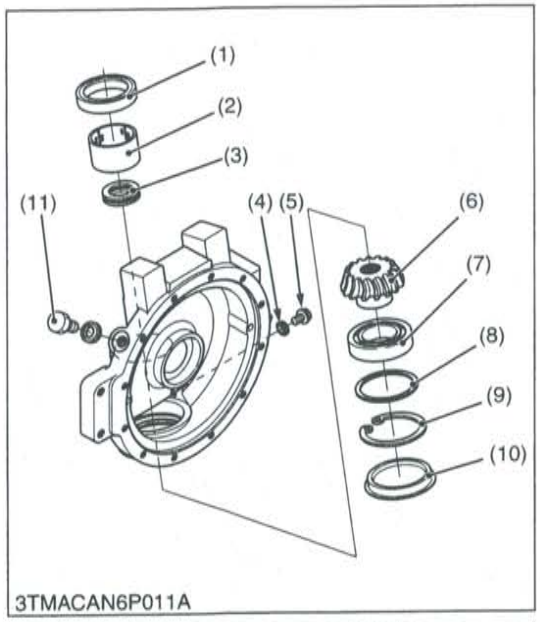
Tightening torque	Front wheel case cover mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs

(Reference)

- Thickness of shim (3) :
  0.4 mm (0.0158 in.)
  0.6 mm (0.0237 in.)
  0.8 mm (0.0315 in.)
  1.0 mm (0.0394 in.)
  1.2 mm (0.0473 in.)

(1) Front Wheel Case Cover
(2) O-ring
(3) Shim
(4) Front Wheel Case

W1016102



Front Wheel Case

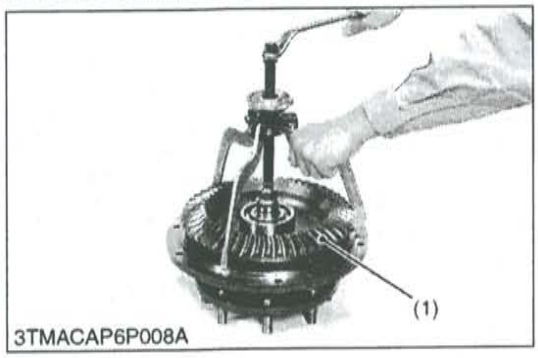
1. Remove the cap (10) which is installed in the bottom of front wheel case.
2. Remove the internal circlip (9) and take out the adjusting shims (8).
3. Tap the bevel gear to downward, and take out the 10T bevel gear (6) with bearing.

(When reassembling)

- Apply grease to the front wheel case DX bushing (2).
- Apply grease to the oil seal.
- Replace the cap (10) with new one.
- Apply transmission fluid to the cap.

(1) Oil Seal
(2) DX Bushing
(3) Thrust Ball Bearing
(4) Front Wheel Case
(5) Plug
(6) 10T Bevel Gear
(7) Ball Bearing
(8) Shim
(9) Internal Circlip
(10) Cap
(11) Plug

W1016239

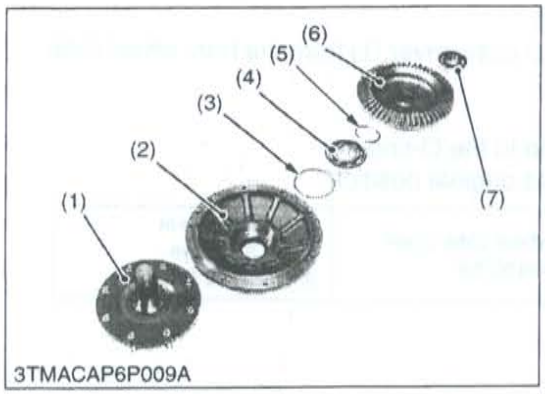


Bevel Gear

1. Remove the bevel gear and bearing with a puller.

(1) Bevel Gear

W1016676



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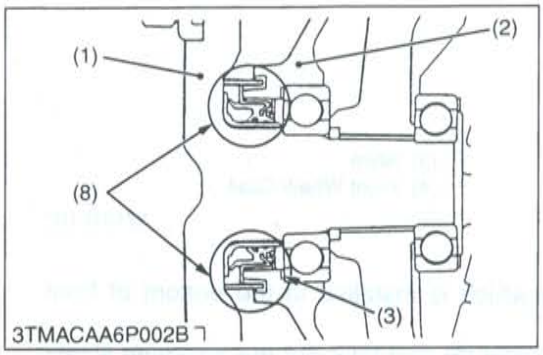


3TMACAA6P002B

Front Axle

1. Take out the collar (5).
2. Tap out the axle (1).

(When reassembling)

- Install the oil seal (8) of front wheel case cover (2), noting its direction as shown in the figure below.
- End play of axle shaft adjusts with shim (3) to 0.1 mm (0.004 in.) or less while front wheel case and front wheel case cover were assembled.
- Install the shims (3) to their original position.

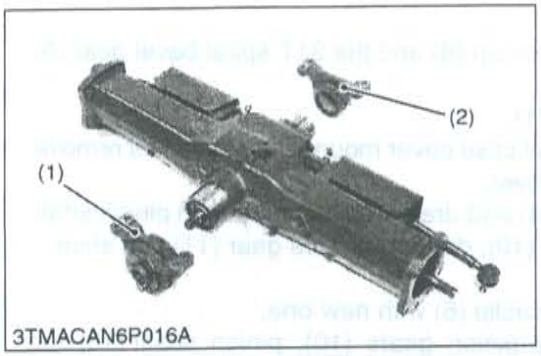
(Reference)

- Thickness of shim (3) :
  0.1 mm (0.004 in.)
  0.2 mm (0.008 in.)

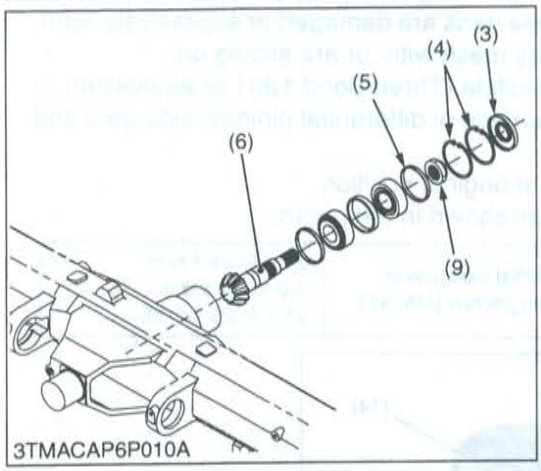
(1) Axle
(2) Front Wheel Case Cover
(3) Shim
(4) Bearing
(5) Collar
(6) Bevel Gear
(7) Bearing
(8) Oil Seal

W1024776

(3) Removing Differential Gear and Bevel Pinion Shaft



3TMACAN6P016A



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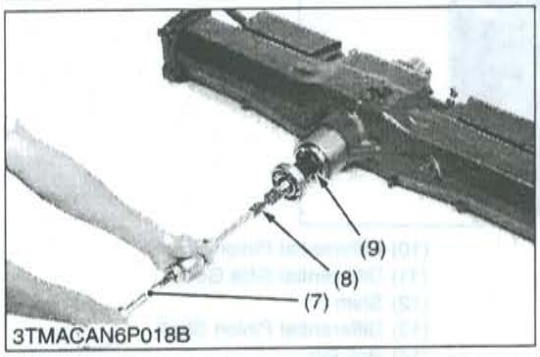

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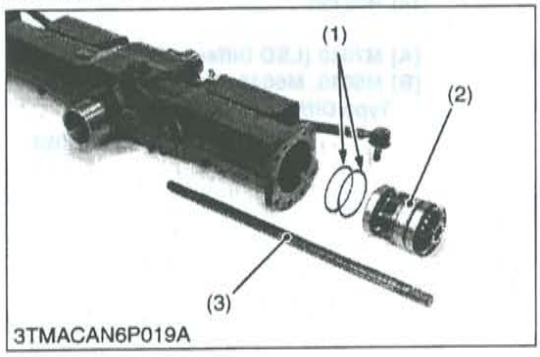


3TMACAN6P019A

Bevel Pinion Shaft

1. Remove the front bracket (2) and rear bracket (1).
2. Remove the oil seal (3), internal circlip (4).
3. Pull out the bevel pinion shaft (6) using a slide hammer (8).

(When reassembling)

- Replace oil seal (3) with new one.
- Install the oil seal (3) to the front axle case so that its lip faces the inward.
- Apply grease to the DX bushing for bracket (1), (2).
- Be sure to adjust the spiral bevel pinon shaft turning torque with lock nut (9) after assemble the spiral bevel pinion shaft assembly. (Refer to "[4] SERVICING" in this section.)

(Reference)

- Adaptor for slide hammer : M6 pitch 1.0 mm. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)

(1) Rear Bracket
(2) Front Bracket
(3) Oil Seal
(4) Internal Circlip
(5) Collar
(6) Bevel Pinion Shaft
(8) Adaptor for Slide Hummer
(7) Slide Hammer
(9) Lock Nut

W1018133

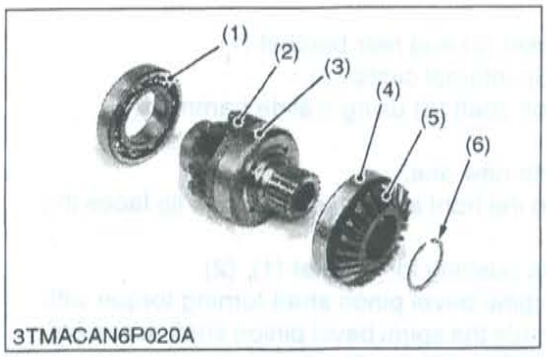
Differential Gear Assembly

1. Draw out the both yoke shafts.
2. Tap out the differential gear assembly (2) and shim (1) to R.H. side.

(1) Shim
(2) Differential Gear Assembly
(3) Yoke Shaft (R.H.)

W1018549

(4) Disassembling Differential Gear



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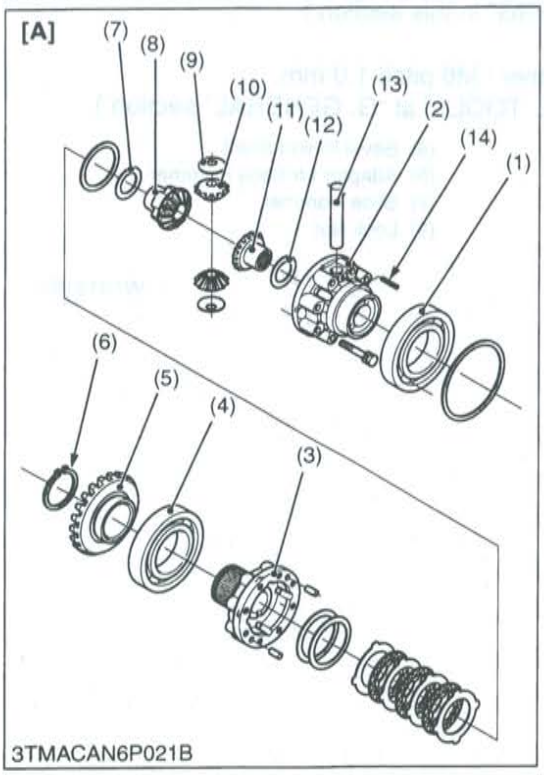

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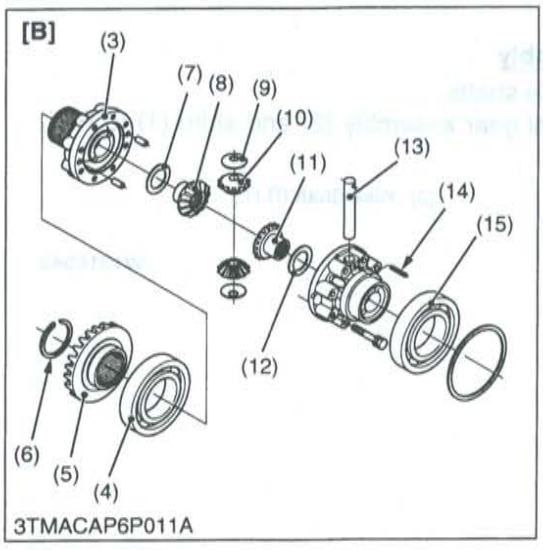


3TMACAP6P011A

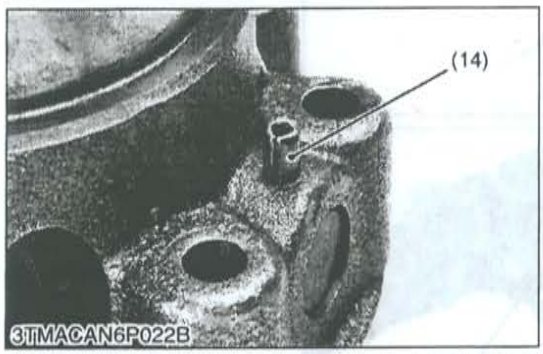
Spiral Bevel Gear

1. Remove the external circlip (6) and the 21T spiral bevel gear (5) with bearing (4).
2. Remove the bearing (1).
3. Remove the differential case cover mounting screws and remove the differential case cover.
4. Tap out the roll pin (14) and draw out the differential pinion shaft (13) and pinion gears (10), differential side gear (11) and shim.

(When reassembling)

- Replace the external circlip (6) with new one.
- Check the differential pinion gears (10), pinion shaft (13) for excessive wear. If these parts are damaged or excessively worn, replace there parts they mesh with, or are sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to inner circumferential surface of differential pinions, side gear and shim.
- Install the parts to there original position.
- Face the roll pin (14) as shown in the photo.

Tightening torque	Differential case cover mounting screw (M8, 9T)	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

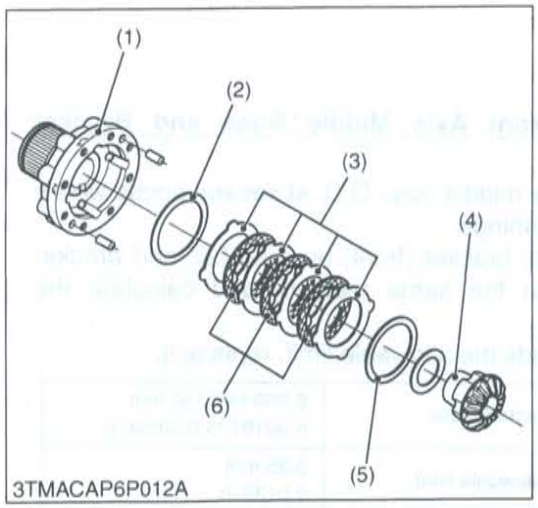


3TMACAN6P022B

(1) Bearing
(2) Differential Case
(3) Differential Case Cover
(4) Bearing
(5) 21T Spiral Bevel Gear
(6) External Circlip
(7) Shim
(8) LSD Side Gear
(9) Pinion Washer
(10) Differential Pinion Gear
(11) Differential Side Gear
(12) Shim
(13) Differential Pinion Shaft
(14) Roll Pin

[A] M7040 (LSD Differential Gear)
[B] M5040, M6040 (Conventional Type Differential Gear)

W1019054



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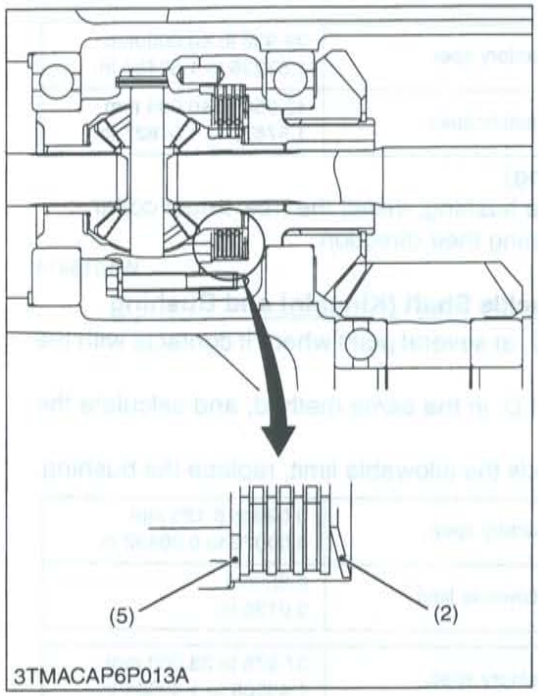


3TMACAP6P013A

LSD Disc and Steel Plate

1. Draw out the LSD side gear (4), LSD shim (5), steel plates (3), LSD discs (6) and belleville washers (cupped spring washer) (2).

(When reassembling)

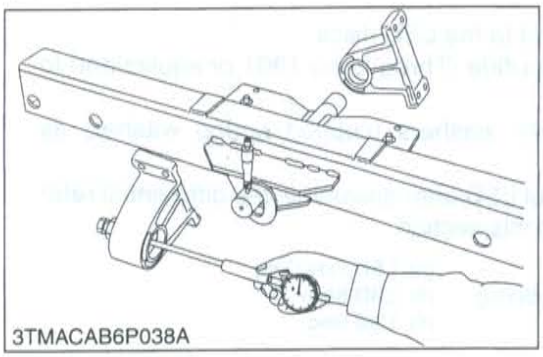
- Apply transmission fluid to the LSD discs.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to side gear and shim.
- Assemble the belleville washers (cupped spring washer) as shown in the figure.
- Check the slip torque of LSD after assembly, the differential refer to "[4] SERVICING" at this section.

(1) Differential Case Cover
(2) Belleville Washer (Cupped Spring Washer)
(3) Steel Plate
(4) LSD Side Gear
(5) LSD Shim
(6) LSD Disc

W1019850

[4] SERVICING

(1) 2WD Model


3TMACAB6P038A

Clearance between Front Axle Middle Boss and Bracket Bushing

1. Measure the front axle middle boss O.D. at several points where it contacts with the bushings.
2. Measure the front axle bracket (front) bushing I.D. and bracket (rear) bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

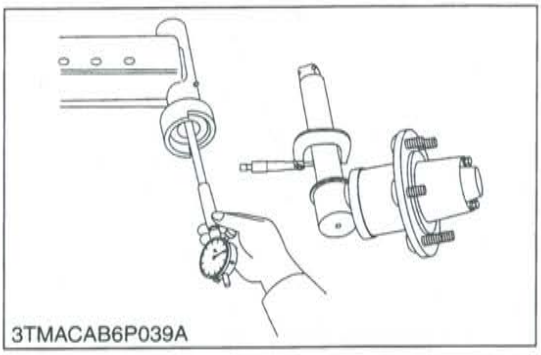
Clearance between front axle middle boss and bracket bushing	Factory spec.	0.050 to 0.150 mm 0.00197 to 0.00590 in.
	Allowable limit	0.35 mm 0.0138 in.

Front axle middle boss O.D.	Factory spec.	39.938 to 40.000 mm 1.57236 to 1.57480 in.
Bracket bushing I.D.	Factory spec.	40.050 to 40.088 mm 1.57677 to 1.57827 in.

(When replacing bushing)

- Before press-fitting the bushing, install the new thrust collar.
- Install the oil seals, noting their direction.

W1018414


3TMACAB6P039A

Clearance between Knuckle Shaft (Kingpin) and Bushing

1. Measure the shaft O.D. at several point where it contacts with the bushings.
2. Measure the bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

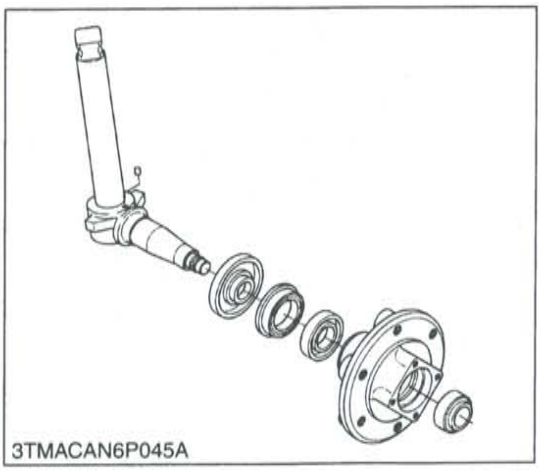
Clearance between knuckle shaft (kingpin) and bushing	Factory spec.	0.020 to 0.125 mm 0.00079 to 0.00492 in.
	Allowable limit	0.35 mm 0.0138 in.

Knuckle shaft O.D.	Factory spec.	37.975 to 38.000 mm 1.49508 to 1.49606 in.
Bushing I.D.	Factory spec.	38.020 to 38.100 mm 1.49685 to 1.50000 in.

(When replacing bushing)

- Remove the bushing with a bushing puller set (Code No. 07916-51011).

W1018596

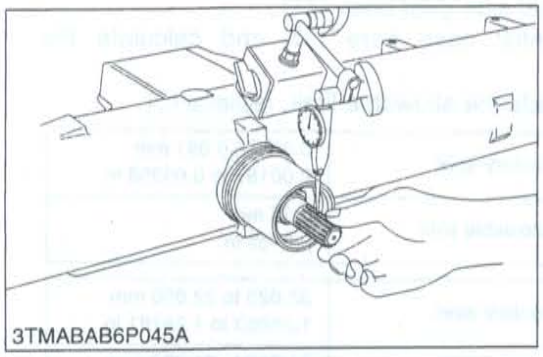

3TMACAN6P045A

Taper Roller Bearing

1. Check the bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a taper roller bearing, replace it.

W1035278

(2) 4WD Model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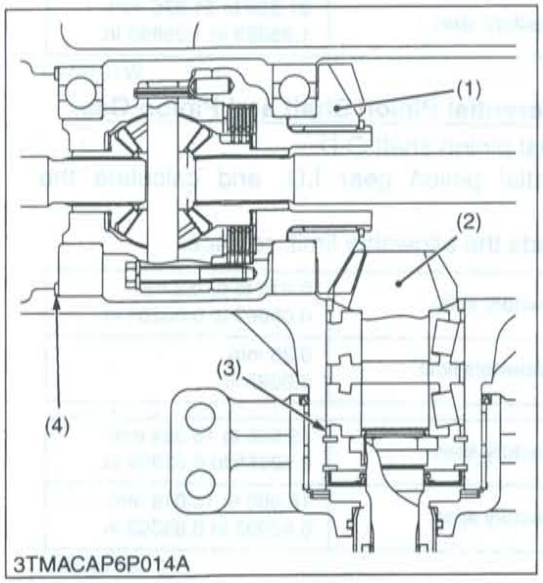


3TMACAP6P014A

(A)


3TMABAB3P043A

(B)


3TMACAB6P042A

(C)


3TMACAB6P043A

Backlash and Tooth Contact between Bevel Pinion Shaft and Bevel Gear

1. Set a dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the bevel pinion shaft (2) and moving the bevel gear (1) by hand.
3. If the backlash exceeds the allowable limit, adjust with the shim (4).
4. Adjust the backlash properly by repeating the above procedures.

Backlash between bevel gear and bevel pinion shaft	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

5. Apply red lead lightly over several teeth at three positions equally spaced on the bevel gear (1).
6. Turn the bevel pinion shaft (2), against the periphery of the bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions shown in the figure.

(Reference)

- Thickness of adjusting collar (3) :
  5.8 mm (0.229 in.) [Code No.: 3C011-43010]
  5.9 mm (0.233 in.) [Code No.: 3C011-43020]
  6.0 mm (0.237 in.) [Code No.: 3C011-43030]
  6.1 mm (0.241 in.) [Code No.: 3C011-43040]
  6.2 mm (0.245 in.) [Code No.: 3C011-43050]
  6.4 mm (0.252 in.) [Code No.: 3C011-43070]
- Thickness of adjusting shims (4) :
  0.7 mm (0.028 in.) [Code No.: 3A151-32180]
  0.8 mm (0.032 in.) [Code No.: 3A151-32130]
  1.0 mm (0.039 in.) [Code No.: 3A151-32140]
  1.2 mm (0.047 in.) [Code No.: 3A151-32150]
  1.4 mm (0.551 in.) [Code No.: 3A151-32160]
  2.3 mm (0.091 in.) [Code No.: 3A151-32170]
- Standard size of collar (3) : 0.5 mm (0.020 in.)
  shim (4) : 1.2 mm (0.047 in.)
- Backlash changes per 0.1 mm (0.004 in.) shim : Approx. 0.05 mm (0.002 in.)

■ **IMPORTANT**

- **Adjust the tooth contact with collar (3) and shim (4) so that the spiral bevel pinion shaft may not contact with the differential case.**

(1) Bevel Gear
(2) Bevel Pinion Shaft
(3) Collar
(4) Shim

(A) Proper Contact :
More than 35 % red lead contact area on the gear tooth surface. The center of tooth contact at 1/3 of the entire width from the small end.
(B) Deep Contact :
Decrease the shims.
(C) Shallow Contact :
Increase the shims.

W1018771


3TMACAN6P025A

Clearance between Differential Case 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. If the clearance exceeds the allowable limit, replace it.

Clearance between differential case and differential side gear	Factory spec.	0.050 to 0.091 mm 0.00197 to 0.00358 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory spec.	32.025 to 32.050 mm 1.26083 to 1.26181 in.
Differential side gear boss O.D.	Factory spec.	31.959 to 31.975 mm 1.25823 to 1.25886 in.

W1019787


3TMACAB6P045A

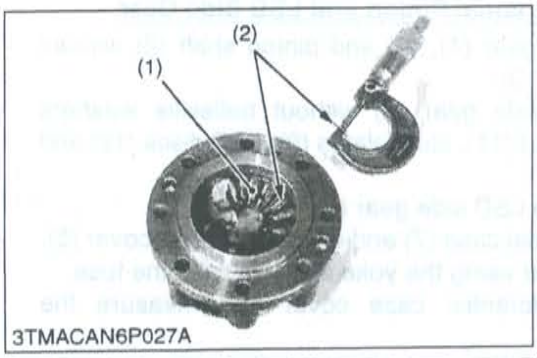
Clearance between Differential Pinion Shaft and Pinion Gear

1. Measure the differential pinion shaft O.D..
2. Measure the differential pinion gear I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace.

Clearance between differential pinion shaft and pinion gear	Factory spec.	0.016 to 0.052 mm 0.00063 to 0.00205 in.
	Allowable limit	0.25 mm 0.0098 in.

Differential pinion shaft O.D.	Factory spec.	15.966 to 15.984 mm 0.62858 to 0.62929 in.
Differential pinion gear I.D.	Factory spec.	16.000 to 16.018 mm 0.62992 to 0.63063 in.

W1020024



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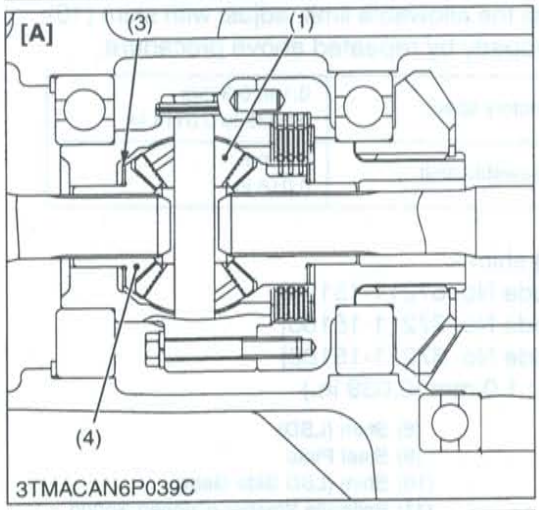

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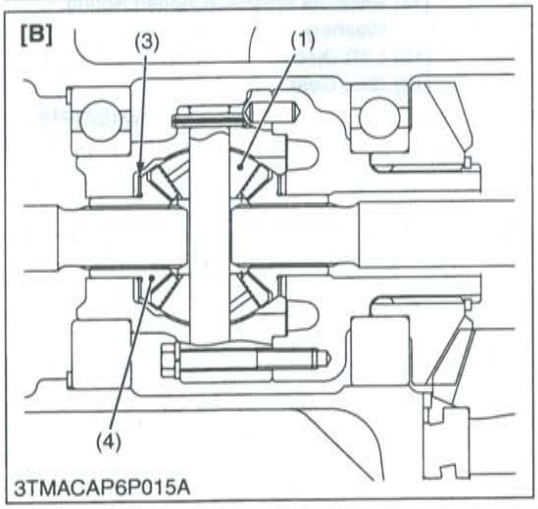


3TMACAP6P015A

Backlash between Differential Pinion and Differential Side Gear

1. Put the fuse (2) on the pinion gear (1).
2. Turn the pinion gear (1) to mash the fuse.
3. Measure the thickness of fuse.
4. If the backlash exceeds the allowable limit, adjust with shim (3).
5. Adjust the backlash properly by repeated above procedure.

Backlash between pinion gear and differential side gear	Factory spec.	0.1 to 0.3 mm 0.0039 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

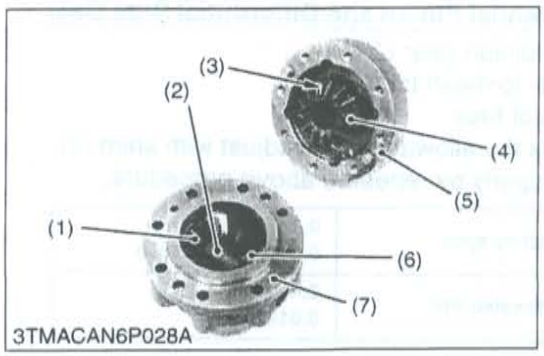
(Reference)

- Thickness of adjusting shim :
  0.8 mm (0.032 in.) [Code No. 67211-15170]
  1.0 mm (0.039 in.) [Code No. 67211-15160]
  1.2 mm (0.047 in.) [Code No. 67211-15180]
- Standard size of shim : 1.0 mm (0.039 in.)

(1) Pinion Gear
(2) Fuse
(3) Shim
(4) Side Gear

[A] M7040
[B] M5040, M6040

W1021715



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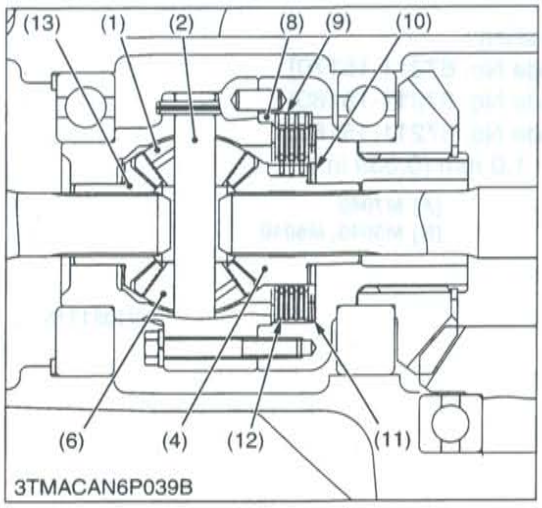


3TMACAN6P039B

Backlash between Differential Pinion and LSD Side Gear

1. Assemble the pinion gear (1), (6) and pinion shaft (2) without differential side gear (13).
2. Assemble the LSD side gear (4) without belleville washers (cupped spring washer) (11), steel plates (9), LSD discs (12) and LSD shim (8).
3. Put the fuse (3) on the LSD side gear (4).
4. Assemble the differential case (7) and differential case cover (5).
5. Turn the LSD side gear using the yoke shaft to clash the fuse.
6. Disassemble the differential case cover and measure the thickness of fuse.
7. If the backlash exceeds the allowable limit, adjust with shim (10).
8. Adjust the backlash properly by repeated above procedure.

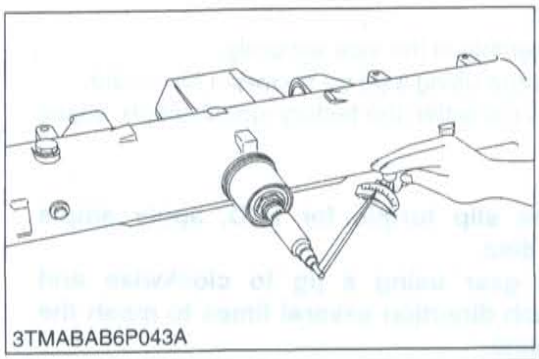
Backlash between pinion gear and LSD side gear	Factory spec.	0.1 to 0.3 mm 0.0039 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shim :
  0.8 mm (0.032 in.) [Code No. 67211-15170]
  1.0 mm (0.039 in.) [Code No. 67211-15160]
  1.2 mm (0.047 in.) [Code No. 67211-15180]
- Standard size of shim : 1.0 mm (0.039 in.)

(1) Pinion Gear
(2) Pinion Shaft
(3) Fuse
(4) Side Gear (LSD)
(5) Differential Case Cover
(6) Pinion Gear
(7) Differential Case
(8) Shim (LSD)
(9) Steel Plate
(10) Shim (LSD Side Gear)
(11) Belleville Washer (Cupped Spring Washer)
(12) LSD Disc
(13) Side Gear

W1021916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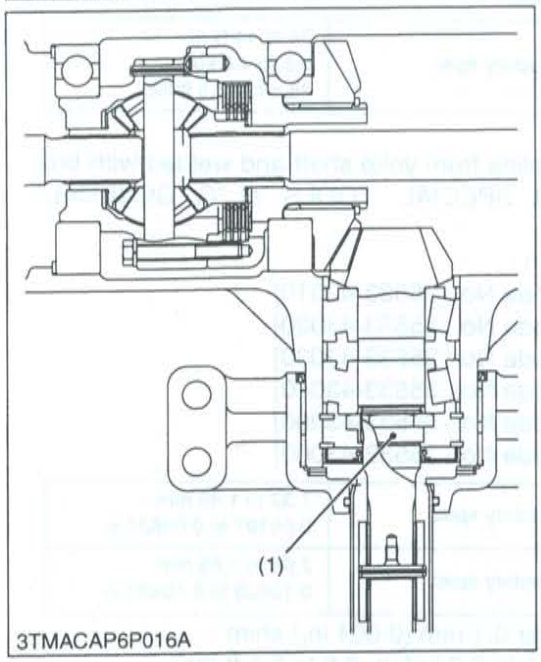


3TMACAP6P016A

Turning Torque of Spiral Bevel Pinion Shaft (Pinion Shaft Only)

1. Install the spiral bevel pinion shaft assembly only to the front axle case.
2. Measure the turning torque of spiral bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut (1).

Turning torque of spiral bevel pinion shaft	Factory spec.	1.43 to 1.56 N·m 0.145 to 0.160 kgf·m 1.05 to 1.15 ft-lbs

■ **NOTE**

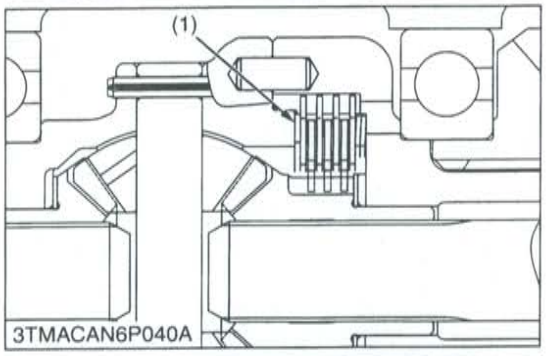
- **After turning torque adjustment, be sure to stake the lock nut.**

(1) Lock Nut

W1018778


3TMACAN6P029A


3TMACAN6P030A



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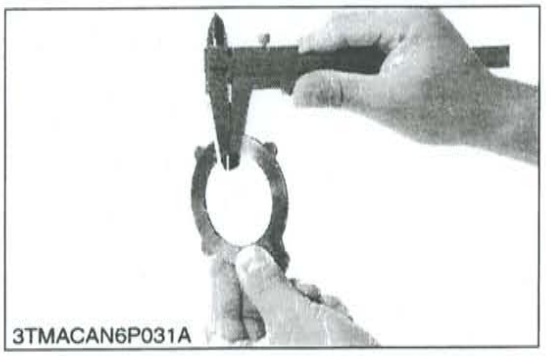
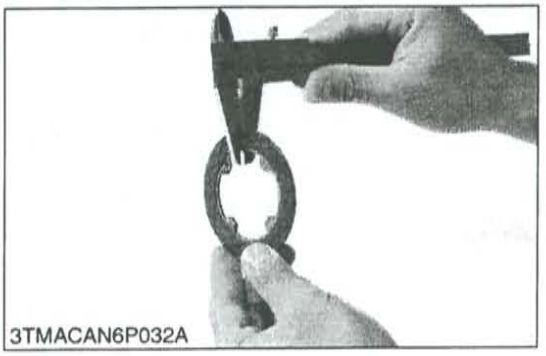

3TMACAN6P031A


3TMACAN6P032A

Slip Torque of LSD Disc

1. Set the differential assembly in the vice securely.
2. Check the LSD slip torque using a jig as shown in the photo.
3. If the LSD slip torque is not within the factory specification, adjust with LSD shim (1).

■ **IMPORTANT**

- **When measuring the slip torque for LSD, apply ample lubricant to the LSD disc.**
- **Turn the LSD side gear using a jig to clockwise and counterclockwise each direction several times to mesh the LSD disc and steel plate.**

LSD slip torque	Factory spec.	34 to 44 N·m 3.5 to 4.5 kgf·m 25.4 to 32.5 ft-lbs

(Reference)

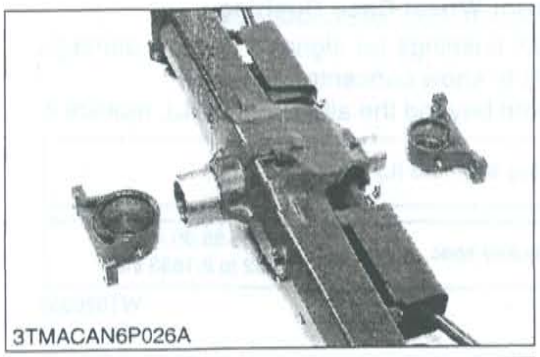
- Jig in the photo is : Spline from yoke shaft and welded with box wrench. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
- Thickness of LSD shim :
  0.1 mm (0.004 in.) [Code No.: 35533-43010]
  0.2 mm (0.008 in.) [Code No.: 35533-43020]
  0.4 mm (0.016 in.) [Code No.: 35533-43030]
  0.8 mm (0.032 in.) [Code No.: 35533-43040]
  1.0 mm (0.039 in.) [Code No.: 35533-43050]
  1.2 mm (0.047 in.) [Code No.: 35533-43060]

Thickness of steel plate	Factory spec.	1.32 to 1.48 mm 0.05197 to 0.05827 in.
Thickness of LSD disc	Factory spec.	2.55 to 2.65 mm 0.10039 to 0.10433 in.

- Slip torque changes per 0.1 mm (0.004 in.) shim :
  Approx. 5 to 7 N·m (0.5 to 0.7 kgf·m, 3.6 to 5.1 ft-lbs)

(1) Shim

W1022263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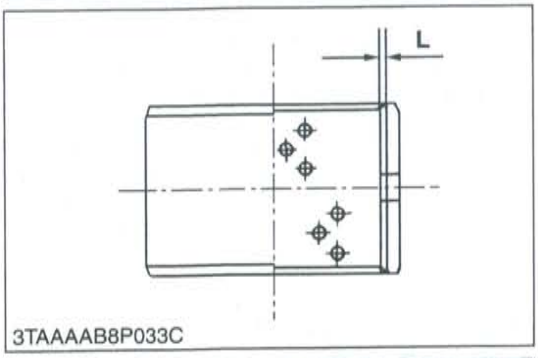


3TAAAAB8P033C

Front Bracket and Rear Bracket Bushing

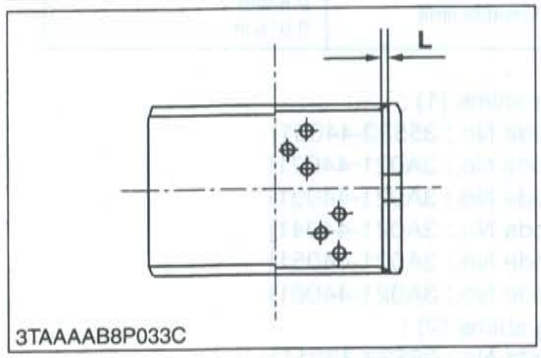
1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**L**), replace it.

Front bracket and rear bracket bushing	Alloy thickness (**L**)	0.57 mm 0.0224 in.

Rear differential case boss O.D.	Factory spec.	89.965 to 90.000 mm 3.5420 to 3.5433 in.
Front differential case boss O.D.	Factory spec.	59.97 to 60.000 mm 2.3611 to 2.3622 in.

W1020171


3TMACAP6P017A



3TAAAAB8P033C

Bearing Retainer and Front Wheel Case Support Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**L**), replace it.

Front wheel case support bushing	Alloy thickness (**L**)	0.57 mm 0.0224 in.

Bearing retainer O.D.	Factory spec.	59.97 to 60.00 mm 2.36101 to 2.36220 in.

W1020339


3TMACAP6P018A

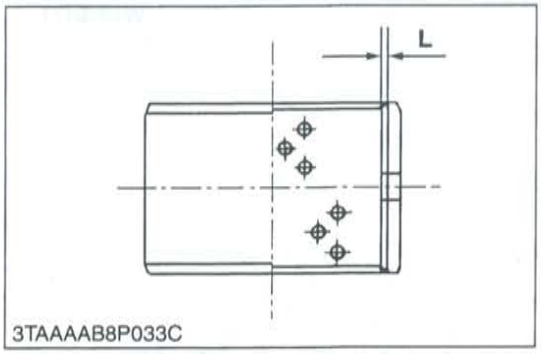
Bevel Gear Case and Front Wheel Case Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**L**), replace it.

Front wheel case bushing	Alloy thickness (L)	0.57 mm 0.0224 in.

Bevel gear case O.D.	Factory spec.	54.97 to 55.00 mm 2.1642 to 2.1653 in.

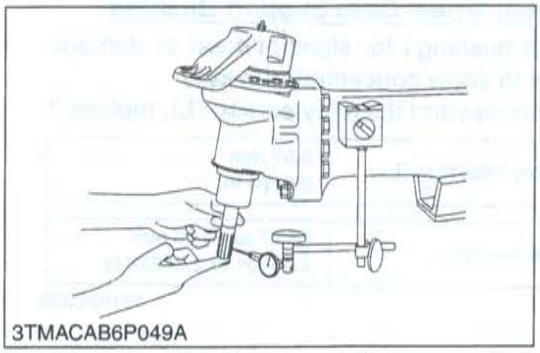
W1020555



3TAAAAB8P033C

Backlash of Bevel Gear in Bevel Gear Case

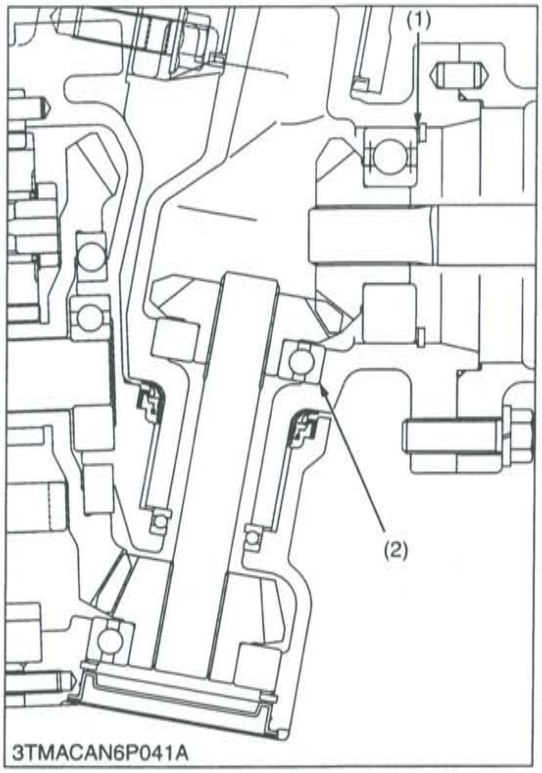
1. Set a dial indicator (lever type) on the shaft (Kingpin).
2. Move the shaft (Kingpin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter. (Backlash = Play x 2)
4. If the backlash exceeds the allowable limit, adjust with the shims (1).


3TMACAB6P049A

Backlash of bevel gear in bevel gear case	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

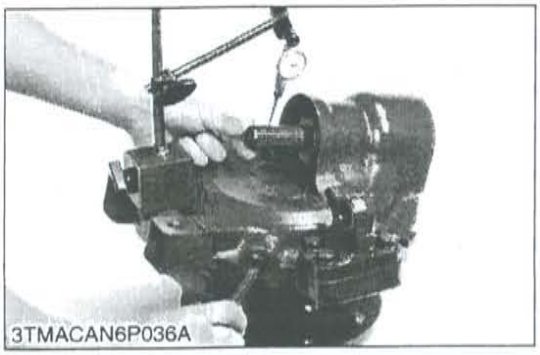
- Thickness of adjusting shims (1) :
  0.1 mm (0.004 in.) [Code No.: 35533-44081]
  0.4 mm (0.016 in.) [Code No.: 3A021-44021]
  0.6 mm (0.024 in.) [Code No.: 3A021-44031]
  0.8 mm (0.032 in.) [Code No.: 3A021-44041]
  1.0 mm (0.039 in.) [Code No.: 3A021-44051]
  1.2 mm (0.047 in.) [Code No.: 3A021-44061]
- Thickness of adjusting shims (2) :
  0.1 mm (0.004 in.) [Code No.: 35533-43011]
  0.2 mm (0.008 in.) [Code No.: 35533-43021]
  0.4 mm (0.016 in.) [Code No.: 35533-43031]



3TMACAN6P041A

(1) Shim (2) Shim

W1020677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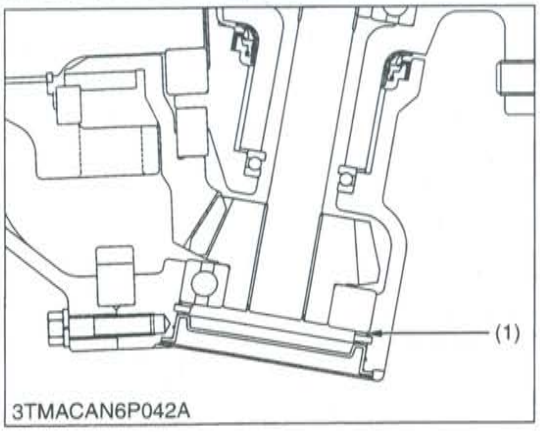


3TMACAN6P042A

Backlash of Bevel Gear in Front Wheel Case

1. Set a dial indicator (lever type) on the shaft (Kingpin).
2. Move the shaft (Kingpin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter. (Backlash = Play x 2)
4. If the backlash exceeds the allowable limit, adjust with the shims (1).

Backlash of bevel gear in front wheel case	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shims (1) :
  0.4 mm (0.016 in.) [Code No.: 3C011-44130]
  0.6 mm (0.008 in.) [Code No.: 3C011-44140]
  0.8 mm (0.032 in.) [Code No.: 3C011-44150]
  1.0 mm (0.039 in.) [Code No.: 3C011-44160]
  1.2 mm (0.047 in.) [Code No.: 3C011-44170]
  1.4 mm (0.056 in.) [Code No.: 3C011-44180]

(1) Shim

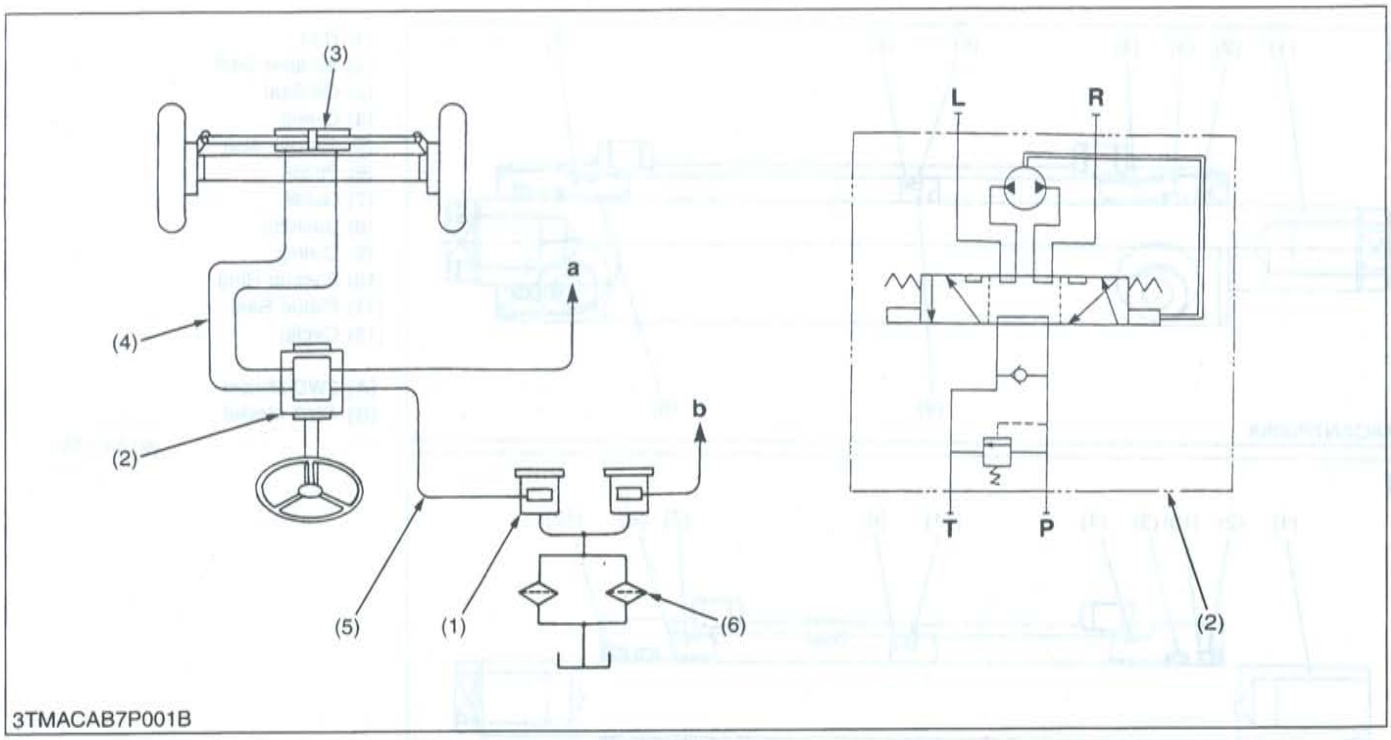
W1021810

7 STEERING

MECHANISM

CONTENTS

1. STEERING MECHANISM



3TMACAB7P001B

(1) Hydraulic Pump
(2) Steering Controller
(3) Steering Cylinder
(4) Power Steering Hose
(5) Power Steering Pipe
(6) Magnet Filter

a : To Oil Cooler and Brake Master Cylinder
b : To 3-point Hydraulic System

All models are provided with a full hydrostatic power steering. Generally power steerings are divided into 4 types : booster type, integral type, semi-integral type and full hydrostatic type.

In the full hydrostatic power steering, the steering controller is connected to the steering cylinder with only the hydraulic piping. This steering is actuated by oil pressure. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc.. Therefore, it is simple in construction.

This steering system consists of the hydraulic pump (1), steering controller (2), steering cylinder (3), magnet filter (6), etc..

The full hydrostatic power steering systems are divided into two types : non-load reaction type and load reaction type.

They are distinguished by wether the cylinder port is blocked or not with the controller in neutral. In these models, load reaction type is used.

With the load reaction type power steering, the steering wheel returns almost to the straight forward position as with an automobile when the operator releases his hands from the steering wheel.

(Reference)

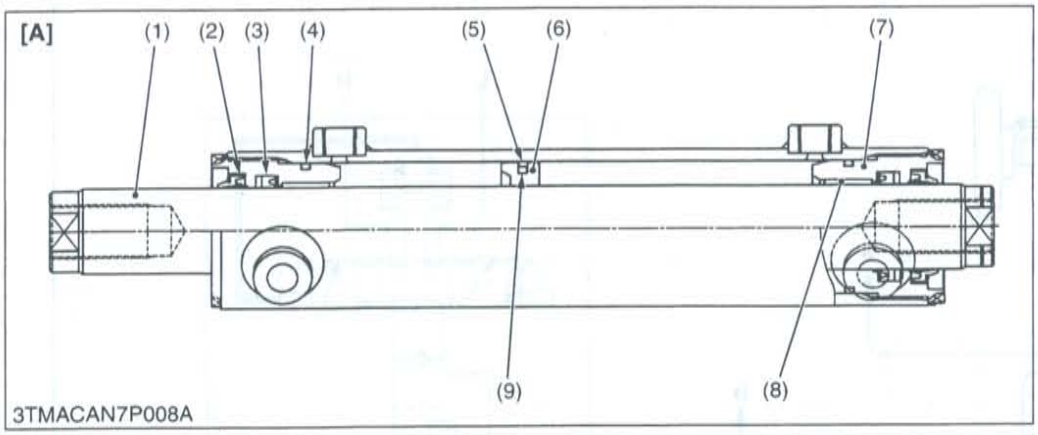
With the non-load reaction type power steering, the steering wheel maintain their position when the operator releases his hands from the steering wheel.

Vibration at the wheels is not transmitted to the steering wheel.

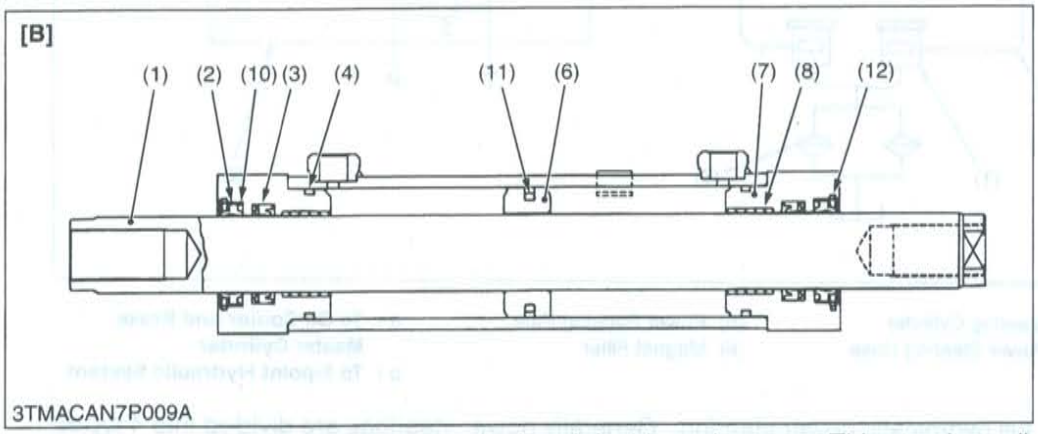
■ **NOTE**

- **Refer to "7. STEERING" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

2. STEERING CYLINDER



3TMACAN7P008A



3TMACAN7P009A

(1) Rod
(2) Scraper Seal
(3) Oil Seal
(4) O-ring
(5) Slipper Seal
(6) Piston
(7) Guide
(8) Bushing
(9) O-ring
(10) Backup Ring
(11) Piston Seal
(12) Circlip

[A] 2WD Model
[B] 4WD Model

W1012783

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provide force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Tractor Cannot Be Steered	Drive shaft in the power steering controller improper assembled	Reassemble	7-S14
	Pipe broken	Replace	–
Hard Steering	Oil improper	Change with specified oil	G-10
	Hydraulic pump malfunctioning	Replace	8-S13
	Relief valve malfunctioning	Replace	7-S4
	Controller (spool and sleeve) malfunctioning	Repair or replace	7-S14
	Oil leak due to seal damaged	Replace	–
Steering Force Fluctuates	Controller malfunctioning	Replace	7-S7, 8
	Air sucked in pump due to leaking or missing of oil	Replenish	G-10, 20
	Air sucked in pump from suction circuit	Repair	–
Heavy Steering Especially in the Beginning of Steering	Controller malfunctioning	Repair or replace	7-S7, 8, 14
Steering Wheel Turns Spontaneously When Released	Controller malfunctioning	Repair or replace	7-S7, 8, 14
Front Wheels Wander to Right and Left	Controller malfunctioning	Repair or replace	7-S7, 8, 14
	Air sucked in pump due to lack of oil	Replenish	G-10, 20
	Air sucked in pump from suction circuit	Repair	–
	Insufficient bleeding	Bleed	–
	Cylinder malfunctioning	Repair or replace	7-S9, 11, 17
Wheels Are Turned to a Direction Opposite to Steering Direction	Cylinder piping connected in reverse	Repair	–
Steering Wheel Turns Idle in Manual Steering	Insufficient bleeding	Bleed	–
	Air sucked in pump due to lack of oil	Replenish	G-10, 20
Noise	Air sucked in pump due to lack of oil	Replenish	G-10, 20
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–
Oil Temperature Increases Rapidly	Relief valve malfunctioning	Replace	7-S4
Front Wheels Vibrate	Mechanical connections or wheel bearings worn	Replace defective parts	–

W1014322

2. SERVICING SPECIFICATIONS

POWER STEERING PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition • Engine Speed 2600 min^{-1} (rpm) • Rated Pressure 18.1 MPa 185 kgf/cm^2 2633.1 psi • Oil Temperature 45 to 55 °C 113 to 131 °F	Delivery	Above 21.4 L/min. Above 5.65 U.S.gals./min. Above 4.71 Imp.gals./min.	18.0 L/min. 4.76 U.S.gals./min. 3.96 Imp.gals./min.

W1013874

POWER STEERING CONTROLLER

Relief Valve Setting Pressure	At Idling Engine Speed	Above 12.3 MPa 125 kgf/cm^2 1777.9 psi	–
	At Maximum Engine Speed	Below 18.1 MPa 185 kgf/cm^2 2631.3 psi	–

W1013973

POWER STEERING CYLINDER

Steering Cylinder (2WD)	I.D.	50.000 to 50.062 mm 1.9686 to 1.9709 in.	50.000 mm 1.9725 in.
Steering Cylinder (4WD)	I.D.	55.000 to 55.074 mm 2.16535 to 2.16827 in.	55.100 mm 2.16929 in.
Rod to Bushing (2WD)	Clearance	0.009 to 0.127 mm 0.00035 to 0.00500 in.	0.135 mm 0.00531 in.
Rod to Bushing (4WD)	Clearance	0.010 to 0.140 mm 0.00039 to 0.00551 in.	0.250 mm 0.00984 in.

W1011137

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

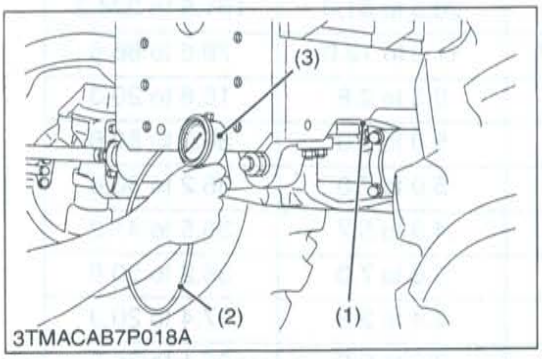
Item	N·m	kgf·m	ft-lbs
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
3-point hitch delivery pipe 2 retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Power steering delivery hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Controller pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Oil cooler pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Power steering controller mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Power steering pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Power steering joint shaft mounting screw	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Tie-rod end slotted nut (2WD)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Tie-rod joint lock nut (2WD)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Cylinder clamp nut (2WD)	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Cylinder clamp lock nut (2WD)	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Cylinder cover mounting screw (2WD)	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Power steering delivery hose (2WD)	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Power steering delivery hose (4WD)	22.6 to 27.5	2.3 to 2.8	16.6 to 20.3
Tie-rod end slotted nut (4WD)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Tie-rod joint (4WD)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Hose joint	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Housing cover mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Gerotor assembly mounting screw (5/16')	25.5 to 28.4	2.6 to 2.9	18.8 to 21.0
Cylinder guide assembly (2WD)	142.2 to 152.0	14.5 to 15.5	104.9 to 112.1

W1018157

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Steering Controller



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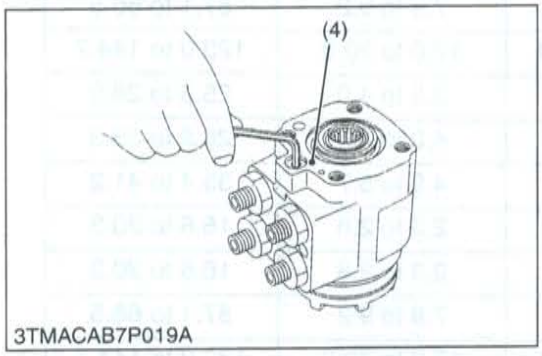


3TMACAB7P019A

Relief Valve Setting Pressure

1. Disconnect one of the delivery hose 1 from steering cylinder and set a pressure gauge (3) (Code No. 07916-50321) between them using power steering adaptor (1) (Code No. 07916-54021), joint (Code No. 07916-50401) and cable (Code No. 07916-50331).
2. Start the engine and fully turn the steering wheel to the left or right and read the pressure when the relief valve operates both idling and maximum engine speed.
3. If the measurement is not within the factory specifications, adjust the relief pressure by the adjust plug (4).

■ **IMPORTANT**

(Air Bleeding)

- **Start the engine, then turn the steering wheel slowly in both directions all the way alternately a few times, and stop the engine.**

(Reference)

- One full turn of the set screw changes the relief setting pressure by approx. 2.9 MPa (30 kgf/cm^2, 427 psi).

Relief valve setting pressure	Factory spec.	At idling engine speed	Above 12.3 MPa 125 kgf/cm^2 1777.9 psi
		At maximum engine speed	Below 18.1 MPa 185 kgf/cm^2 2631.3 psi

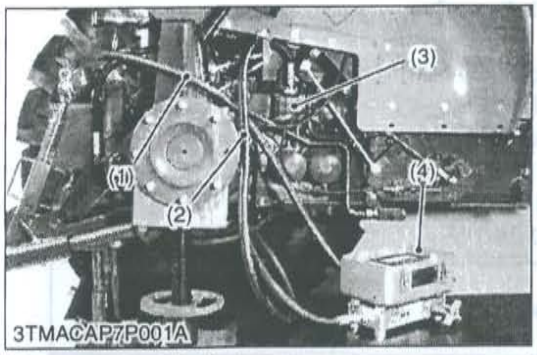
Condition

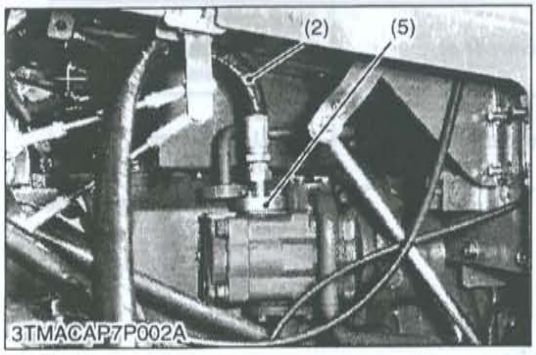
- Oil temperature ..... 50 to 60 °C
  122 to 140 °F

(1) Power Steering Adaptor
(2) Cable
(3) Pressure Gauge
(4) Adjust Plug for Relief Valve

W1014224

(2) Hydraulic Pump





Hydraulic Flow Test

■ **IMPORTANT**

- **When using flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with the flowmeter.**
- **Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.**
- **Set the main change lever and shuttle lever in Neutral position.**
- **Set parking brake lever in parking position.**

1. Place the disassembling stand under the transmission case.
2. Remove the right rear wheel.
3. Place the disassembling stand under the right rear axle case.
4. Disconnect the differential lock rod from pedal.
5. Disconnect the delivery pipe for power steering from hydraulic pump (3).
6. Install the adaptor **54** (4) or **53** and **54** (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the pump discharge port.
7. Connect the hydraulic test hose (2) to the adaptor at hydraulic pump (3) and flowmeter (4) inlet port.
8. Connect the other hydraulic test hose (1) to the flowmeter outlet, insert the hydraulic test hose other end to transmission oil filling port at PTO case.
9. Open the flowmeter loading valve completely. (Turn counterclockwise.)
10. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
11. Slowly close the loading valve to generator pressure approx. 9.8 MPa (100 kgf/cm^2, 1422 psi). Hold in this condition until oil temperature reaches approx. 55 °C (131 °F).
12. Open the loading valve completely.
13. Set the engine speed. (Refer to **"Condition"**.)
14. Read and note the pump delivery at rated pressure.
15. Open the loading valve completely and stop the engine.
16. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.
17. Check the hydraulic flow test for power steering and three point pump are same procedure.

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Hydraulic Test Hose
(2) Hydraulic Test Hose
(3) Hydraulic Pump
(4) Flowmeter
(5) Adaptor **54**

W1010684

Hydraulic Flow Test (Continued)

[Power Steering Pump Delivery]

Condition

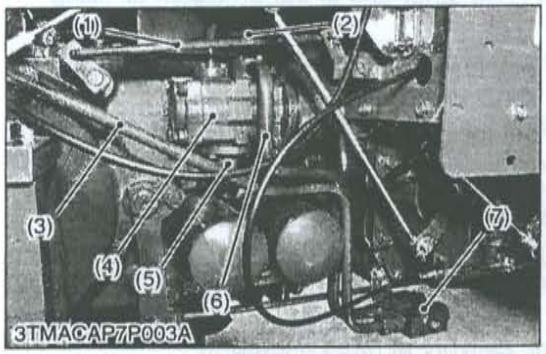
- Engine speed : Approx. 2600 min^{-1} (rpm)
- Rated pressure : 18.1 MPa
  185 kgf/cm^2
  2631 psi
- Oil temperature : 50 to 60 °C
  122 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 21.8 L/min. 5.76 U.S.gals./min. 4.80 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	21.4 L/min. 5.65 U.S.gals./min. 4.71 Imp.gals./min.
	Allowable limit	18.0 L/min. 4.76 U.S.gals./min. 3.96 Imp.gals./min.

W1011083

[2] PREPARATION

(1) Removing Power Steering Hydraulic Pump



Hydraulic Pump Assembly

1. Place the disassembling stand under the transmission case and right rear wheel.
2. Remove the right rear wheel.
3. Remove the differential lock rod (1).
4. Remove the 3-point hitch delivery pipe 1 (6) and delivery pipe 2 (3) with outlet block (7).
5. Disconnect the suction pipe (5).
6. Disconnect the power steering delivery pipe (2).
7. Remove the hydraulic pump (4).

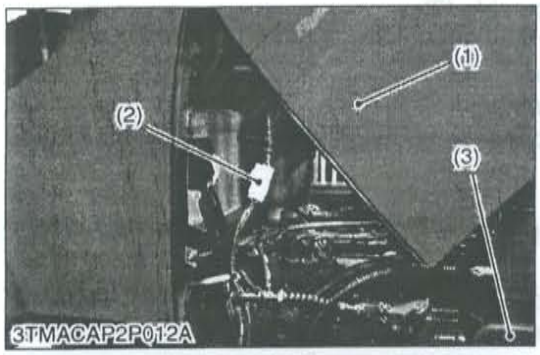
(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs
	3-point hitch delivery pipe 2 retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 ft-lbs

(1) Differential Lock Rod
(2) Power Steering Delivery Pipe
(3) 3-point Hitch Delivery Pipe 2
(4) Hydraulic Pump
(5) Suction Pipe
(6) 3-point Hitch Delivery Pipe 1
(7) Outlet Block

W1016819

(2) Removing Power Steering Controller (ROPS Model)



Bonnet

1. Open the bonnet (1) and disconnect the battery negative terminal.
2. Disconnect the connectors (2) for head lights.
3. Disconnect the dampers (4).
4. Remove the bonnet (1) and side cover (3) (R.H) (L.H.).

■ **IMPORTANT**

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

(1) Bonnet
(2) Connector
(3) Side Cover
(4) Damper

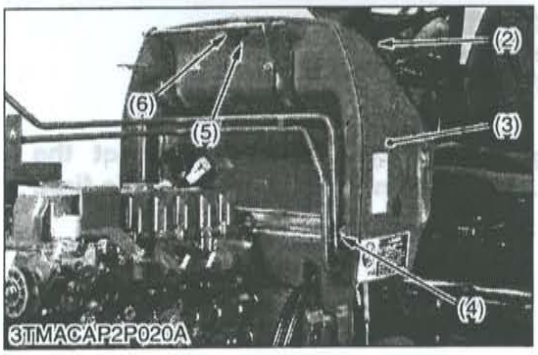
W1017878

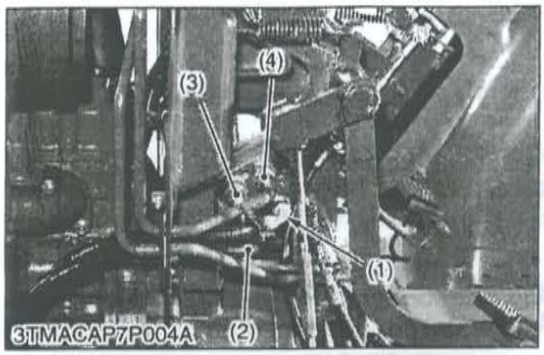
Steering Support Under Cover and Rear Bonnet

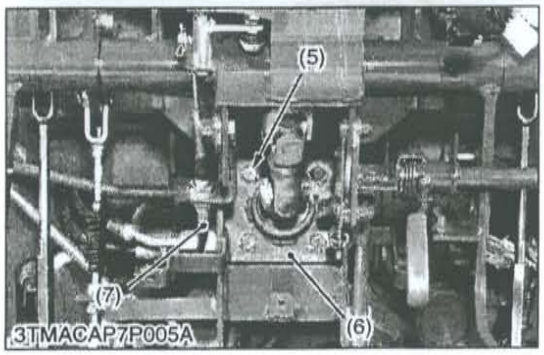
1. Remove the steering support under cover (1).
2. Loosen the rear bonnet mounting screws (4).
3. Remove the seal (6) and panel guide mounting screw (5).
4. Disconnect the wire harness and remove the panel guide (2) and rear bonnet (3).

(1) Steering Support Under Cover
(2) Panel Guide
(3) Rear Bonnet
(4) Screw
(5) Screw
(6) Seal

W1018035







Steering Controller

1. Disconnect the shuttle cable (7).
2. Disconnect the power steering delivery hose 1 (1) and hose 2 (2) from power steering controller.
3. Disconnect the oil cooler pipes (2), (3).
4. Remove the steering controller mounting screws (5) and steering controller (6).

(When reassembling)

- Be sure to assemble the power steering delivery hose to original position.
- After assembling the power steering controller, be sure to adjust the shuttle lever **"Neutral"** position.

Tightening torque	Power steering delivery hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Controller pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Power steering controller mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs

(1) Power Steering Delivery Hose 1
(2) Power Steering Delivery Hose 2
(3) Oil Cooler Pipe
(4) Oil Cooler Pipe
(5) Screw
(6) Steering Controller
(7) Shuttle Cable

W1010629

(3) Removing Steering Controller (CABIN Model)

Bonnet

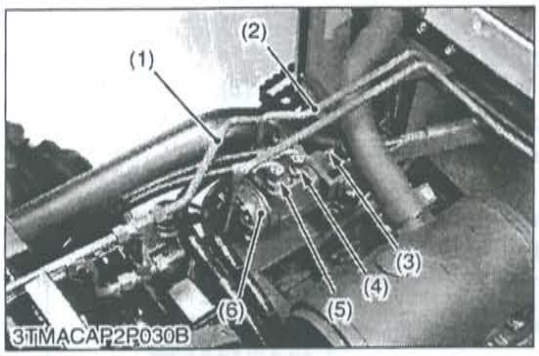
1. Open the bonnet (3) and disconnect the battery negative terminal.
2. Disconnect the connector (2) for head lights.
3. Disconnect the dampers (1).
4. Remove the bonnet (3).

■ **IMPORTANT**

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

(1) Damper
(2) Connector
(3) Bonnet

W1021839



Steering Controller

1. Disconnect the power steering pipe (2) and oil cooler pipe (1).
2. Disconnect the power steering delivery hoses (3), (4).
3. Remove the steering joint shaft mounting screw (5).
4. Remove the steering controller mounting screws and steering controller (6).

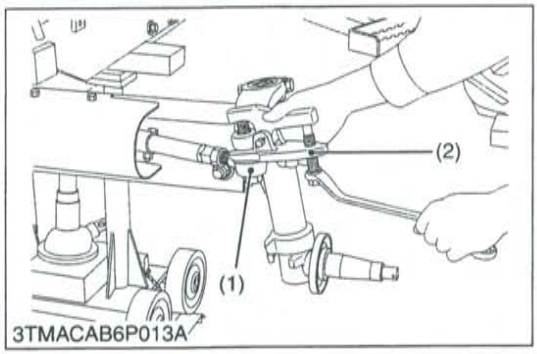
(When reassembling)

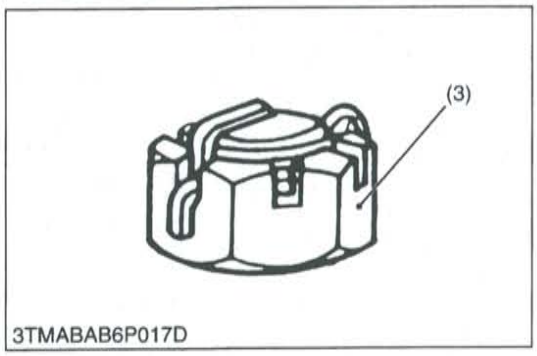
Tightening torque	Power steering pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Oil cooler pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Power steering delivery hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Power steering joint shaft mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Power steering controller mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs

(1) Oil Cooler Pipe
(2) Power Steering Pipe
(3) Power Steering Delivery Hose
(4) Power Steering Delivery Hose
(5) Steering Joint Shaft Mounting Screw
(6) Steering Controller

W1022208

(4) Removing Power Steering Cylinder (2WD Model)





Tie-rod

1. Pull out the cotter pin and loosen the tie-rod end slotted nut (3).
2. Disconnect the tie-rod (1) with a tie-rod end lifter (2) (Code No. 07909-39051).
3. Remove the tie-rod end nut and tie-rod end.

(When reassembling)

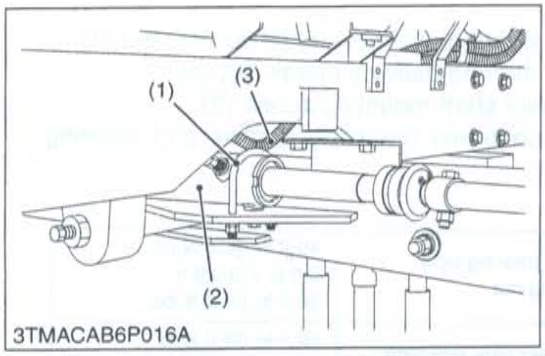
- Replace cotter pin with a new one.
- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure.
- After assembling the power steering cylinder and tie-rod, check the toe-in and adjust it if necessary.

Tightening torque	Tie-rod end slotted nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Tie-rod joint lock nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

Toe-in	Factory spec.	1.0 to 5.0 mm 0.04 to 0.20 in.

(1) Tie-rod
(2) Tie-rod End Lifter
(3) Slotted Nut

W1022966



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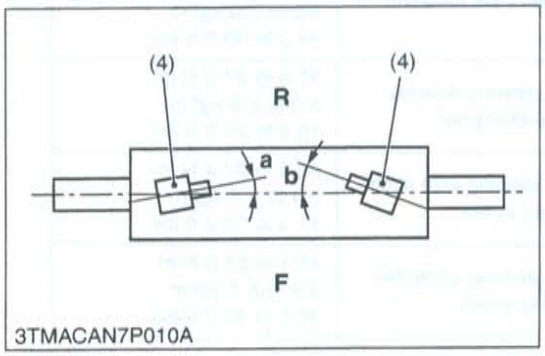

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Steering Cylinder

1. Remove the cylinder cover.
2. Disconnect the power steering delivery hoses (3).
3. Remove the cylinder clamps (1).
4. Take out the steering cylinder (2).

(When reassembling)

- If the hose joint (4) was removed, apply teflon tape and fix the direction as shown in the figure.

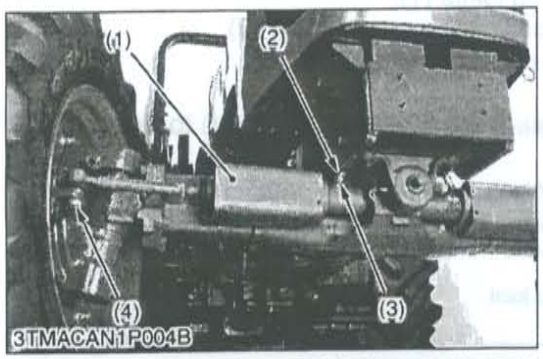
Tightening torque	Cylinder clamp nut	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Cylinder clamp lock nut	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 ft-lbs
	Cylinder cover mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
	Power steering delivery hose	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Hose joint	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

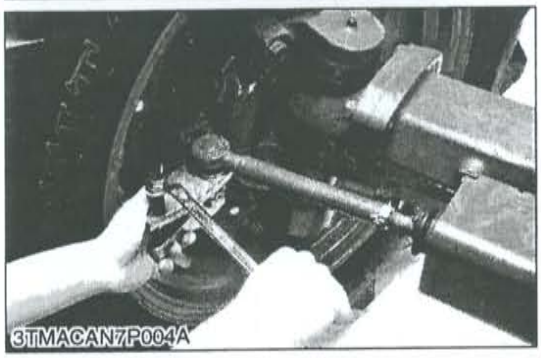
(1) Cylinder Clamp
(2) Steering Cylinder
(3) Power Steering Delivery Hose
(4) Hose Joint

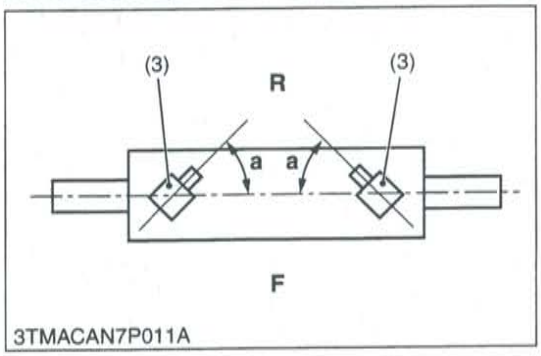
F : Front
R : Rear
a : 0.17 rad (10 °)
b : 0.35 rad (20 °)

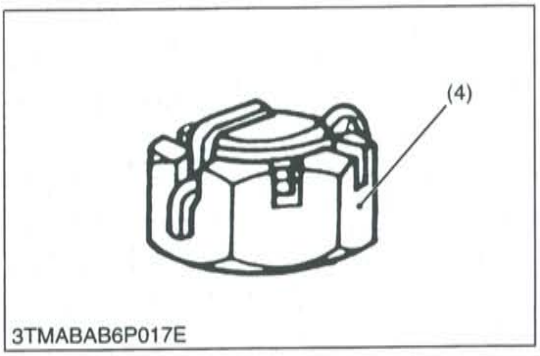
W1023157

(5) Removing Steering Cylinder (4WD Model)









Tie-rod

1. Remove the both cylinder covers (1).
2. Disconnect the both power steering delivery hoses (2) from cylinder.
3. Remove the both hose joints (3) from steering cylinder.
4. Pull out the cotter pin and remove the tie-rod end slotted nuts (4).
5. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

(When reassembling)

- Apply teflon tape to joint and set the joint as shown in figure.
- Connect the power steering delivery hose with blue tape to the R.H..
- Replace cotter pin with a new one.
- After tightening the tie-rod end nut to the specified torque, install a cotter pin as shown in the figure left.
- After assembling the power steering cylinder and tie-rod, check the toe-in and adjust it if necessary.

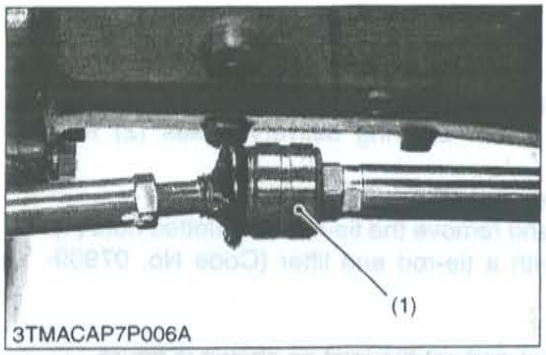
Tightening torque	Power steering delivery hose	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.3 ft-lbs
	Tie-rod end slotted nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Hose joint	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 ft-lbs

Toe-in	Factory spec.	2.0 to 8.0 mm 0.078 to 0.315 in.

(1) Cylinder Cover
(2) Power Steering Delivery Hose
(3) Hose Joint
(4) Slotted Nut

F : Front
R : Rear
a : 0.79 rad (45 °)

W1011235



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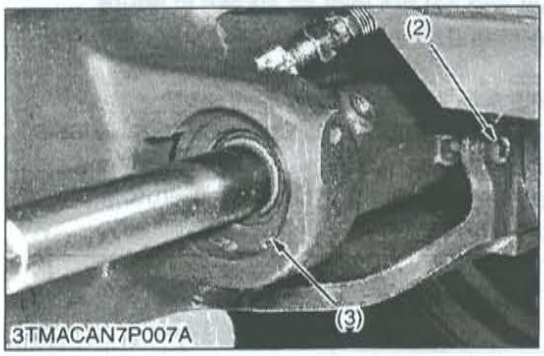

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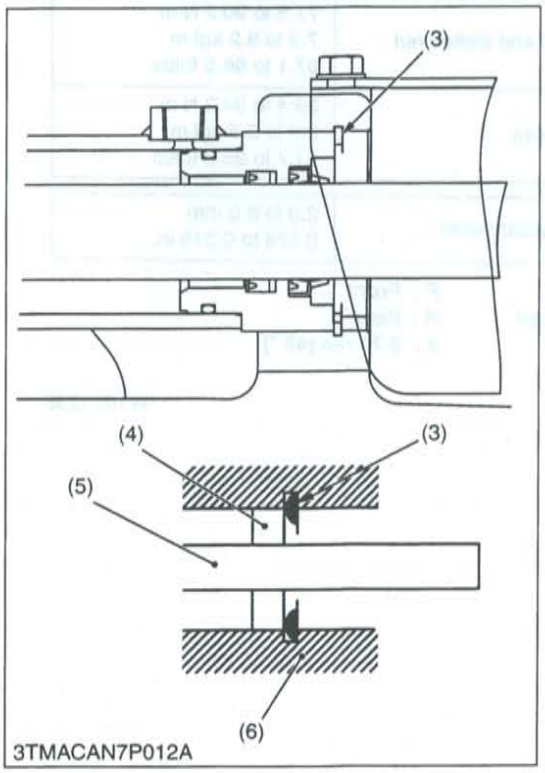

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Steering Cylinder

1. Remove the both tie-rod joints (1).
2. Remove the internal circlip (3) and set screw (2).
3. Draw out the steering cylinder to the right.

(When reassembling)

- Apply liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.
- When reassembling internal circlip (3), should be positioned so that sharp edge face to outward as shown in the figure.

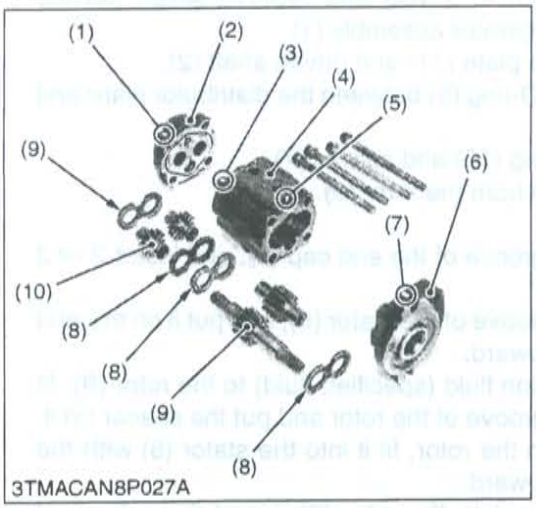
Tightening torque	Tie-rod joint	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs

(1) Tie-rod Joint
(2) Set Screw
(3) Internal Circlip
(4) Cylinder
(5) Cylinder Rod
(6) Front Axle Case

W1011578

[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump



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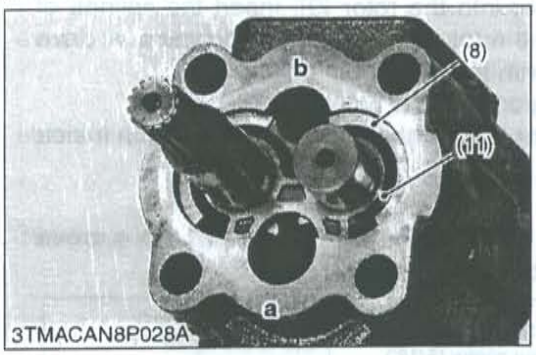

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Hydraulic Pump

1. Put the parting marks (1), (3), (5), (7) on the flange (6), housing (4), housing (8) and housing cover (2).
2. Unscrew the housing cover mounting screw and separate the flange (6) and housing cover (2) from the housing (4).
3. Remove the backup plate (8).
4. Take out the gears (9), (10).

(When reassembling)

- When installing the backup plate (8) with seal element (11), be sure to reassemble them to the each original position. Seal element on the backup plate (8) does not face to the gear side.
- Take care not to damage the seal elements and O-rings.
- After reassembly, check the smooth rotation of the hydraulic pump (for example, mount arm an approx. 100 mm (3.94 in.) long to the drive gear and rotate its arm slowly for smooth rotation).

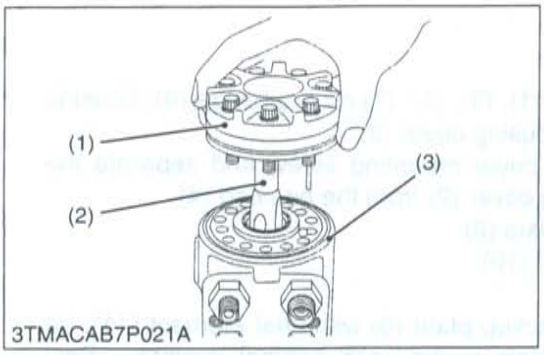
Tightening torque	Housing cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

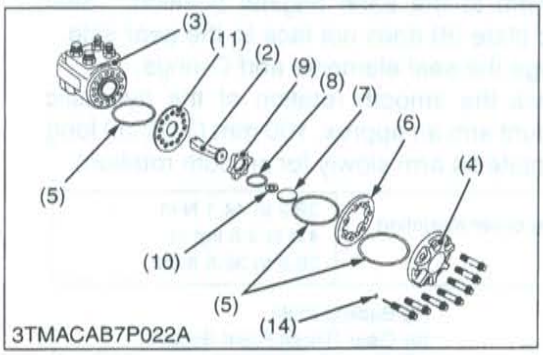
(1) Parting Mark
(2) Housing Cover
(3) Parting Mark
(4) Housing
(5) Parting Mark
(6) Flange
(7) Parting Mark
(8) Backup Plate
(9) Gear (Three Point System)
(10) Gear (Power Steering)
(11) Seal Element

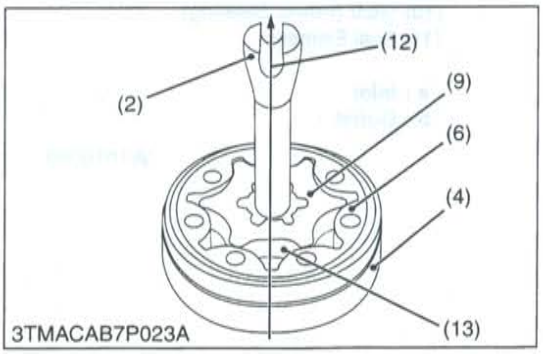
a : Inlet
b : Outlet

W1018089

(2) Steering Controller







Removing Gerotor

1. Secure the housing (3) in a vise and remove seven gerotor mounting screws and gerotor assembly (1).
2. Remove the distributor plate (11) and driven shaft (2).
3. Remove the rotor (9), O-ring (5) between the distributor plate and stator (6).
4. Take out the spacer ring (10) and spacer (7).
5. Remove the O-ring (8) from the rotor (9).

(When reassembling)

1. Fit an O-ring into the groove of the end cap (4), and insert 2 or 3 bolts.
2. Fit an O-ring into the groove of the stator (6), and put it on the end cap, with the O-ring upward.
3. Apply clean transmission fluid (specified fluid) to the rotor (9), fit an O-ring (8) into the groove of the rotor and put the spacer on it. Keeping the spacer on the rotor, fit it into the stator (6) with the spline bevelled side upward.
4. After putting the spacer into the rotor (9), insert the splines of driven shaft (2) into the rotor (9), aligning the direction of drive shaft pin groove (12) with the rotor tooth bottom (13).
5. Fit an O-ring into the groove of the housing (3). Fit the pin groove of the driven shaft (2) to the dowel pin inside the housing.

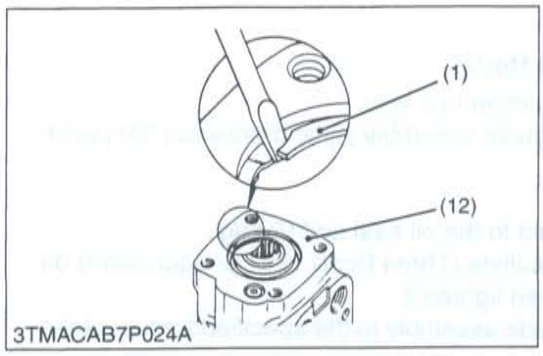
■ **IMPORTANT**

- **Be sure to align the direction of the drive shaft pin groove (12) with the rotor tooth bottom (13).**

Tightening torque	Gerotor assembly mounting screw (5/16')	25.5 to 28.4 N·m 2.6 to 2.9 kgf·m 18.8 to 21.0 ft-lbs

(1) Gerotor Assembly
(2) Driven Shaft
(3) Housing
(4) End Cap
(5) O-ring
(6) Stator
(7) Spacer
(8) O-ring
(9) Rotor
(10) Spacer Ring
(11) Distributor Plate
(12) Direction Pin Groove
(13) Rotor Tooth Bottom
(14) Ball

W1015327



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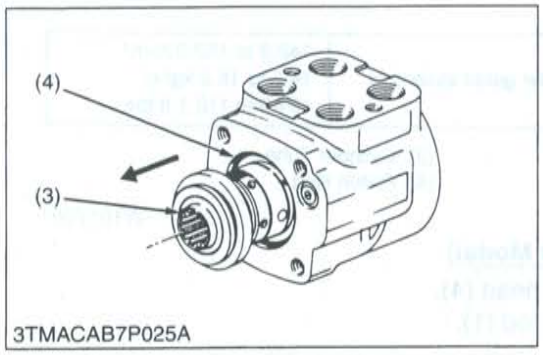

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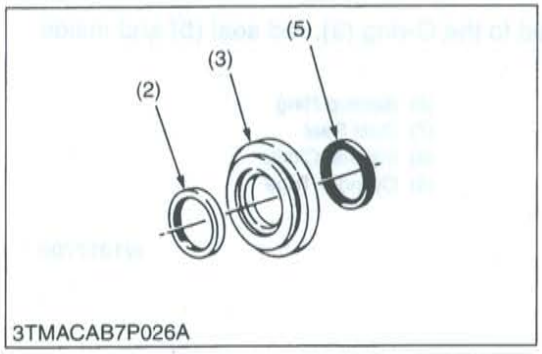

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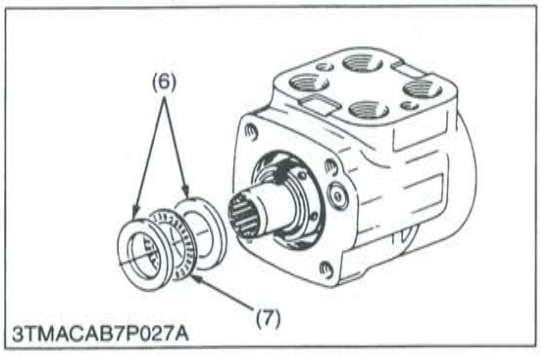

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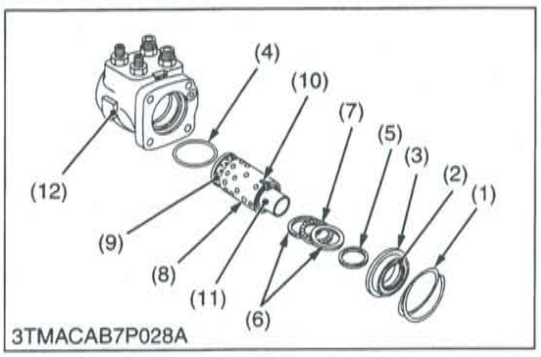

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Grand Seal, Needle Bearing, Sleeve and Spool

1. Remove the retaining ring (1) with a screw driver.
2. Hold the control valve unit vertically and spool and sleeve align the cross pin parallels to flat side of housing (flow priority valve mounting side), the cross pin is visible through open end of spool.
3. At this time, take care so as not to allow the cross pin to be caught in the groove of the housing. If the cross pin is caught, adjust its position with a fingertip.
4. Push the spool and sleeve to the allow direction and remove the seal grand bushing (3) with dust seal (2) and quad ring seal (5).
5. Remove the O-ring (4) from the housing (12).
6. Remove the dust seal from the seal grand bushing (3).
7. Remove the O-ring (4).

(When reassembling)

- Replace O-ring with new one.
  Apply transmission oil to the dust seal, quad ring seal and O-ring.

8. Remove the quad ring seal (5) from the sleeve (9).
9. Remove the bearing races and needle bearing from valve assembly.

(When reassembling)

- Apply transmission oil to the bearing races and needle bearing.

10. Draw out the sleeve (9) and spool (11) assembly from the gerotor side, with the port surface of the housing downward. At this time, take care so as not to allow the dowel pin to be caught in the groove of the housing (12). If the dowel pin is caught, adjust its position with a fingertip and draw out the sleeve and spool assembly slowly.

■ **IMPORTANT**

- **As the clearance between the housing and sleeve is very narrow, do not forcibly draw out the sleeve.**

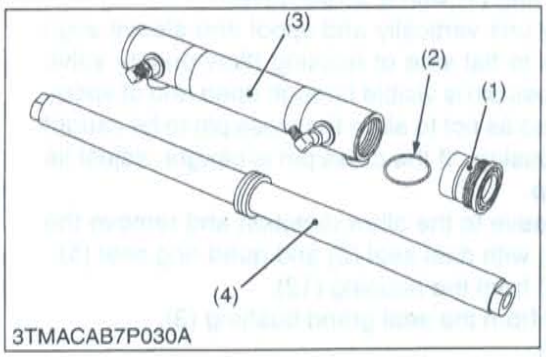
(When reassembling)

- When fitting the sleeve (9) and spool (11) assembly into the housing (12), apply clean transmission oil to the assembly and then insert it while turning it slowly, taking care so that the parts are not inclined. Also, pay attention to the dowel pin so that it is not caught in the housing grooves. If the pin is caught, adjust its position with a fingertip.

(1) Retaining Ring
(2) Dust Seal
(3) Seal Grand Bushing
(4) O-ring
(5) Quad Ring Seal
(6) Bearing Race
(7) Needle Bearing
(8) Pin
(9) Sleeve
(10) Centering Spring
(11) Spool
(12) Housing

W1015723

(3) Disassembling Steering Cylinder



Steering Cylinder (2WD Model)

1. Carefully clamp the cylinder in a vise.
2. Remove the cylinder guide assembly (1) and draw out the piston rod (4).

(When reassembling)

- Apply transmission fluid to the oil seal and O-ring.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) on the screw of guide when tighten it.
- After tightening the guide assembly to the specified torque, stake the cylinder firmly.

Tightening torque	Cylinder guide assembly	142.2 to 152.0 N·m 14.5 to 15.5 kgf·m 104.9 to 112.1 ft-lbs

(1) Cylinder Guide Assembly
(2) O-ring
(3) Cylinder Tube
(4) Piston Rod

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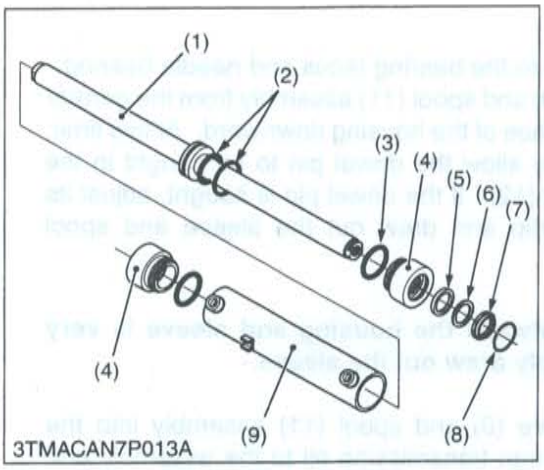


Steering Cylinder (4WD Model)

1. Draw out the cylinder head (4).
2. Draw out the cylinder rod (1).

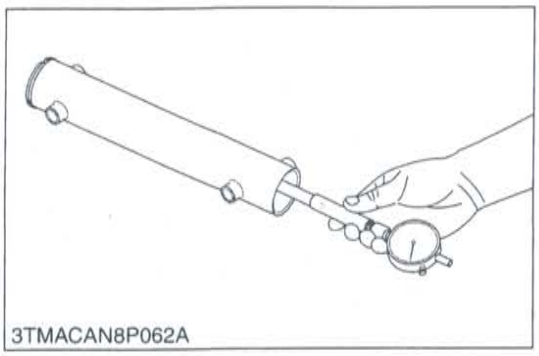
(When reassembling)

- Apply transmission fluid to the O-ring (3), rod seal (5) and inside of cylinder tube (9).

(1) Cylinder Rod
(2) Piston Seal
(3) O-ring
(4) Cylinder Head
(5) Rod Seal
(6) Backup Ring
(7) Dust Seal
(8) Internal Circlip
(9) Cylinder Tube

W1017709

[4] SERVICING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Steering Cylinder I.D.

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceeds the allowable limit, replace the cylinder barrel.

Steering cylinder I.D. (2WD)	Factory spec.	50.000 to 50.062 mm 1.9686 to 1.9709 in.
	Allowable limit	50.100 mm 1.9725 in.

Steering cylinder I.D. (4WD)	Factory spec.	55.000 to 55.074 mm 2.16535 to 2.16827 in.
	Allowable limit	55.100 mm 2.16929 in.

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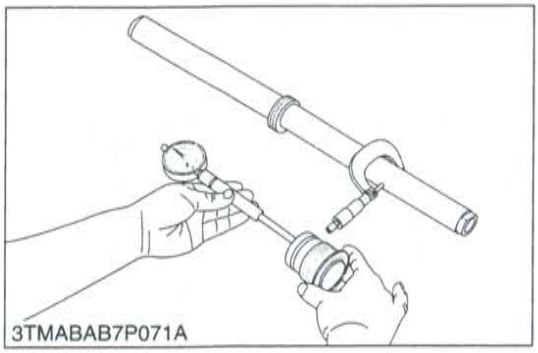
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Clearance between Rod and Bushing

1. Measure the bushing I.D. with a cylinder gauge.
2. Measure the rod O.D. with an outside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace as a unit.

Clearance between rod and bushing (2WD)	Factory spec.	0.009 to 0.127 mm 0.0035 to 0.00500 in.
	Allowable limit	0.135 mm 0.00531 in.

Clearance between rod and bushing (4WD)	Factory spec.	0.010 to 0.140 mm 0.00039 to 0.00551 in.
	Allowable limit	0.250 mm 0.00984 in.

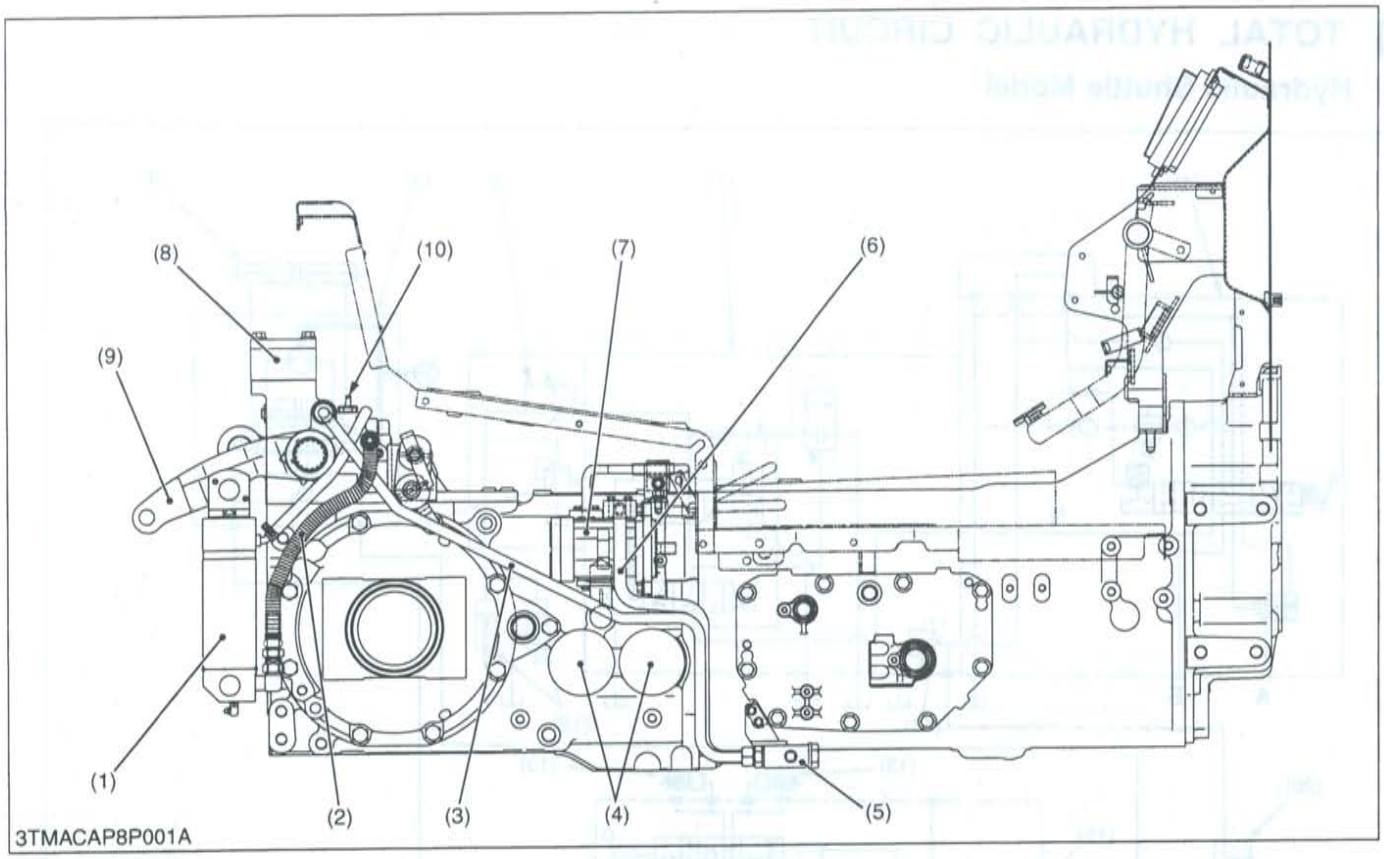
W1017904

8 HYDRAULIC SYSTEM

MECHANISM

CONTENTS

1. STRUCTURE



(1) Hydraulic Cylinder
(2) Hydraulic Hose
(3) 3-point Hitch Delivery Pipe 2
(4) Oil Filter
(5) Outlet Block
(6) 3-point Hitch Delivery Pipe 1
(7) Hydraulic Pump
(8) Auxiliary Control Valve
(9) Hydraulic Block
(10) Lowering Speed Adjusting Valve

The hydraulic system of the M5040, M6040 and M7040 tractor is composed of a 3-point hitch, remote hydraulic control for implements, power steering, PTO clutch and shuttle clutch.

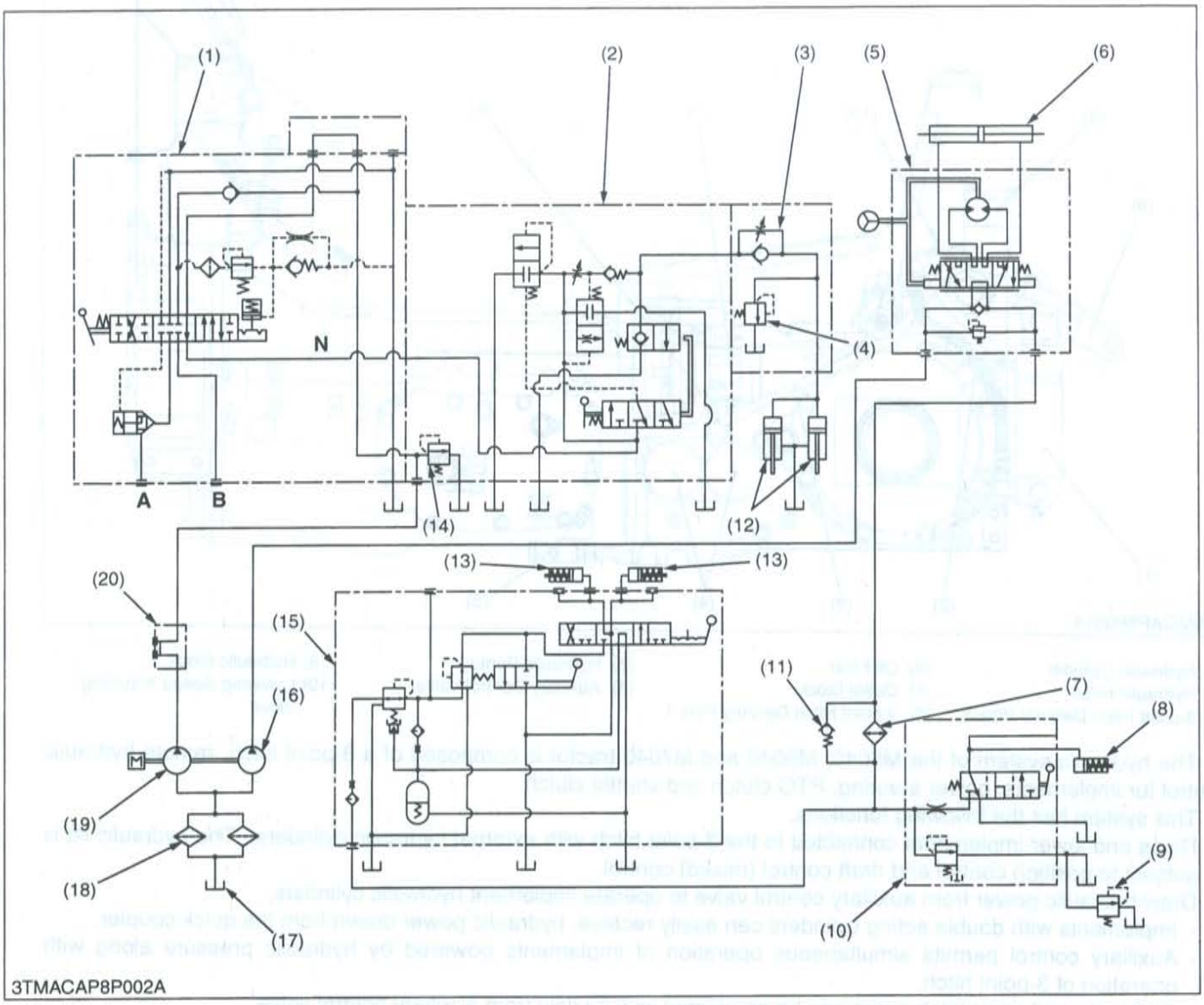
This system has the following functions.

1. Raise and lower implements connected to the 3-point hitch with external hydraulic cylinders. The hydraulic lift is subject to position control and draft control (mixed) control.
2. Draw hydraulic power from auxiliary control valve to operate implement hydraulic cylinders.
   - Implements with double acting cylinders can easily receive, hydraulic power drawn from the quick coupler.
   - Auxiliary control permits simultaneous operation of implements powered by hydraulic pressure along with operation of 3-point hitch.
   - Oil flow from 3-point hitch pump can be connected with oil flow from auxiliary control valve.
   - Operating pressure is 19.6 MPa (200 kgf/cm^2, 2847 psi).
   - Maximum of three remote valves or 2 valves with a flow control valve.

2. HYDRAULIC CIRCUIT

[1] TOTAL HYDRAULIC CIRCUIT

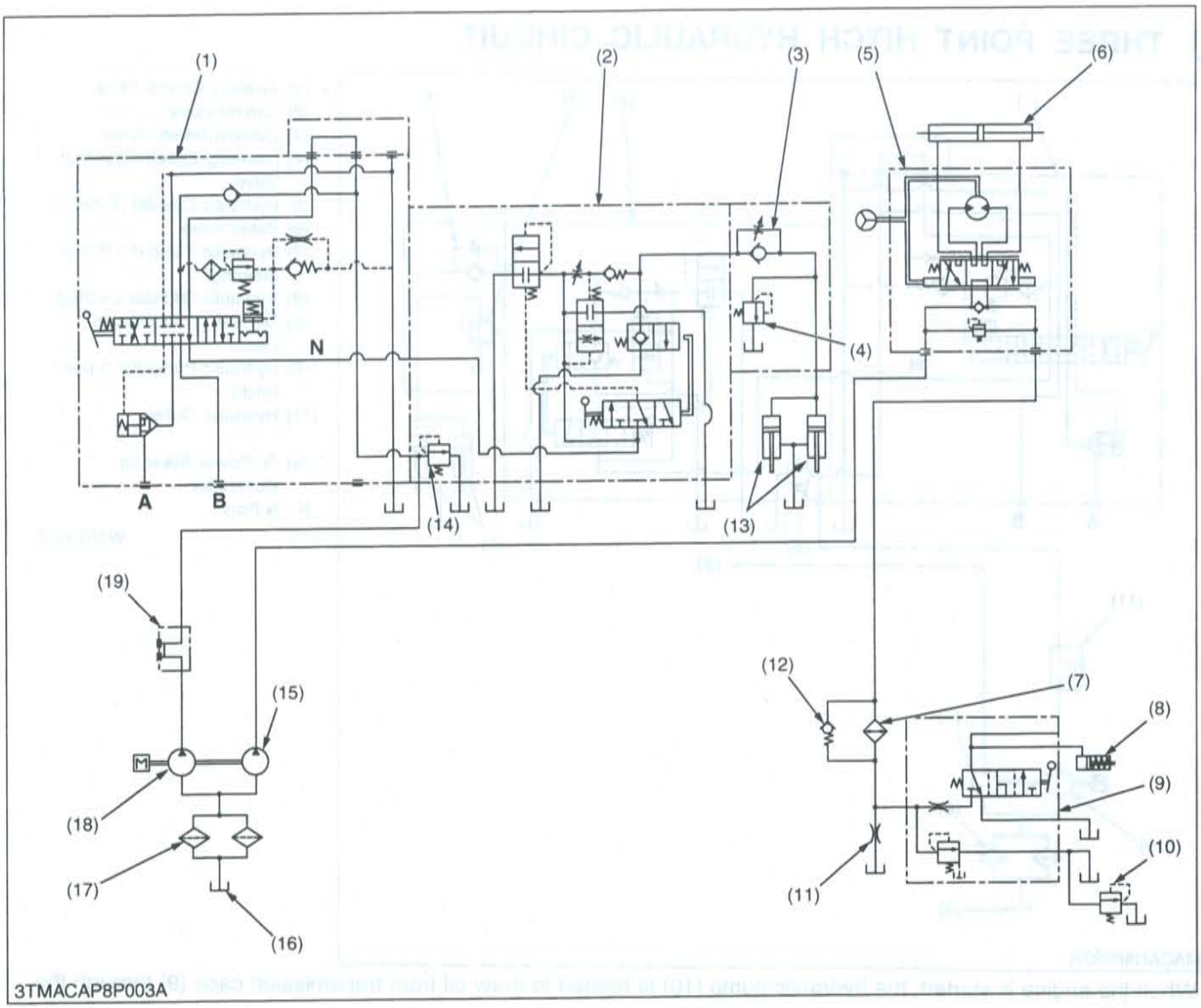
(1) Hydraulic Shuttle Model



(1) Auxiliary Control Valve
(2) Control Valve (for 3-point Hitch)
(3) Lowering Speed Adjusting Valve
(4) Cylinder Safety Valve
(5) Power Steering Controller
(6) Steering Cylinder
(7) Oil Cooler
(8) PTO Clutch Pack
(9) Relief Valve (for Lubricating Line)
(10) PTO Valve
(11) Oil Cooler Check Valve
(12) Exterior Hydraulic Cylinder
(13) Shuttle Clutch Pack
(14) Relief Valve for 3-point Hitch
(15) Shuttle Valve
(16) Hydraulic Pump (Power Steering, Brake, PTO Clutch and Shuttle Clutch)
(17) Oil Tank (Transmission Case)
(18) Hydraulic Oil Filter Cartridge
(19) Hydraulic Pump (for 3-point Hitch)
(20) Hydraulic Outlet

A : To Implement Cylinder
B : To Implement Cylinder
N : N Port

(2) Synchro Shuttle Model

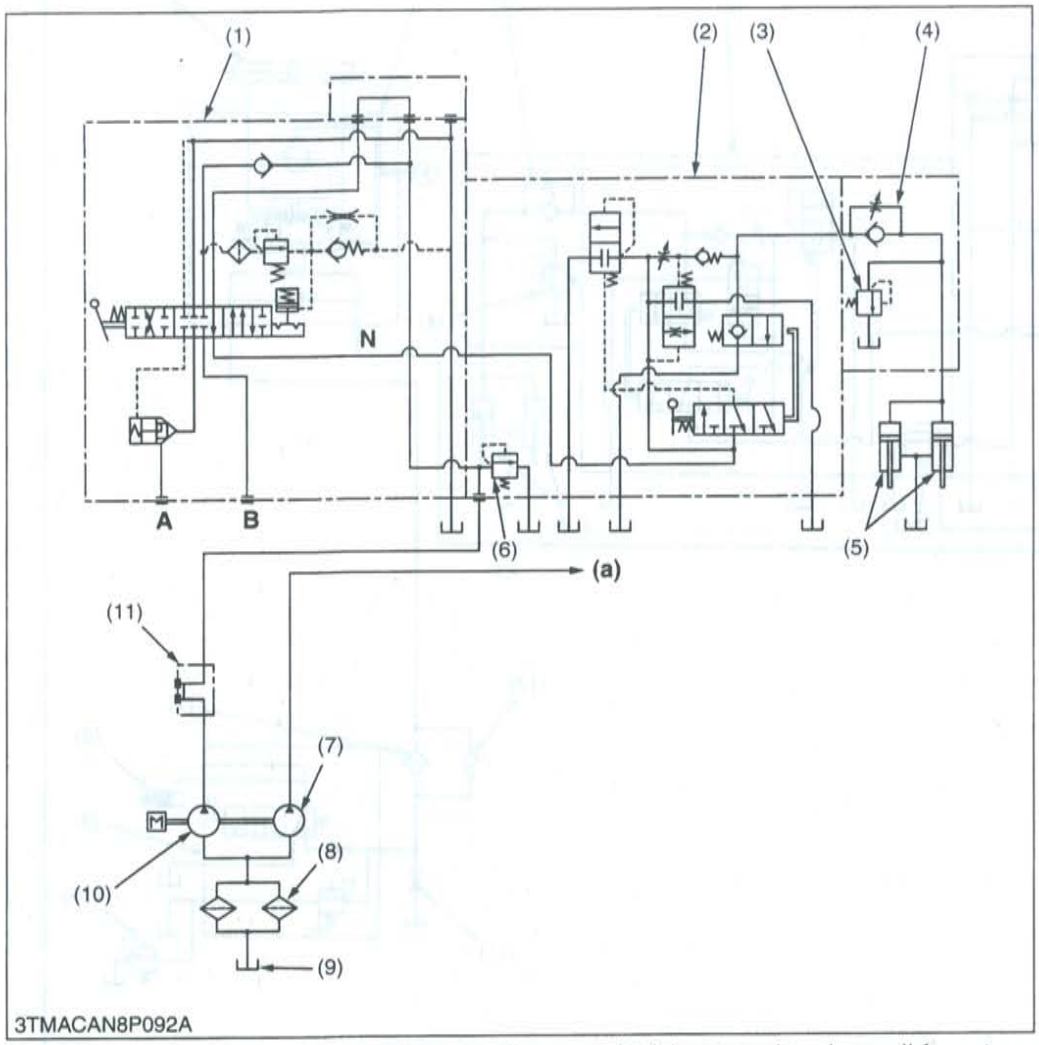


(1) Auxiliary Control Valve
(2) Control Valve (for 3-point Hitch)
(3) Lowering Speed Adjusting Valve
(4) Cylinder Safety Valve
(5) Power Steering Controller
(7) Oil Cooler
(8) PTO Clutch Pack
(9) PTO Valve
(10) Relief Valve (for Lubricating Line)
(11) Orifice
(6) Steering Cylinder
(12) Oil Cooler Check Valve
(13) Exterior Hydraulic Cylinder
(14) Relief Valve for 3-point Hitch
(15) Hydraulic Pump (Power Steering, Brake and PTO Clutch)
(16) Oil Tank (Transmission Case)
(17) Hydraulic Oil Filter Cartridge
(18) Hydraulic Pump (for 3-point Hitch)
(19) Hydraulic Outlet

A : To Implement Cylinder
B : To Implement Cylinder
N : N Port

3. THREE POINT HITCH HYDRAULIC SYSTEM

[1] THREE POINT HITCH HYDRAULIC CIRCUIT



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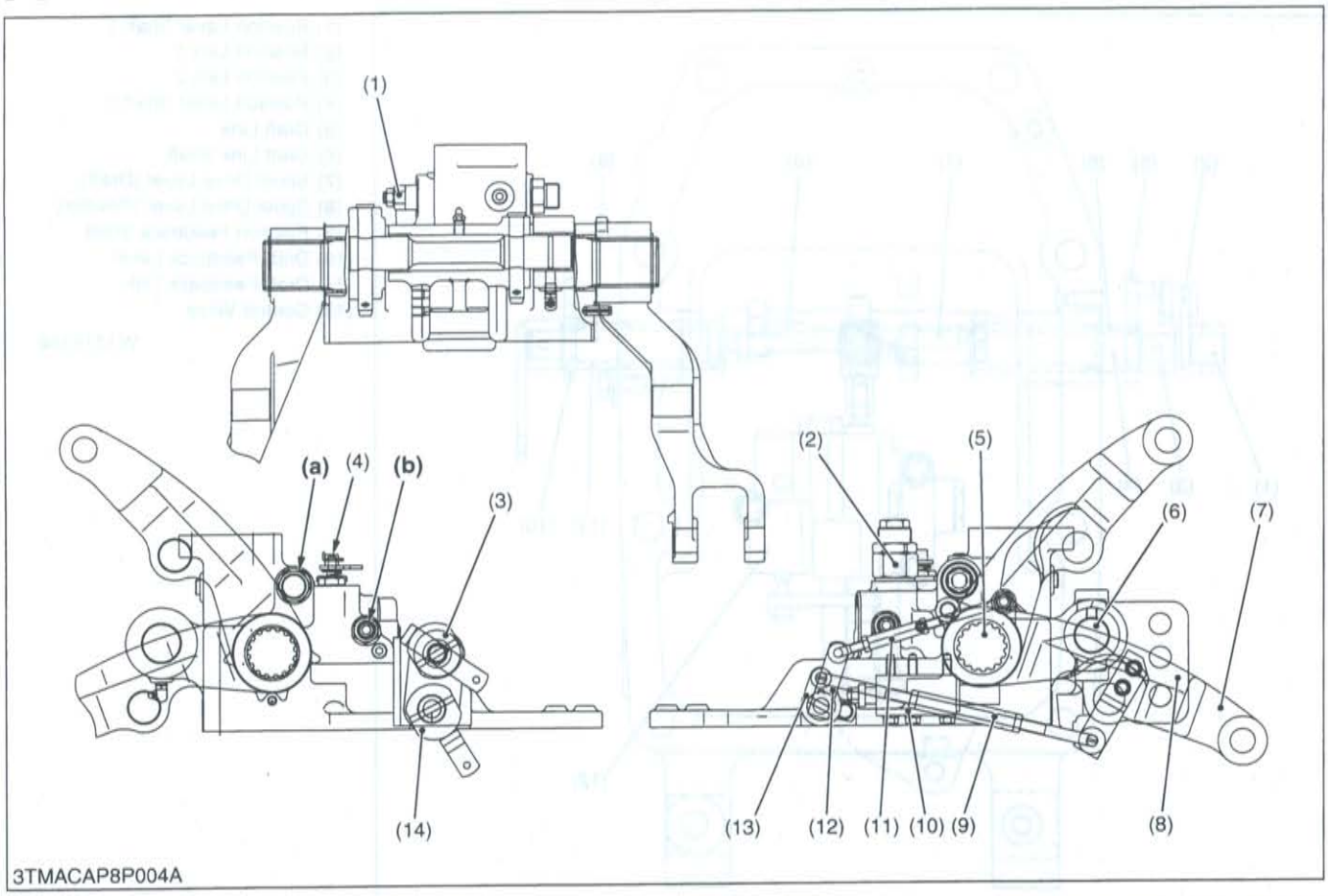
(1) Auxiliary Control Valve
(2) Control Valve
(3) Cylinder Safety Valve
(4) Lowering Speed Adjusting Valve
(5) Hydraulic Cylinder (Exterior)
(6) Relief Valve
(7) Hydraulic Pump (for Power Steering)
(8) Hydraulic Oil Filter Cartridge
(9) Oil Tank (Transmission Case)
(10) Hydraulic Pump (for 3-point Hitch)
(11) Hydraulic Outlet

(a) To Power Steering Controller
N : N Port

W1013426

1. When the engine is started, the hydraulic pump (10) is rotated to draw oil from transmission case (9) through the suction pipe.
   Supplied oil is filtered by the hydraulic oil filter cartridge (8).
2. Filtered oil is forced out by the hydraulic pump to the auxiliary control valve (1) through the hydraulic outlet (11).
3. With the auxiliary control valve (1) in neutral position, oil is channeled from **"N"** port to the control valve (2).
4. The hydraulic system has a relief valve (6) which restricts the maximum pressure in the circuit.
   The hydraulic cylinders (5) have a cylinder safety valve (3) to relieve shock pressure due to heavy implement bounce.
5. The control valve (2) is actuated by the mechanical linkage for **"Position control"** or **"Draft control"** or both **"Mix control"** (combining position control with draft control).
6. Tractor has a double acting auxiliary control valve (1) as standard equipment.

[2] HYDRAULIC BLOCK



(1) Relief Valve
(2) Cylinder Safety Valve
(3) Draft Control Linkage
(4) Lowering Speed Adjusting Valve
(5) Lift Arm Shaft
(6) Torsion Bar
(7) Lift Arm
(8) Top Link Bracket
(9) Draft Feedback Rod
(10) Control Valve
(11) Position Feedback Rod
(12) Position Feedback Link
(13) Draft Feedback Link
(14) Position Control Linkage

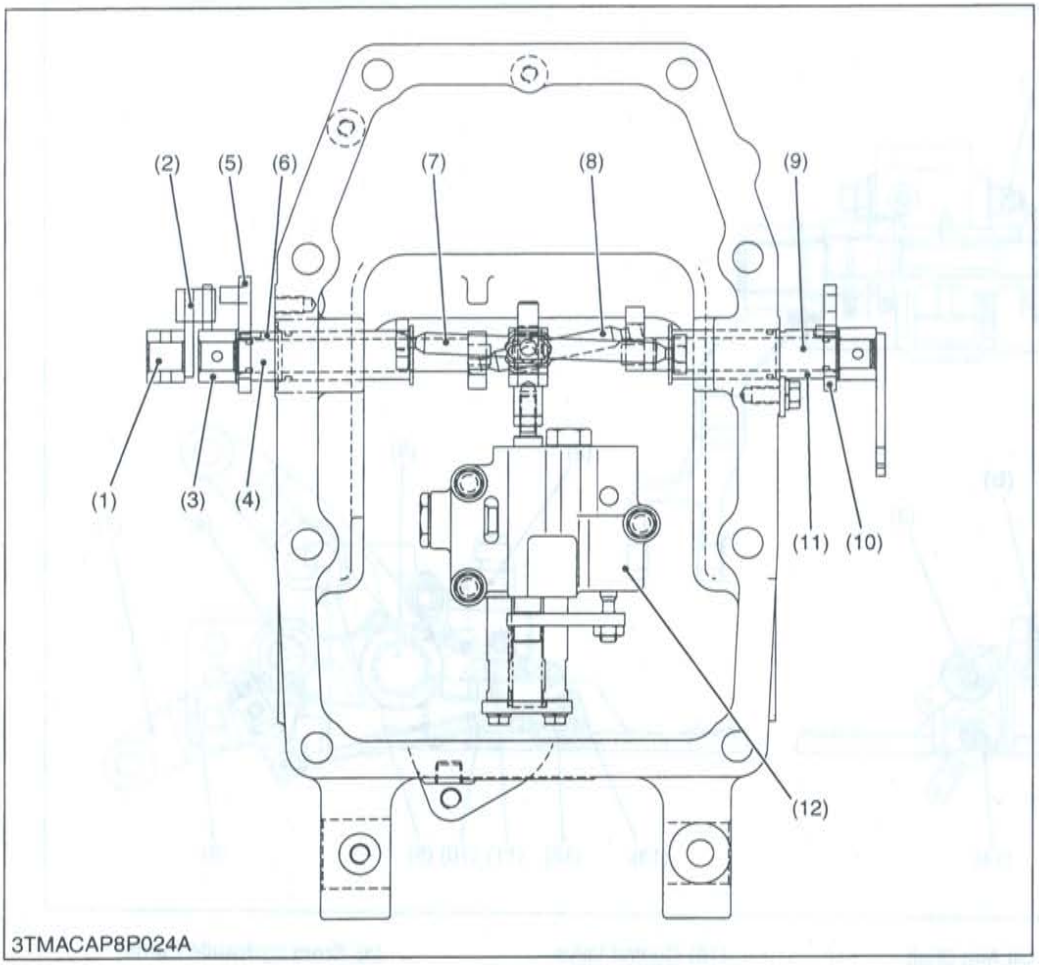
(a) From Hydraulic Pump
(b) To or From Hydraulic Cylinder

The hydraulic block is equipped with cylinder safety valve (2), relief valve (1), lowering speed adjusting valve (4), check valve, control valve (10), lift arm (7), lift arm shaft (5), torsion bar (6), position feedback rod (11) and draft feedback rod (9) etc.

The hydraulic outlet port (**b**) is located in the hydraulic block to take power from the tractor to operate the hydraulic cylinders of the three point linkage.

1. To operate the control valve, refer to "8. HYDRAULIC SYSTEM / (7) Position Control Valve - Type 7" in the workshop manual of tractor mechanism (Code No. 97897-18200).
2. To operate the relief valve operation, refer to "8. HYDRAULIC SYSTEM / 4. RELIEF VALVE / [2] PILOT OPERATED TYPE" in the workshop manual of tractor mechanism (Code No. 97897-18200).
3. To operate the cylinder safety valve (surge relief valve) operation, refer to "8. HYDRAULIC SYSTEM / 7. CYLINDER SAFETY VALVE (SURGE RELIEF VALVE)" in the workshop manual of tractor mechanism (Code No. 97897-18200).

[3] LINKAGE MECHANISM



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(1) Position Lever Shaft 1
(2) Position Link 1
(3) Position Link 2
(4) Position Lever Shaft 2
(5) Draft Link
(6) Draft Link Shaft
(7) Spool Drive Lever (Draft)
(8) Spool Drive Lever (Position)
(9) Position Feedback Shaft
(10) Draft Feedback Lever
(11) Draft Feedback Link
(12) Control Valve

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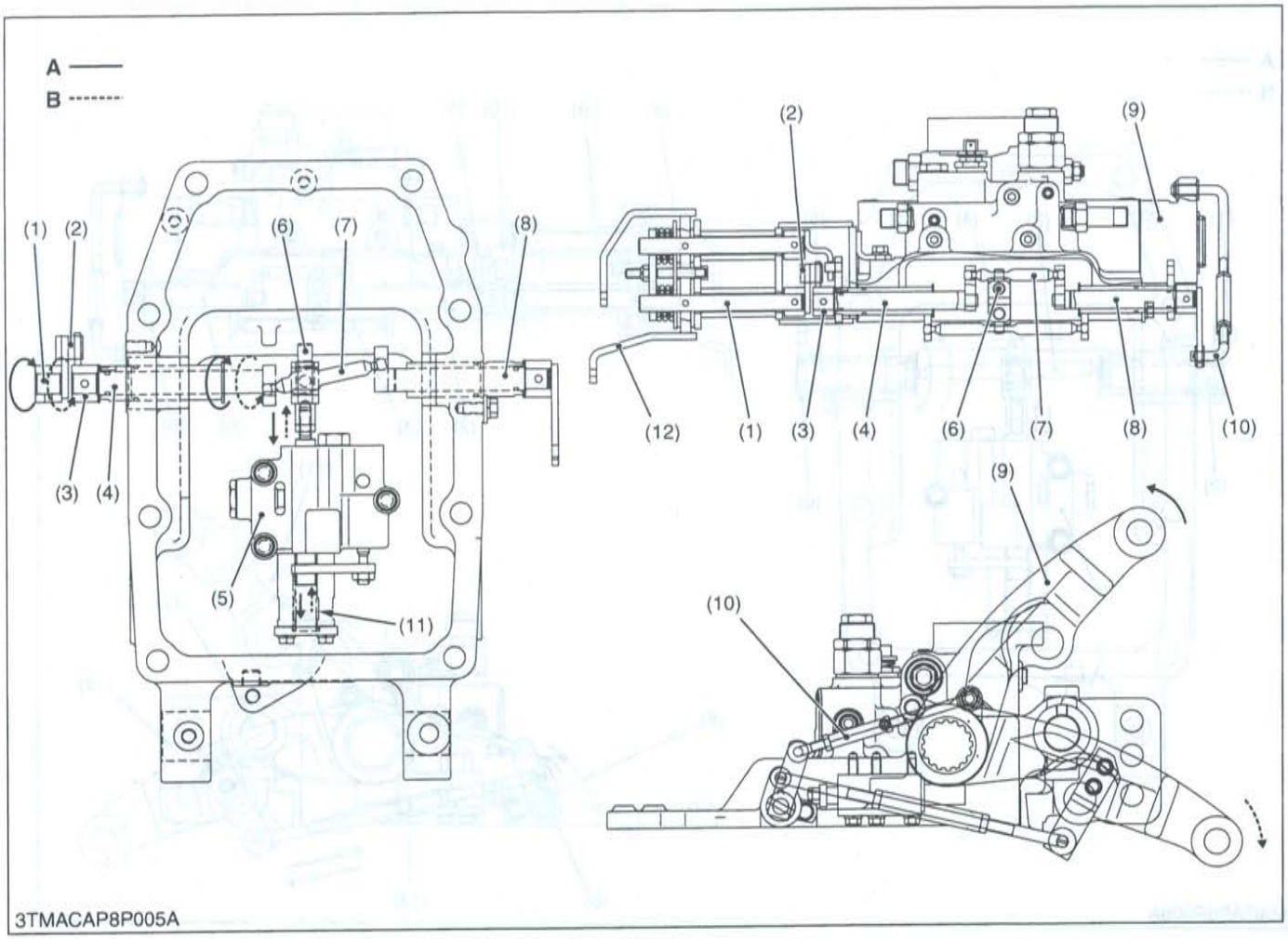
(1) Position Control



(1) Position Lever Shaft 1
(2) Position Link 1
(3) Position Link 2
(4) Position Lever Shaft 2
(5) Control Valve
(6) Spool
(7) Spool Drive Lever (Position)
(8) Position Feedback Shaft
(9) Lift Arm
(10) Position Feedback Rod
(11) Spring
(12) Position Control Lever

A : Lift
B : Down

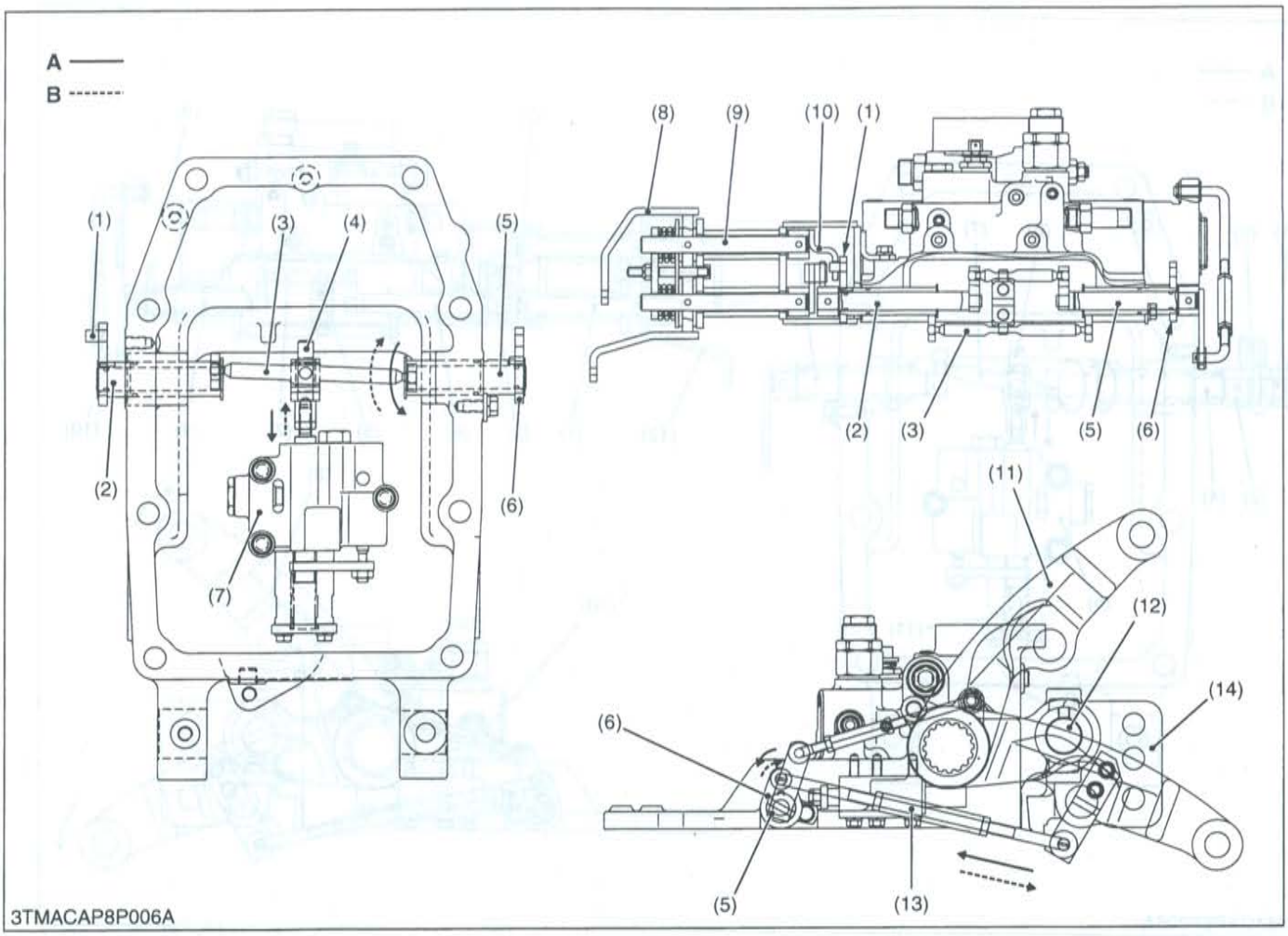
■ Lift

1. When the position control lever (12) is moved to the **"LIFT"** position, the position lever shaft 1 (1) and position link 1 (2) rotates and press down the position link 2 (3).
   The position lever shaft 2 (4) rotates and pushes the spool (6) by the spool drive lever (7), opening the **"LIFT"** circuit.
2. When the lift arm (9) moves upward, position feedback shaft (8) rotates via position feedback rod (10) and pulls the spool (6) by the spool drive lever (7).
   The lift arm stops when the spool (6) returns to the neutral position.

■ Down

1. When the position control lever (12) is moved to the **"DOWN"** position, the position link 2 (3) is free.
   The spool (6) of control valve moves by spool spring (11) to opening the **"DOWN"** circuit.
2. When the lift arm (9) moves downward, feedback shaft (8) rotates via position feedback rod (10) and push the spool (6) by the spool drive lever (7).
   The lift arm stops when the spool returns to the neutral position.

(2) Draft Control

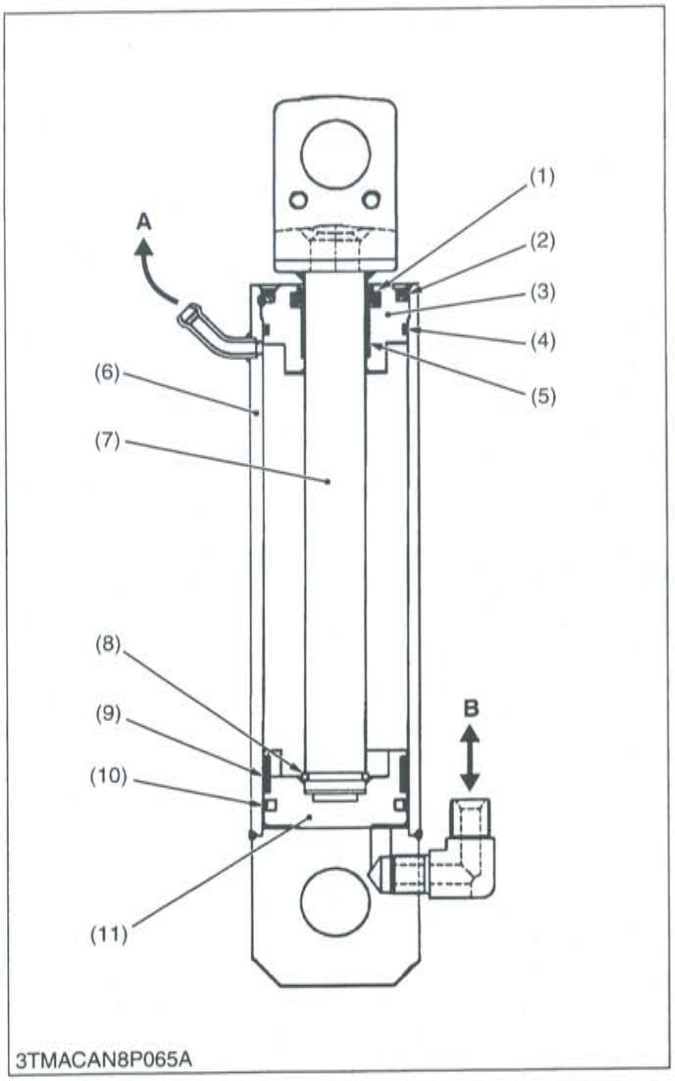


(1) Draft Link
(2) Draft Link Shaft
(3) Spool Drive Lever (Draft)
(4) Spool
(5) Draft Feedback Link Shaft
(6) Draft Feedback Lever
(7) Control Valve
(8) Draft Control Valve
(9) Draft Lever Shaft
(10) Draft Lever
(11) Lift Arm
(12) Torsion Bar
(13) Draft Feedback Rod
(14) Top Link Holder

A : Lift
B : Down

1. When the traction load increases, the torsion bar (12) is twisted, and its displacement is transmitted to the draft feedback link shaft (5) via the draft feedback rod (13) and draft feedback lever (6). The draft feedback link shaft (5) rotates.
   The draft feedback link shaft (5) pushes the spool (4) in via the spool drive lever (3) and the **"LIFT"** circuit is activated.
   As the implement is raised and the traction load decreases, the torsion bar is restored to return the spool (4) to neutral point.
2. When the traction load decreases, the torsion bar is restored and its displacement is transmitted to the draft feedback link shaft (5) via the draft feedback rod (13) and draft feedback lever (6). As the draft feedback link shaft (5) rotates, the spool drive lever (3) pulls the spool (4) to form the **"DOWN"** circuit.
   As the implement lowers and the traction load increases, the torsion bar is twisted to return the spool (4) to neutral position.

[4] HYDRAULIC CYLINDER



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The external type hydraulic cylinders are used for 3-point linkage system. This hydraulic cylinder is single acting type, and it is installed directly between hydraulic lift arms.

The main components of the hydraulic cylinder are shown in the figure.

(1) Dust Seal
(2) Circlip
(3) Head
(4) O-ring
(5) Bushing
(6) Cylinder Tube
(7) Rod
(8) Circlip
(9) Wear Ring
(10) Seal
(11) Piston

A : To Transmission Case
B : To or From Position Control Valve

W1015282

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Raise (Not Noise)	Control linkage improperly assembled or damaged	Repair or replace	8-S17
	Control valve malfunctioning (unload valve, spool, check valve, poppet valve)	Repair or replace	8-S20
	Control valve broken	Replace	8-S20
	Control valve improperly adjusted	Adjust	8-S20
	Relief valve spring damaged	Replace	8-S22
	Cylinder damaged	Replace	8-S21
	Safety valve damaged	Replace	8-S22
Implement Does Not Raise (Noise)	Transmission fluid improper or insufficient	Change or replenish	G-10
	Oil filter clogged	Replace	G-19
	Relief valve setting pressure too low	Adjust	8-S6
	Relief valve spring weak or damaged	Replace	8-S22
	Hydraulic pump malfunctioning	Repair or replace	8-S13
Implement Does Not Reach Maximum Height	Position rod and feedback rod improperly adjusted	Adjust	8-S8
	Draft rod and feedback rod improperly adjusted	Adjust	8-S8
Implement Does Not Lower	Control valve malfunctioning	Repair or replace	8-S20
	Spool damaged	Replace	8-S20
	Lowering speed adjusting valve closed	Open	8-S23
Implement Drops by Weight	Hydraulic cylinder worn or damaged	Replace	8-S21
	Safety valve damaged	Replace	8-S22
	Lowering speed adjusting valve damaged	Replace	8-S23
	Control valve malfunctioning (check valve seat surface, check valve O-ring, poppet valve seat surface and poppet valve O-ring damaged)	Replace	8-S20
Implement Hunts (Moves Up and Down)	Poppet valve, poppet seat surface damaged	Replace	8-S20
	Check valve, check valve seat surface damaged	Replace	8-S20
	Control valve O-ring worn or damaged	Replace	8-S20
Draft Control Malfunctioning	Draft control linkage improperly adjusted	Adjust	8-S8, 10
	Torsion bar weak or broken	Replace	–

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2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump for Three Point Linkage **Condition** • Engine speed : Approx. 2600 min^{-1} (rpm) • Rated pressure : 18.6 MPa 190 kgf/cm^2 2703 psi • Oil temperature : 50 to 60 °C 122 to 140 °F	Delivery	Above 38.3 L/min. 10.12 U.S.gals/min. 8.42 Imp.gals/min.	32.2 L/min. 8.51 U.S.gals/min. 7.08 Imp.gals/min.

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RELIEF AND SAFETY VALVE

Relief Valve	Setting Pressure	18.2 to 19.1 MPa 185 to 195 kgf/cm^2 2632 to 2773 psi	–
Safety Valve	Opening Pressure	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3556 psi	–

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POSITION AND DRAFT CONTROL LINKAGE

Position Control Rod (ROPS)	Length	Approx. 159 mm 6.260 in.	–
Draft Control Rod (ROPS)	Length	Approx. 146 mm 5.748 in.	–
Position Control	Floating Range	10 to 30 mm 0.39 to 1.18 in.	–
Uppermost Position of Lift Arm	Cylinder Free Play	5 to 8 mm 0.197 to 0.315 in.	–
Draft Lever Free Range	Floating Range	Less than 25.0 mm 0.984 in.	–
Draft Floating Range Check	Floating Range	More than 15.0 mm 0.59 in.	–
Position and Draft Control Lever	Operating Force	20 to 40 N 2.0 to 4.1 kgf 4.5 to 9.0 lbs	–

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CONTROL VALVE

Spool Joint	Length	24.5 to 25.0 mm 0.9646 to 0.9842 in.	–

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LIFT ARM AND TOP LINK BRACKET

Bushing	Press-fit Location	11.0 mm 0.433 in.	–

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HYDRAULIC CYLINDER

Item		Factory Specification	Allowable Limit
Cylinder Head Bushing to Cylinder Rod	Clearance	0.081 to 0.199 mm 0.00319 to 0.00783 in.	0.25 mm 0.0098 in.
Hydraulic Cylinder Head Bushing	I.D.	30.056 to 30.153 mm 1.1834 to 1.1871 in.	–
Hydraulic Cylinder Rod	O.D.	29.954 to 29.975 mm 1.1793 to 1.1801 in.	–
Hydraulic Cylinder	I.D.	55.000 to 55.074 mm 2.1654 to 2.1682 in.	55.100 mm 2.1693 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 : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

Item	N·m	kgf·m	ft-lbs
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
Relief valve assembly	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Safety valve assembly	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Safety valve lock nut	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
3-point hitch delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Housing cover mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Cylinder hose rataining nut	45.1 to 53.0	4.6 to 5.4	33.3 to 39.1
3-point hitch hydraulic block mounting screw (M14, 9T)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
3-point hitch hydraulic block mounting nut (M14, 7T)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Cabin mounting bolt and nut (M14, 7T)	124 to 147	12.6 to 15.0	91.2 to 108
Control valve mounting screw	19.6 to 23.5	2.0 to 2.4	14.5 to 17.4
Seat plug 1	34.4 to 44.1	3.5 to 4.5	25.4 to 32.5
Seat plug 2	23.6 to 35.3	2.4 to 3.6	17.4 to 26.0
Lowering speed adjusting valve assembly	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9

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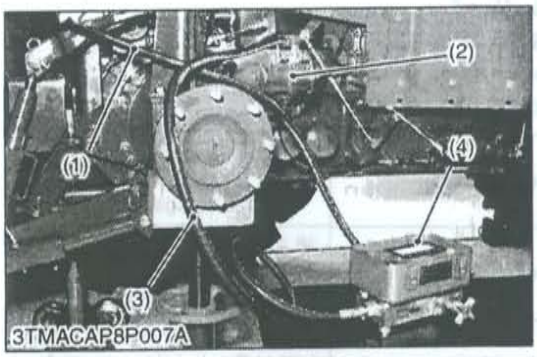
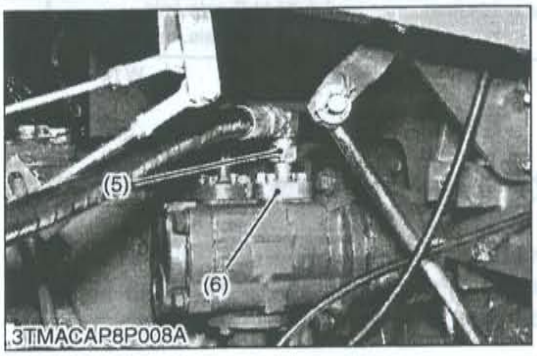
4. CHECKING AND ADJUSTING

[1] HYDRAULIC PUMP (FOR THREE POINT HITCH)





Hydraulic Flow Test

■ **IMPORTANT**

- **When using flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with the flowmeter.**
- **Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.**
- **Set the main change lever and shuttle lever in Neutral position.**
- **Set parking brake lever in parking position.**

1. Place the disassembling stand under the transmission case.
2. Remove the right rear wheel.
3. Place the disassembling stand under the right rear axle case.
4. Disconnect the differential lock rod from pedal.
5. Disconnect the delivery pipe for power steering or delivery pipe for 3 point hydraulic from hydraulic pump (2).
6. Install the adaptor **53** and **54** (refer to "SPECIAL TOOLS" at "G. GENERAL" section) to the pump discharge port.
7. Connect the hydraulic test hose (3) to the adaptor at hydraulic pump (2) and flowmeter (4) inlet port.
8. Connect the other hydraulic test hose (1) to the flowmeter outlet, insert the hydraulic test hose other end to transmission oil filling port at PTO case.
9. Open the flowmeter loading valve completely. (Turn counterclockwise.)
10. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
11. Slowly close the loading valve to generate pressure approx. 9.8 MPa (100 kgf/cm^2, 1422 psi). Hold in this condition until oil temperature reaches approx. 55 °C (131 °F).
12. Open the loading valve completely.
13. Set the engine speed. (Refer to **"Condition"**.)
14. Read and note the pump delivery at rated pressure.
15. Open the loading valve completely and stop the engine.
16. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.
17. Check the hydraulic flow test for power steering and three point pump are same procedure.

(When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Hydraulic Test Hose
(2) Hydraulic Pump
(3) Hydraulic Test Hose
(4) Flowmeter
(5) Adaptor **53**
(6) Adaptor **54**

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Hydraulic Flow Test (Continued)

Condition

- Engine speed : Approx. 2600 min^{-1} (rpm)
- Rated pressure : 18.6 MPa
  190 kgf/cm^2
  2703 psi
- Oil temperature : 50 to 60 °C
  122 to 140 °F

Hydraulic pump delivery at no pressure	Factory spec.	Above 39.1 L/min. 10.33 U.S.gals./min. 8.6 Imp.gals./min.
Hydraulic pump delivery at rated pressure	Factory spec.	38.3 L/min. 10.12 U.S.gals./min. 8.42 Imp.gals./min.
	Allowable limit	32.2 L/min. 8.51 U.S.gals./min. 7.08 Imp.gals./min.

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[2] RELIEF AND SAFETY VALVE


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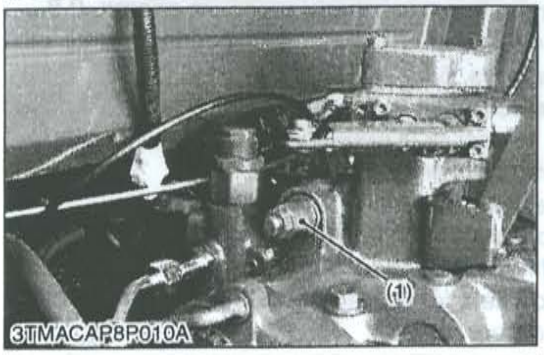

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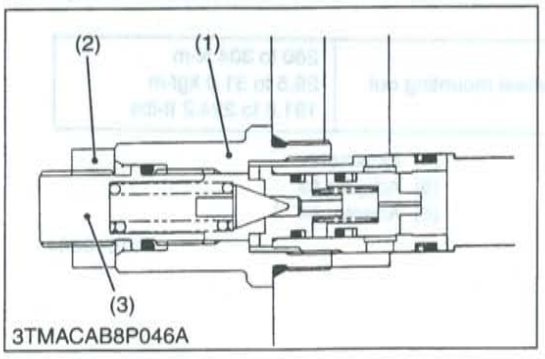

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Relief Valve Setting Pressure Test Using Pressure Tester (Coupler)

1. Install the relief valve set pressure adaptor **G** (Code No. 07916-52751) to the male half of the quick coupler and then install a pressure gauge (Code No. 07916-50322), cable (Code No. 07916-50331).
2. Start the engine, set at maximum speed.
3. Set the auxiliary control valve operation lever to the **UP** position and read the pressure gauge when the relief valve is actuated.
4. If the pressure is not within the factory specification, adjust the relief valve adjuster (3).

Condition

- Engine speed : Approx. 2600 min^{-1} (rpm)
- Oil temperature : 45 to 55 °C
  113 to 131 °F

Tightening torque	Relief valve assembly	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

Relief valve setting pressure	Factory spec.	18.2 to 19.1 MPa 185 to 195 kgf/cm^2 2632 to 2773 psi

(1) Relief Valve
(2) Lock Nut
(3) Adjuster

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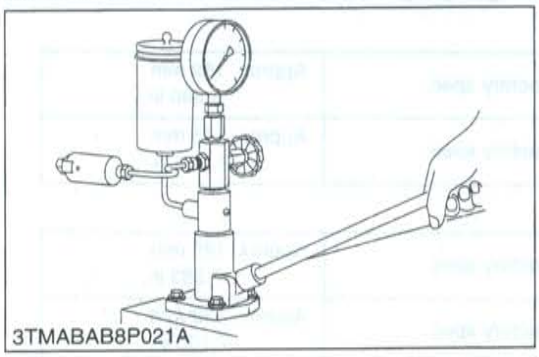
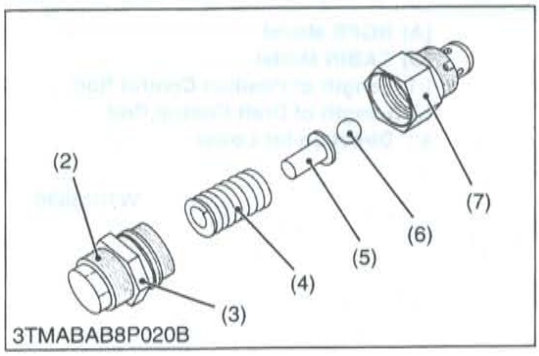




Safety Valve Setting Pressure Test Using Injection Nozzle Tester

1. Remove the safety valve assembly (1).
2. Attach the safety valve to an injection nozzle tester with a safety valve setting adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
3. Measure the operating pressure of the safety valve.
4. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (2).
5. After adjustment, tighten the lock nut (3) firmly.

(When reassembling)

- Install the safety valve to the hydraulic cylinder block, taking care not to damage the O-ring and apply transmission fluid.

Tightening torque	Safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs
	Safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft-lbs

Safety valve operating pressure	Factory spec.	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3556 psi

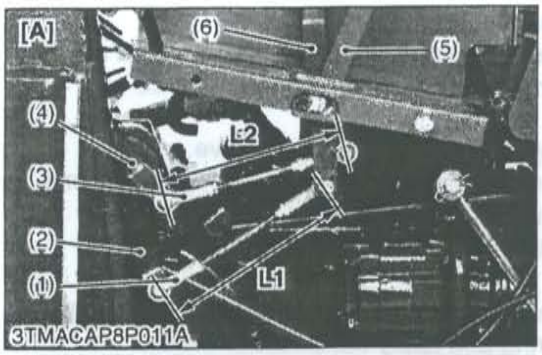
■ **NOTE**

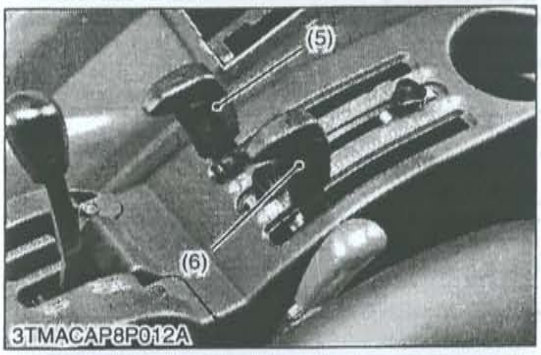
- **Use specified transmission fluid (refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section) to test the operating pressure of the cylinder safety valve.**

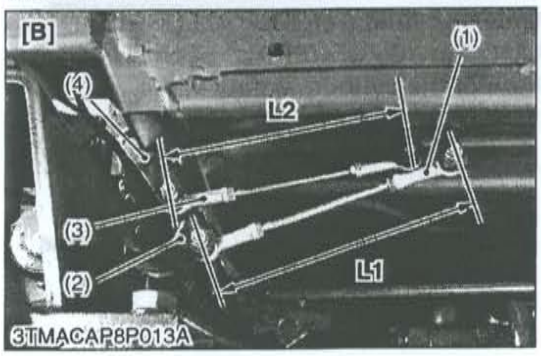
(1) Safety Valve Assembly
(2) Adjusting Screw
(3) Lock Nut
(4) Spring
(5) Seat
(6) Ball
(7) Housing

W1012986

[3] POSITION AND DRAFT CONTROL LINKAGE







Adjusting Position Control Rod and Draft Control Rod

1. Be sure to adjust the position control rod (1) length (**L1**) and draft control rod (3) length (**L2**).

■ **IMPORTANT**

- **Each draft control lever and position control lever should contact with lever guide lowest position when operate the position lever 1 (2) and draft lever 1 (4) to end of direction (a). If not, adjust the position control rod (1) length (L1) and/or draft control rod (3) length (L2).**

[ROPS Model]

Position control rod length (**L1**)	Factory spec.	Approx. 159 mm 6.260 in.
Draft control rod length (**L2**)	Factory spec.	Approx. 146 mm 5.748 in.

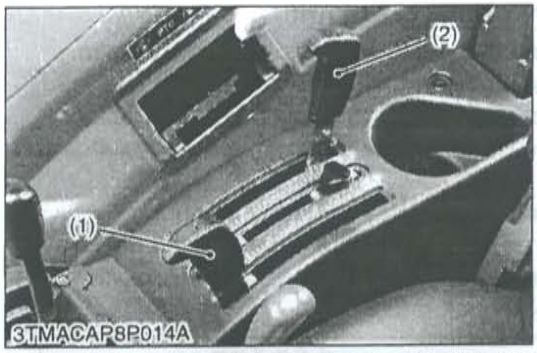
[CABIN Model]

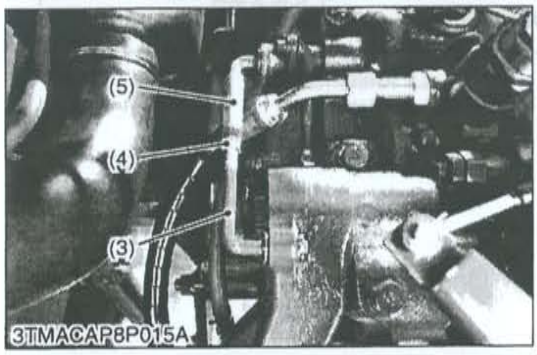
Position control rod length (**L1**)	Factory spec.	Approx. 185 mm 7.283 in.
Draft control rod length (**L2**)	Factory spec.	Approx. 182 mm 7.165 in.

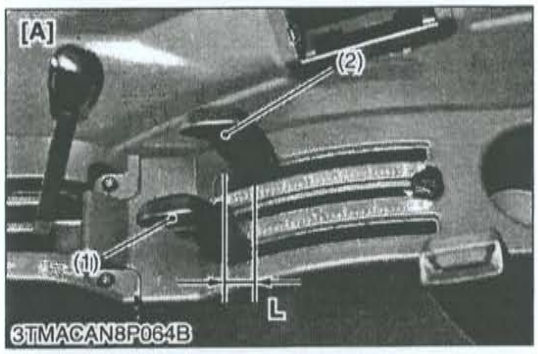
(1) Position Control Rod
(2) Position Lever 1
(3) Draft Control Rod
(4) Draft Lever 1
(5) Position Control Lever
(6) Draft Control Lever

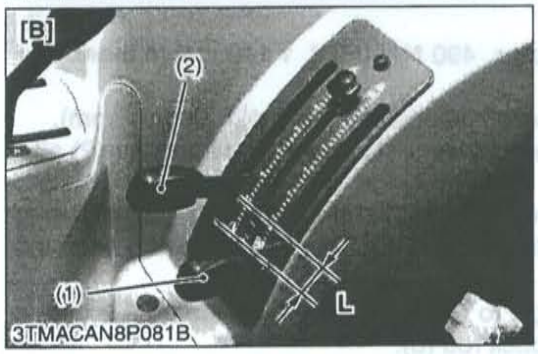
[A] ROPS Model
[B] CABIN Model
L1 :Length of Position Control Rod
L2 :Length of Draft Control Rod
a : Direction for Lower

W1013598









Adjusting Position Control

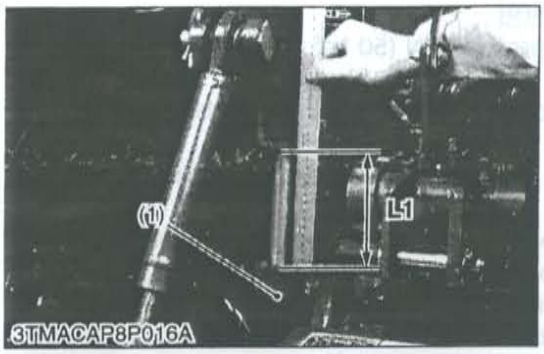
1. Attach a weight of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Set the position control lever (2) and draft control lever (1) to the lowest position.
3. Start the engine, and after warming-up, set the engine speed at 1000 min^{-1} (rpm).
4. Move the position control lever (2) to the uppermost position. (Contact to the position control lever guide.)
5. Lengthen the position feedback rod (3) until the relief valve begins to be operated.
6. From the relief valve operating position, turn the turnbuckle (5) 1.5 turns to shorten the position feedback rod (3).
7. Tighten the lock nut (4).
8. Move the position control lever (2) to the lowest position to check the cylinder goes to lowest position.
9. Set the position control lever (2) to the lowest position, then slowly shift the lift arm to the upper until the lift arm begins to operated. Check the floating range length (**L**) guide end and position control lever.
10. If floating range (**L**) is not with in the factory specification, readjust with above procedure.

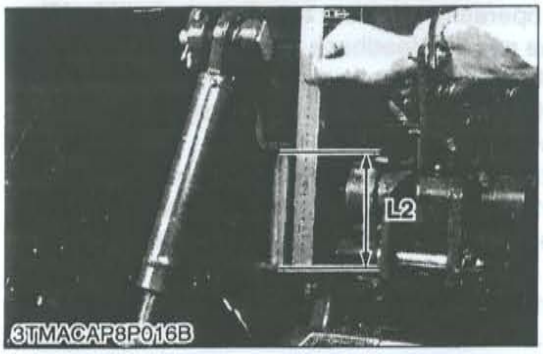
Floating range (**L**)	Factory spec.	10 to 30 mm 0.39 to 1.18 in.

(1) Draft Control Lever
(2) Position Control Lever
(3) Position Feedback Rod
(4) Lock Nut
(5) Turnbuckle

[A] ROPS Model
[B] CABIN Model
L : Floating Range

W1014181





Adjusting Uppermost Position of Lift Arm

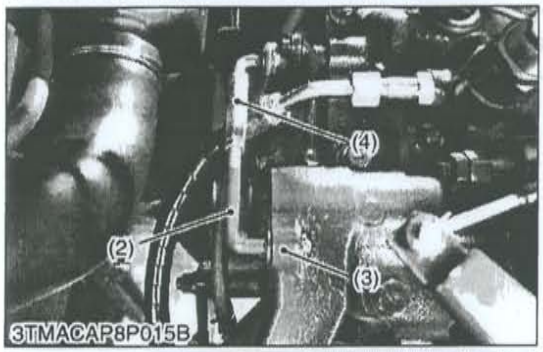
1. Move the position and draft control levers all the way down.
2. Start the engine and set the engine speed at maximum speed.
3. Operate the position control lever to the uppermost position.
4. Measure the distance (**L1**) between cylinder body end and cylinder rod end.
5. Raise the lift arm (3) to the top dead center by hand.
6. Measure the distance (**L2**) and calculate the cylinder free play.
7. If the cylinder free play is not within the factory specifications adjust the position feedback rod (2).

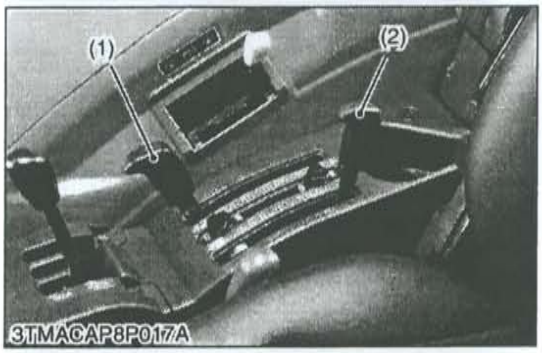
Cylinder free play (**L2 – L1**)	Factory spec.	5 to 8 mm 0.197 to 0.315 in.

(1) Hydraulic Cylinder
(2) Position Feedback Rod
(3) Lift Arm
(4) Turnbuckle

L1 :Distance
L2 :Distance

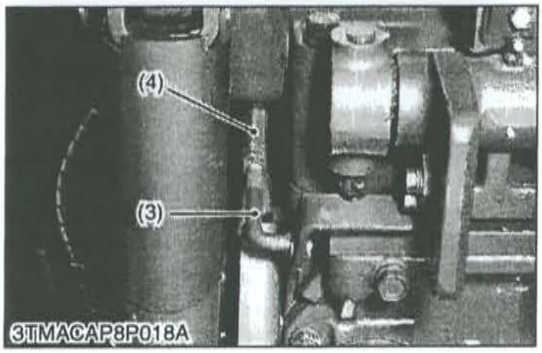
W1014511





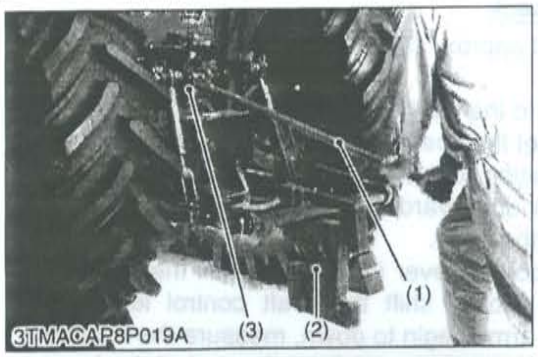
Adjusting Draft Control

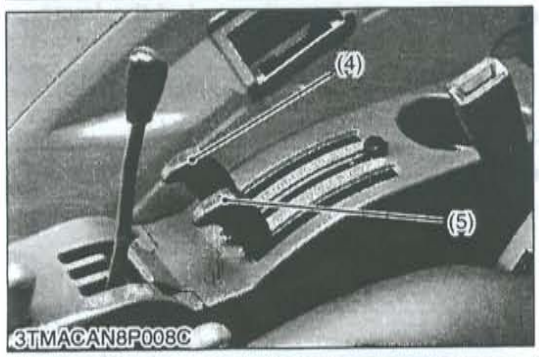
1. Attach a weight of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Start the engine and set the engine speed at 1000 min^{-1} (rpm).
3. Move the position control lever (1) and draft control lever (2) all the way down.
4. Move the draft control lever (2) to uppermost position then lengthen the draft feedback rod (3) and check the point where the lift arms begin to rise.
5. When the lift arms begin to rise, turn the turnbuckle (4) 1 turn to shorten the draft feedback rod (3).
6. Move the position control lever (1) and draft control lever (2) to uppermost position to make sure the relief does not operate.
7. If the relief valve operate, adjust the draft feedback rod (3).
8. Tighten the lock nuts securely.

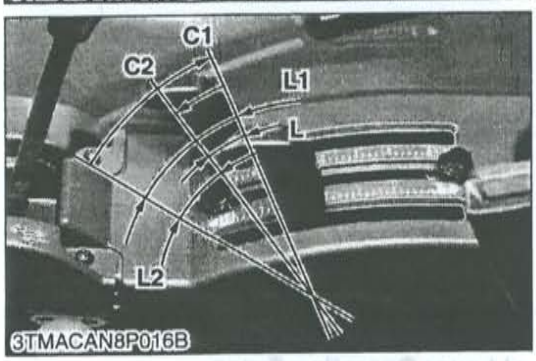


(1) Position Control lever
(2) Draft Control Lever
(3) Draft Feedback Rod
(4) Turnbuckle

W1015078







Draft Lever Free Range

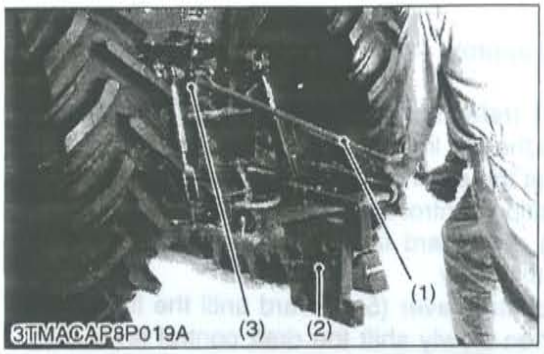
1. Attach the weight (2) of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Attach the test bar (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the top link bracket (3).
3. Start the engine and set the engine speed at maximum speed.
4. Move the draft and position control lever (5), (4) all the way down.
5. Press the test bar (1) downward until the top link bracket (3) comes in contact with the body.
6. Slowly shift the draft control lever (5) upward until the lift arms begin to rise (**C1**). Then slowly shift the draft control lever (5) downward until the lift arms begin to down (**C2**). Calculate the free range (**L**) of the draft control lever (5) on the lever guide.

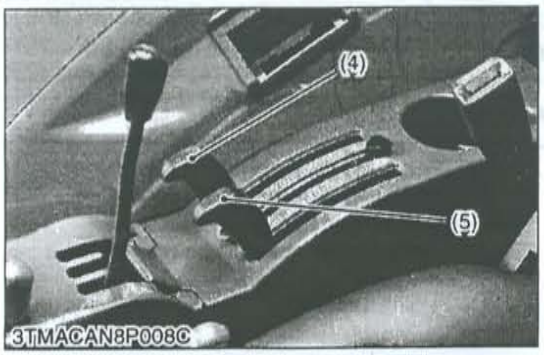
Free range **L1 – L2**	Factory spec.	Less than 25.0 mm 0.984 in.

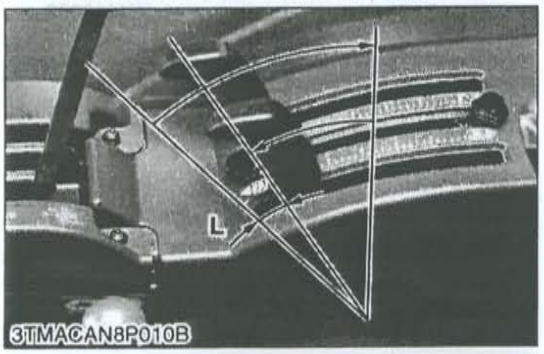
(1) Test Bar
(2) Weight
(3) Top Link Bracket
(4) Position Control Lever
(5) Draft Control Lever

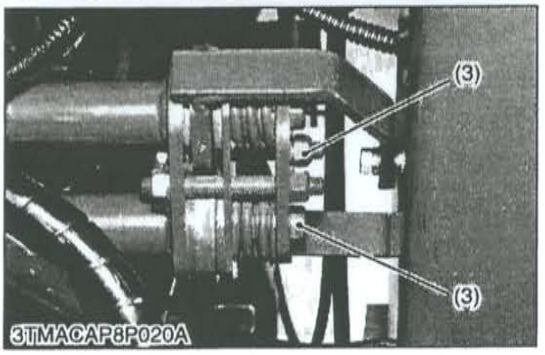
C1 : Begin to rise the lift arm
C2 : Begin to down the lift arm
L : Free Range
L1 : Distance for begin to rise the lift arm
L2 : Distance for begin to down the lift arm

W1015369









Draft Floating Range Check

1. Attach the weight (2) of approx. 490 N (50 kgf, 110 lbs) to the end of the lower links.
2. Attach the test bar (1) to the top link bracket (3).
3. Start the engine and set the speed at maximum speed.
4. Move the draft and position control lever (5), (4) all the way down.
5. Press the test bar (1) downward until the top link bracket (3) comes in contact with the body.
6. Slowly shift the draft control lever (5) upward until the lift arms begin to rise. Then slowly shift the draft control lever (5) downward until the lift arms begin to down, measure the floating range (**L**) of the draft control lever (5) from the end of the lever guide (4).
7. If floating range (**L**) is not within the factory specification, adjust the draft control rod.

Floating range (**L**)	Factory spec.	More than 15.0 mm 0.59 in.

(1) Test Bar
(2) Weight
(3) Top Link Bracket
(4) Position Control Lever
(5) Draft Control Lever

L : Floating Range

W1015844

Position and Draft Control Lever Operating Force

1. Check the position and draft control lever operating force.
2. If measurement is not within the factory specification, adjust the with tightening nuts (3).

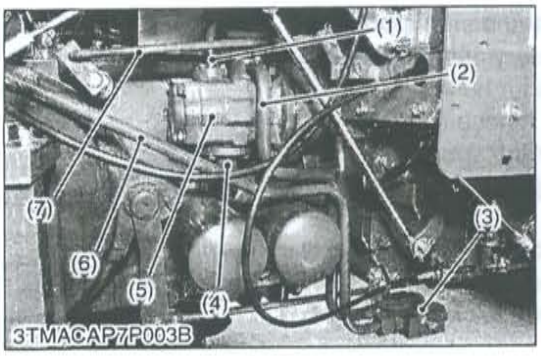
Operating force for position and draft control lever	Factory spec.	20 to 40 N 2.0 to 4.1 kgf 4.5 to 9.0 lbs

(1) Position Control Lever
(2) Draft Control Lever
(3) Nut

W1017524

5. DISASSEMBLING AND ASSEMBLING

[1] HYDRAULIC PUMP



Removing Hydraulic Pump Assembly

1. Place the disassembling stand under the transmission case and right rear axle.
2. Remove the right rear wheel.
3. Remove the differential lock rod (7).
4. Remove the 3-point hitch delivery pipe 1 (2) and delivery pipe 2 (6) with outlet block (3).
5. Disconnect the power steering delivery pipe (1).
6. Remove the suction pipe (4).
7. Remove the hydraulic pump (5).

(When reassembling)

- Be sure to fix the O-ring with transmission fluid.

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs
	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.0 to 86.8 ft-lbs

(1) Delivery Pipe (for Power Steering)
(2) 3-point Hitch Delivery Pipe 1
(3) Outlet Block
(4) Suction Pipe
(5) Hydraulic Pump
(6) 3-point Hitch Delivery Pipe 2
(7) Differential Lock Rod

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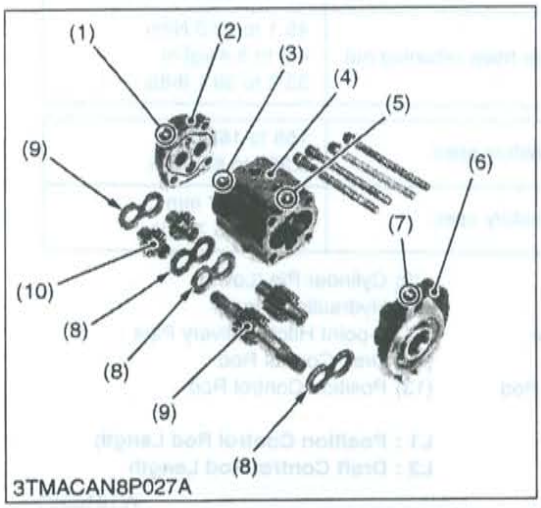
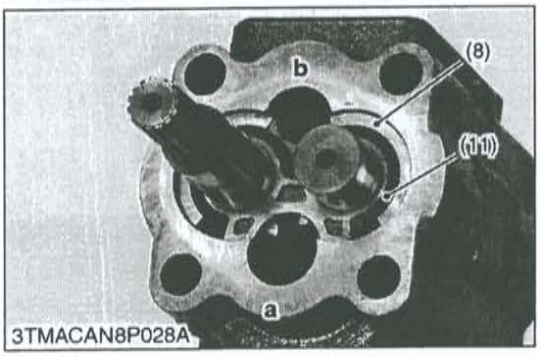




Hydraulic Pump

1. Put the parting marks (1), (3), (5), (7) on the flange (6), housing (4), housing (8) and housing cover (2).
2. Unscrew the housing cover mounting screw and separate the flange (6) and housing cover (2) from the housing (4).
3. Remove the backup plate (8).
4. Take out the gears (9), (10).

(When reassembling)

- When installing the backup plate (8) with seal element (11), be sure to reassemble them to the each original position. Seal element on the backup plate (8) does not face to the gear side.
- Take care not to damage the seal elements and O-rings.
- After reassembly, check the smooth rotation of the hydraulic pump (for example, mount arm an approx. 100 mm (3.94 in.) long to the drive gear and rotate its arm slowly for smooth rotation).

Tightening torque	Housing cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

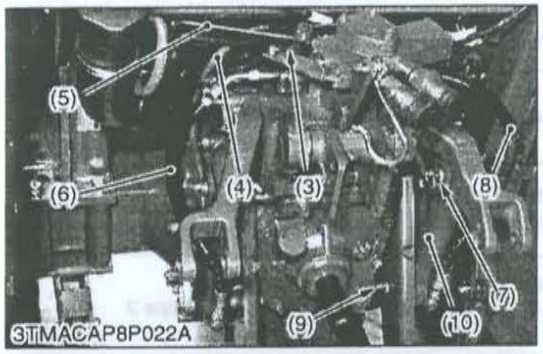
(1) Parting Mark
(2) Housing Cover
(3) Parting Mark
(4) Housing
(5) Parting Mark
(6) Flange
(7) Parting Mark
(8) Backup Plate
(9) Gear (Three Point System)
(10) Gear (Power Steering)
(11) Seal Element

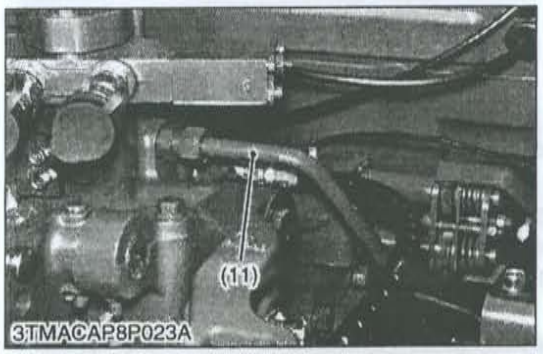
a : Inlet
b : Outlet

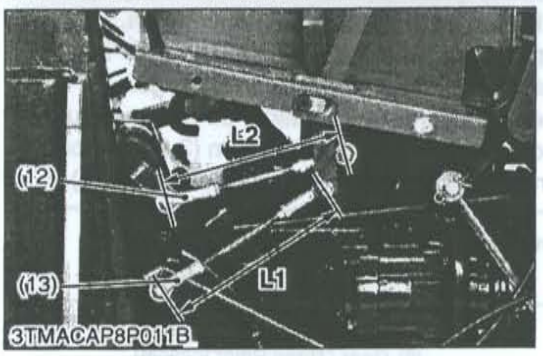
W1018089

[2] THREE POINT HITCH HYDRAULIC BLOCK ASSEMBLY

(1) Removing 3-point Hitch Hydraulic Block (ROPS Model)







Preparation

1. Remove the seat (1) and seat support (2).
2. Disconnect the auxiliary control valve wire (3).
3. Disconnect the cylinder hoses (6), (8).
4. Disconnect the return hose (4).
5. Disconnect the lowering speed adjusting rod (5).
6. Remove the cylinder pins (7), (9) and take out the cylinder (10) (R.H., L.H.).
7. Disconnect the ground cable from hydraulic cylinder block.
8. Disconnect the position control rod (13) and draft control rod (12).
9. Disconnect the 3-point hitch delivery pipe (11).

■ **NOTE**

- **Take care not to damage the grease nipple when remove the hydraulic cylinder pin.**

(When reassembling)

- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.
- To assemble the auxiliary control valve wire, refer to "4. CHECKING AND ADJUSTING" in this section.
- Be sure to fit the O-rings for auxiliary control valve.

Tightening torque	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 ft-lbs
	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 ft-lbs

Position control rod length (**L1**)	Factory spec.	158 to 160 mm 6.221 to 6.299 in.
Draft control rod length (**L2**)	Factory spec.	145 to 147 mm 5.709 to 5.787 in.

(1) Seat
(2) Seat Support
(3) Auxiliary Control Valve Wire
(4) Return Hose
(5) Lowering Speed Adjusting Rod
(6) Cylinder Hose (L.H.)
(7) Cylinder Pin (Upper)
(8) Cylinder Hose (R.H.)
(9) Cylinder Pin (Lower)
(10) Hydraulic Cylinder
(11) 3-point Hitch Delivery Pipe
(12) Draft Control Rod
(13) Position Control Rod

L1 : Position Control Rod Length
L2 : Draft Control Rod Length

W1018551

Removing 3-point Hitch Hydraulic Block Assembly

1. Remove the 3-point hitch hydraulic block mounting screws and nuts.
2. Remove the 3-point hitch hydraulic block assembly with nylon lift strap and hoist.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D, 1206C or equivalent) to joint face of transmission case and cylinder block.

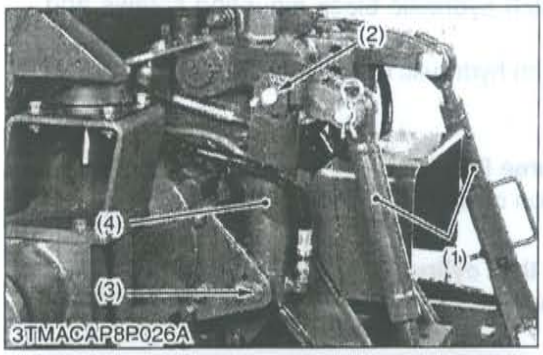
■ **NOTE**

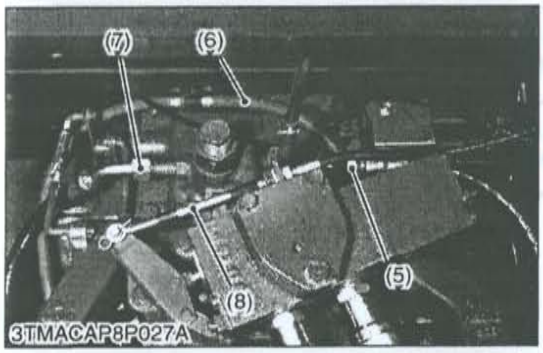
- **After reassembling the cylinder block assembly to the tractor, be sure to adjust the position and draft feedback rods.**

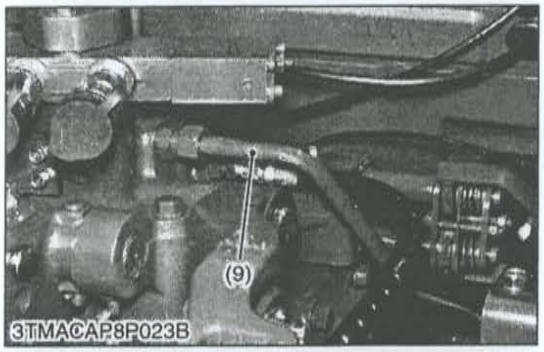
Tightening torque	3-point hitch hydraulic block mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs
	3-point hitch hydraulic block mounting nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

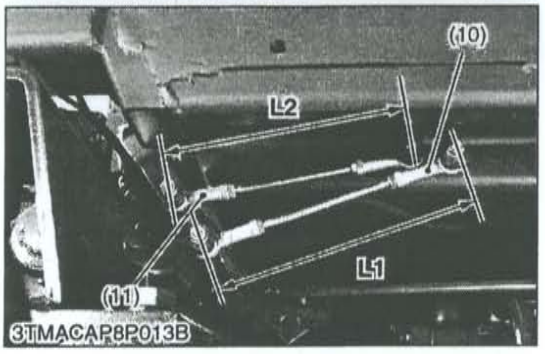
W1020724

(2) Removing 3-point Hitch Hydraulic Block (CABIN Model)









Preparation

1. Park the tractor on a flat place.
2. Place the disassembling stand under the transmission case and rear axle.
3. Remove the rear wheel (R.H.).
4. Remove the lift rods (1).
5. Disconnect the cylinder hoses (5), (7) and return hose (6).
6. Draw out the pins (2), (3) and remove the cylinder (4).
7. Remove the auxiliary control valve wire (8).
8. Remove the 3-point hitch delivery pipe (9).
9. Disconnect the position control rod (10) and draft control rod (11).

■ **NOTE**

- **Take care not to damage the grease nipple when remove the hydraulic cylinder pin.**

(When reassembling)

- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.
- To assemble the auxiliary control valve wire, refer to "4. CHECKING AND ADJUSTING" in this section.
- Be sure to fit the O-rings for auxiliary control valve.
- Be sure to adjust the position control rod and draft control rod.

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs
	3-point hitch delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 ft-lbs
	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 ft-lbs

Position control rod length (**L1**)	Factory spec.	Approx. 185 mm 7.283 in.
Draft control rod length (**L2**)	Factory spec.	Approx. 182 mm 7.165 in.

(1) Lift Rod
(2) Pin (Upper)
(3) Pin (Lower)
(4) Hydraulic Cylinder
(5) Cylinder Hose (R.H.)
(6) Return Hose
(7) Cylinder Hose (L.H.)
(8) Auxiliary Control Valve Wire
(9) 3-point Hitch Delivery Pipe
(10) Position Control Rod
(11) Draft Control Rod

L1 : Position Control Rod Length
L2 : Draft Control Rod Length

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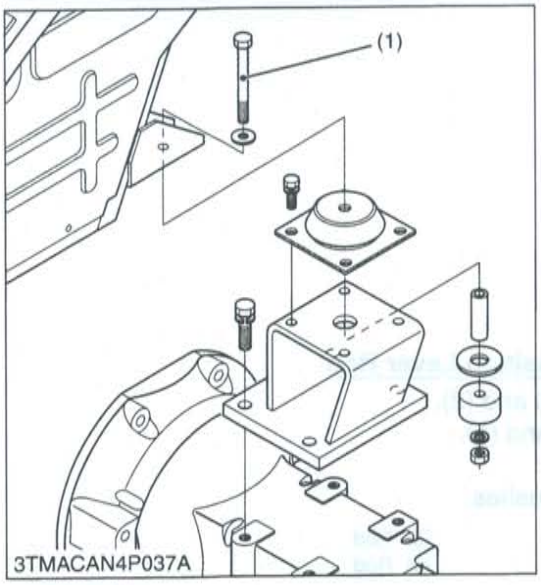

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Removing 3-Point Hitch Hydraulic Block

1. Remove the rear cabin mounting bolts (1) and lift up the cabin rear side approx. 38.0 to 50.0 mm (1.5 to 2.0 in.) then support the cabin.
2. Remove the 3-point hitch hydraulic block mounting screws and nuts.
3. Take out the 3-point hitch hydraulic block assembly.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D, 1206C or equivalent) to joint face of transmission case and 3-point hitch hydraulic block.

■ **NOTE**

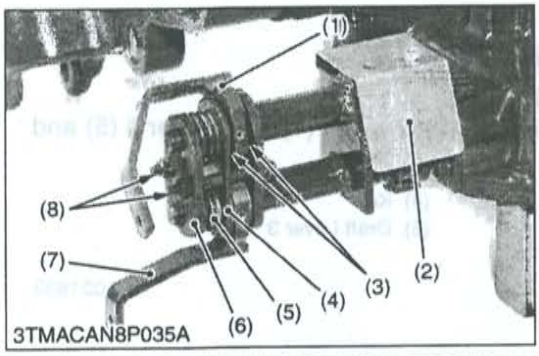
- **After reassembling the 3-point hitch hydraulic block assembly to the tractor, be sure to adjust the position and draft levers and position and draft feedback rods.**
- **3-point hitch hydraulic block mounting screw has two different length, be sure to assemble the original position.**
- **Be sure to assemble the cabin mount as shown figure.**

Tightening torque	Cabin mounting bolt and nut (M14, 7T)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs
	3-point hitch hydraulic block mounting screw (M14, 9T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs
	3-point hitch hydraulic block mounting nut (M14, 7T)	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

(1) Cabin Mounting Bolt

W1077358

[3] HYDRAULIC LINKAGE



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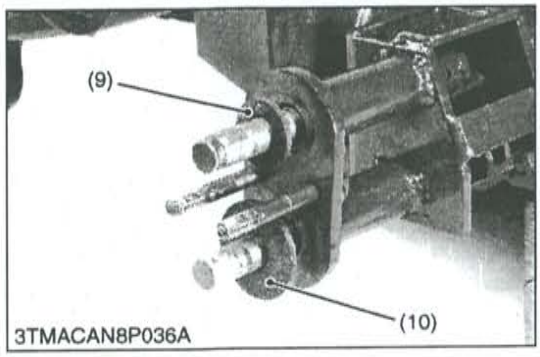

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Position and Draft Linkage

1. Remove the link cover (2).
2. Unscrew the nuts (8) then draw out the spring plates (6), springs (5) and plate (4).
3. Tap out the roll pin then draw out the friction plates (3), draft lever 1 (1) and position lever 1 (7).

(When reassembling)

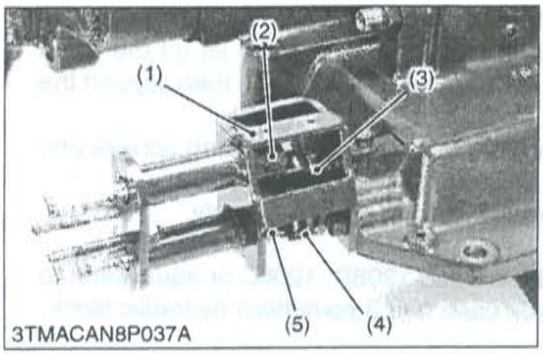
- Be sure to assemble the friction plate to original position and they are free for oil and dust.
  - Smaller friction plate (Dia. 29 mm (1.14 in.)) to the draft (upper) side.
  - Larger friction plate (Dia. 42 mm (1.65 in.)) to the position (lower) side.

■ **NOTE**

- **After assembling the linkage, adjust the position and draft levers operating force and position and draft rods.**

(1) Draft Lever 1
(2) Link Cover
(3) Friction Plate
(4) Plate
(5) Spring
(6) Spring Plate
(7) Position Lever 1
(8) Nut
(9) Friction Plate (Smaller)
(10) Friction Plate (Larger)

W1020750



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Linkage Bracket

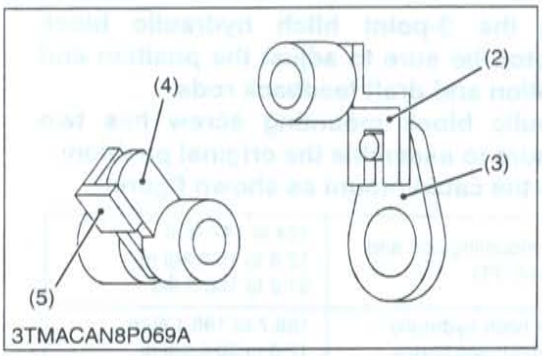
1. Remove the bracket (1).

(When reassembling)

- Be sure to assemble the position lever 2 (5) and 3 (4) as shown in figure.
- Be sure to assemble the draft link cam 2 (2) and draft lever 3 (3) as shown in figure.

(1) Bracket
(2) Draft Link Cam 2
(3) Draft Lever 3
(4) Position Lever 3
(5) Position Lever 2

W1021374



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Draft Lever Rod and Position Lever Rod

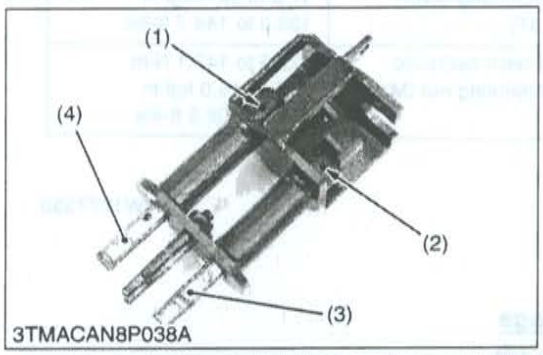
1. Tap out the roll pin (1) and (2).
2. Draw out the rod (3) and (4).

(When reassembling)

- Apply grease to the bushes.

(1) Roll Pin
(2) Roll Pin
(3) Rod
(4) Rod

W1021505



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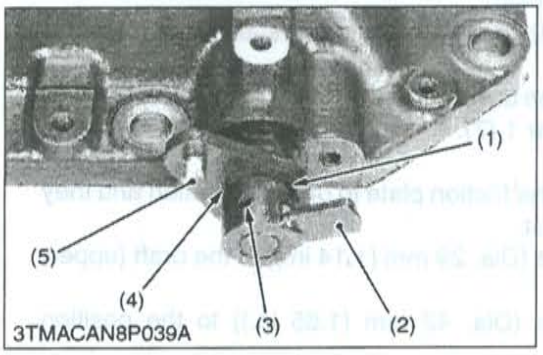
Draft Lever 3 and Position Lever 3

1. Tap out the roll pin (3).
2. Remove the position lever 3 (2), washer (1), draft lever 3 (5) and key (4).

(1) Washer
(2) Position Lever 3
(3) Roll Pin
(4) Key
(5) Draft Lever 3

W1021633



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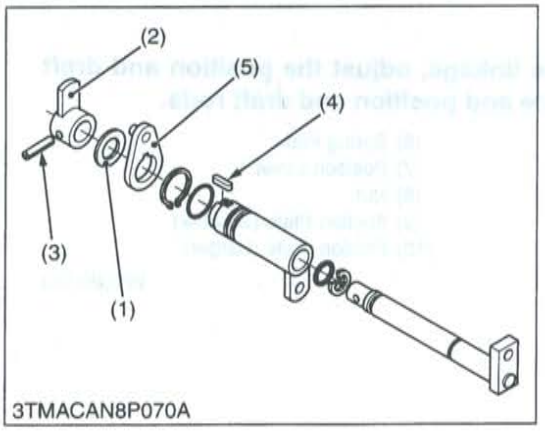

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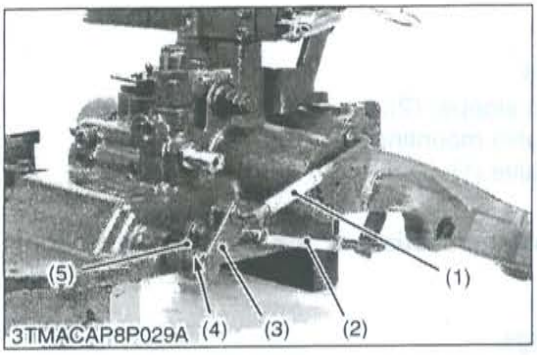


Position Feedback Rod and Draft Feedback Rod

1. Tap out the roll pin (4), remove the position feedback rod (1) with position feedback lever (3).
2. Remove the draft feedback rod (2) with draft feedback lever (5).

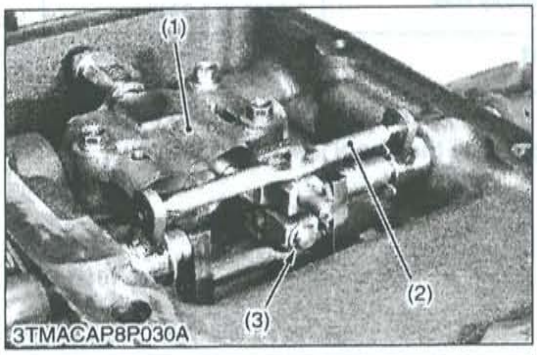
(When reassembling)

- Adjust the position and feedback rod length to the factory specifications.

Position feedback rod length	Factory spec.	210 mm 8.268 in.
Draft feedback rod length	Factory spec.	272 mm 10.709 in.

(1) Position Feedback Rod
(2) Draft Feedback Rod
(3) Position Feedback Lever
(4) Roll Pin
(5) Draft Feedback Lever

W1021825



Control Valve and Spool Lever

1. Remove the control valve mounting screws.
2. Remove the E-shaped stopper (3).
3. Take out the control valve (1) and spool lever (2).

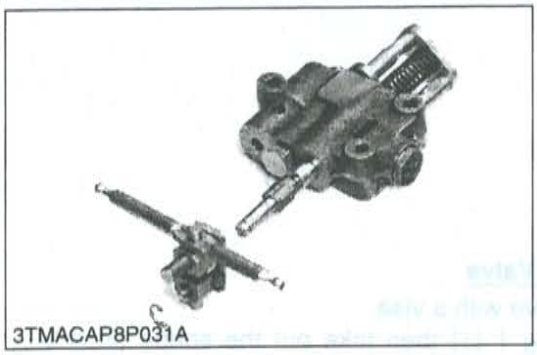
(When reassembling)

- Be sure to fix the O-rings to the control valve and apply grease to them.

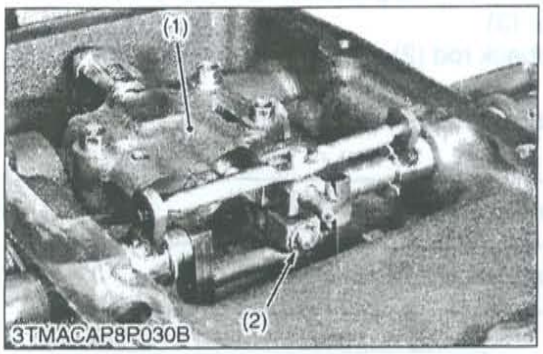
Tightening torque	Control valve mounting screw	19.6 to 23.5 N·m 2.0 to 2.4 kgf·m 14.5 to 17.4 ft-lbs

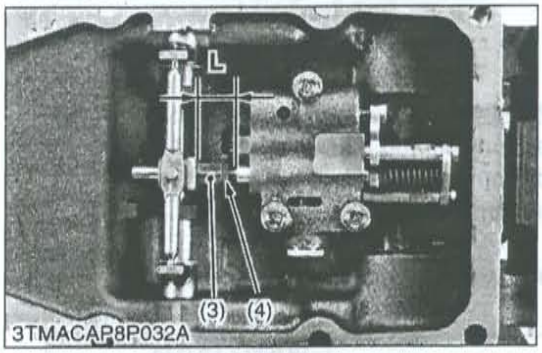
(1) Control Valve
(2) Spool Lever
(3) E-shaped Stopper

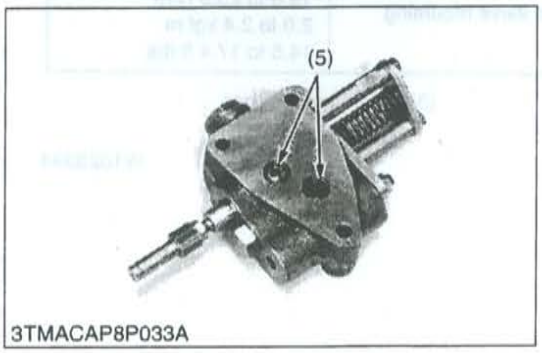
W1023394

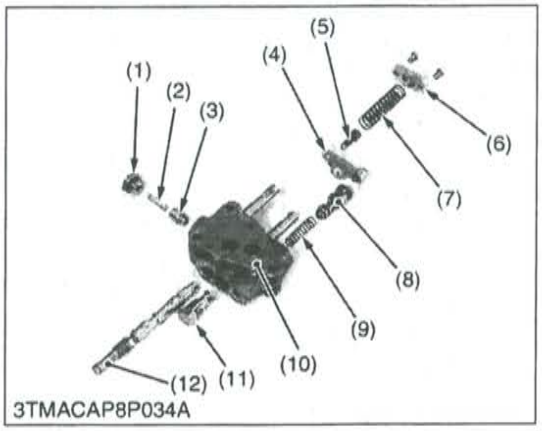


[4] CONTROL VALVE









Removing Control Valve

1. Remove the E-shaped stopper (2).
2. Remove the control valve mounting screws.
3. Remove the control valve (1).

■ **NOTE**

- **Do not loosen adjusting section at the end of the spool unless necessary.**

(When reassembling)

- Be sure to fit the O-rings.

Tightening torque	Control valve mounting screw	19.6 to 23.5 N·m 2.0 to 2.4 kgf·m 14.5 to 17.4 ft-lbs

Length (L)	Factory spec.	24.5 to 25.0 mm 0.9646 to 0.9842 in.

■ **Adjusting Spool Joint**

1. Measure the length (**L**).
2. If the measurement is not within the factory specifications, loosen the lock nut (4) and adjust by the spool link (3).

(1) Control Valve
(2) E-shaped Stopper
(3) Spool Link
(4) Lock Nut
(5) O-ring

W1019759

Disassembling Control Valve

1. Secure the control valve with a vise.
2. Remove the seat plug 1 (1) then take out the spring (2) and poppet (3).
3. Remove the spring plate (6) and spring (7).
4. Remove the screw (5) and plate (4).
5. Draw out the spool (12).
6. Remove the sleeve (8) and spring (9).
7. Remove the seat plug 2 (11).

(When reassembling)

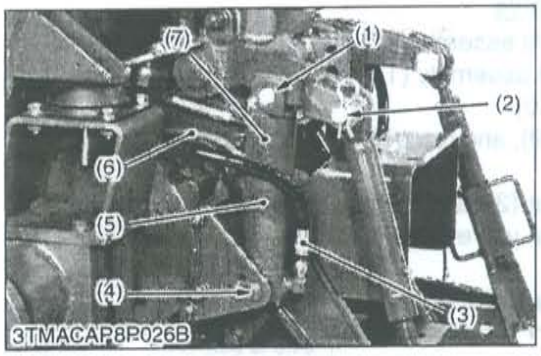
- Install the plug, noting O-ring.

Tightening torque	Seat plug 1	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 ft-lbs
	Seat plug 2	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 ft-lbs

(1) Seat Plug 1
(2) Spring
(3) Poppet
(4) Plate
(5) Screw
(6) Spring Plate
(7) Spring
(8) Sleeve
(9) Spring
(10) Body
(11) Seat Plug 2
(12) Spool

W1020079

[5] HYDRAULIC CYLINDER



Removing Hydraulic Cylinder

1. Remove the lift rod pin (2).
2. Disconnect the hydraulic hose (3) from hydraulic cylinder (5).
3. Remove the cylinder cover (7).
4. Disconnect the return hose (6).
5. Remove the pin (upper) (1) and pin (lower) (4).
6. Take out the hydraulic cylinder (5).

■ **NOTE**

- **Take care not to damage the grease nipples when remove the hydraulic cylinder.**

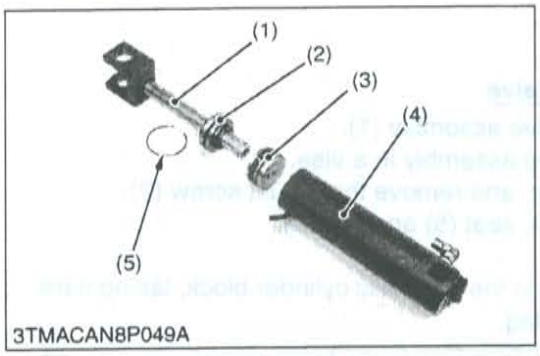
(When reassembling)

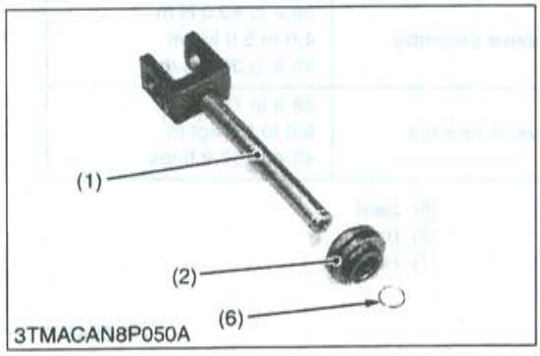
- Apply grease to the grease nipples.
- Take care not to damage the grease nipples when reassemble the hydraulic cylinder.

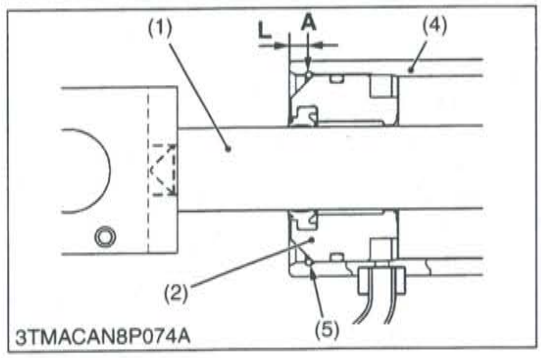
Tightening torque	Cylinder hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 ft-lbs

(1) Cylinder Pin (Upper)
(2) Lift Rod Pin
(3) Hydraulic Hose
(4) Cylinder Pin (Lower)
(5) Hydraulic Cylinder
(6) Return Hose
(7) Cylinder Cover

W1017814







Disassembling Hydraulic Cylinder

1. Remove the liquid gasket from top of head (2).
2. Slightly tap-in the head (2) to inside, and remove the internal circlip (5) by using the small screwdriver.
3. If the internal circlip (5) cannot be removed by above-mentioned method, remove it by the following procedure.
   - Carefully clamp the cylinder tube (4) in a vise.
   - Drill approx. 2.5 mm (0.1 in.) diameter hole on the cylinder tube (position **A**) just over the internal circlip (5) as shown in figure.
   - Use a small screwdriver and remove the internal circlip (5). Simultaneously support this action by pushing from the outside of the cylinder tube with another small screwdriver or similar tool.
4. Remove the rod (1) and head (2).
5. Inject the compressed air through the oil inlet port of the cylinder tube (4), and remove the piston (3).
6. Remove the external circlip (6), and remove the head (2).

(When reassembling)

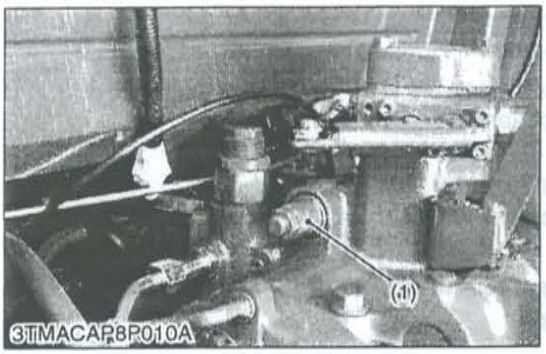
- Apply transmission fluid to the piston (3), head (2) and cylinder tube (4).
- Take care not to damage the O-ring, backup ring and seal.
- Apply liquid gasket (Three Bond 1208D or equivalent) to the top of head (2), while pressing the head (2) against internal circlip (5).
- After reassembling the cylinder, be sure to close the drilled hole by liquid gasket.

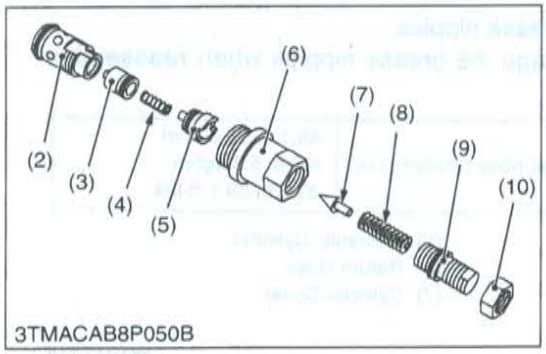
(1) Rod
(2) Head
(3) Piston
(4) Cylinder Tube
(5) Internal Circlip
(6) External Circlip

A : Position for drilling
L : 6.0 mm (0.236 in.)

W1018811

[6] RELIEF VALVE





Disassembling Relief Valve

1. Remove the relief valve assembly (1).
2. Secure the relief valve assembly (1) in a vise.
3. Loosen the lock nut (10).
4. Remove the adjuster (9), and remove the spring (8) and then pilot valve (7).
5. Remove the valve seat (2), and draw out the valve seat (5), the spring (4) and the main valve (3).

(When reassembling)

- Take care not to damage the O-ring.

Tightening torque	Relief valve	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

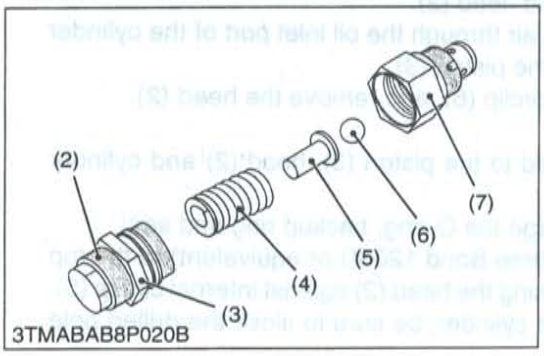
■ **IMPORTANT**

- **After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure.**

(1) Relief Valve
(2) Valve Seat
(3) Main Valve
(4) Spring
(5) Valve Seat
(6) Valve Body
(7) Pilot Valve
(8) Spring
(9) Adjuster
(10) Lock Nut

W1053972

[7] SAFETY VALVE



Disassembling Safety Valve

1. Remove the safety valve assembly (1).
2. Secure the safety valve assembly in a vise.
3. Loosen the lock nut (3), and remove the adjust screw (2).
4. Draw out the spring (4), seat (5) and ball (6).

(When reassembling)

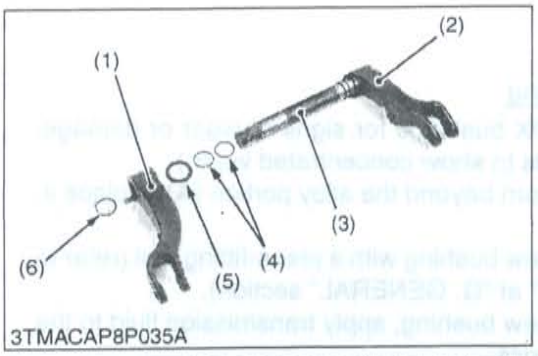
- Install the safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.

Tightening torque	Safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs
	Safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft-lbs

(1) Safety Valve Assembly
(2) Adjust Screw
(3) Lock Nut
(4) Spring
(5) Seat
(6) Ball
(7) Housing

W1054901

[8] LIFT ARM AND LIFT ARM SHAFT



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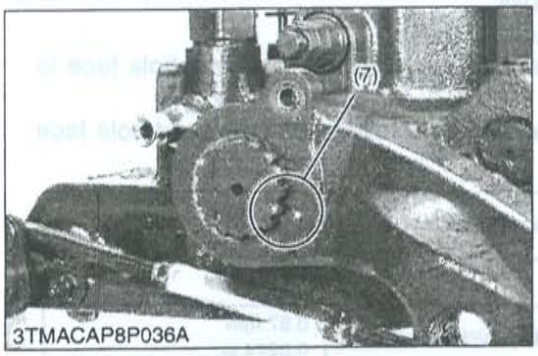

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Disassembling Lift Arm and Lift Arm Shaft

1. Remove the external circlip (6).
2. Remove the lift arm R.H. (2).
3. Draw out the lift arm shaft (3) and lift arm L.H. (1) as a unit.
4. Remove the collar (5) and O-rings (4).

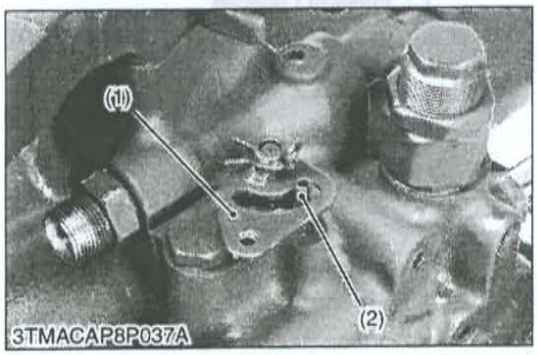
(When reassembling)

- Align the alignment marks (7) of the lift arm shaft and lift arms.
- Apply grease to the right and left bushings of lift arm support and O-rings.
- Take care not to damage the O-rings.

(1) Lift Arm L.H.
(2) Lift Arm R.H.
(3) Lift Arm Shaft
(4) O-ring
(5) Collar
(6) External Circlip
(7) Alignment Mark

W1022677

[9] LOWERING SPEED ADJUSTING VALVE



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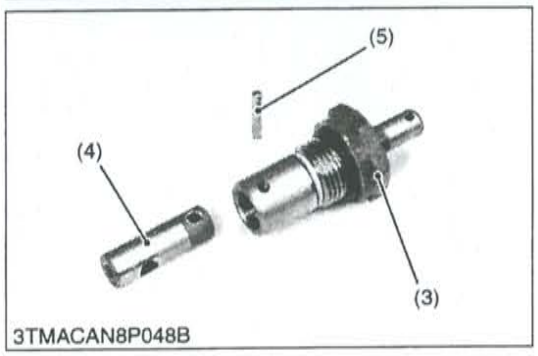

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Disassembling Lowering Speed Adjusting Valve

1. Remove the plate (1).
2. Tap out the roll pin (2) using a vice grip pliers.
3. Remove the lowering speed adjusting valve assembly (3).

(When reassembling)

- Check the lowering speed adjusting valve turns smoothly.

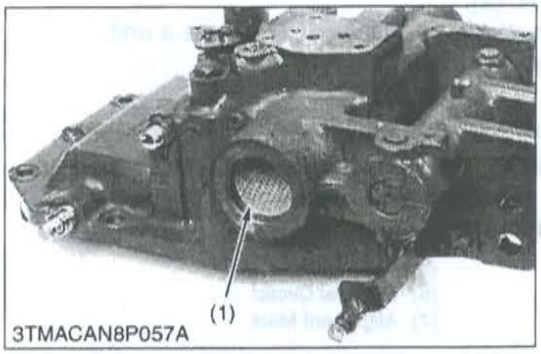
Tightening torque	Lowering speed adjusting valve assembly	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

(1) Plate
(2) Roll Pin
(3) Lowering Speed Adjusting Valve Assembly
(4) Valve
(5) Pin

W1023001

6. SERVICING

[1] LIFT ARM AND TOP LINK BRACKET



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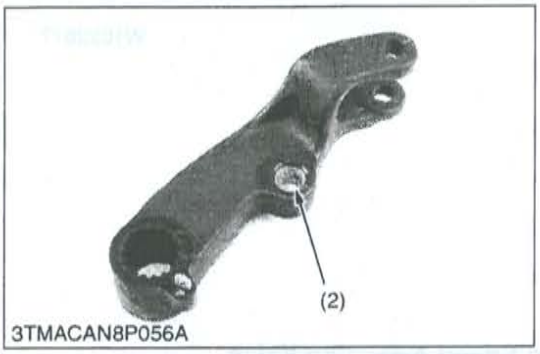

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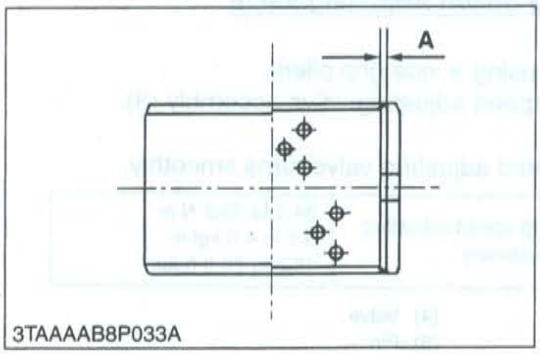

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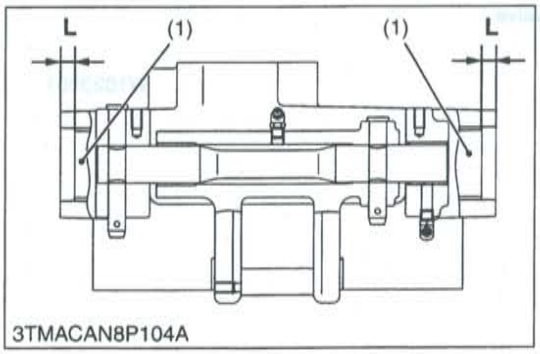

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Lift Arm Support Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**A**), replace it.

(When installing)

- When press-fitting a new bushing with a press-fitting tool (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
- When press-fitting a new bushing, apply transmission fluid to the lift arm support liner boss.
- When press-fitting a new bushing
  - Lift arm support bushing's seam face to rear and hole face to front and upper.
  - Lift arm bushing's seam face to front and lower and hole face to rear.

Press-fit location of bushing (**L**)	Factory spec.	11.0 mm 0.433 in.

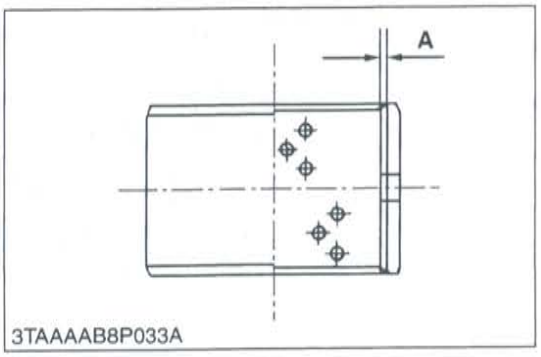
(Reference)

Lift arm support and lift arm bushing	Alloy thickness (**A**)	0.57 mm 0.0224 in.

(1) Lift Arm Support Bushing
(2) Lift Arm Bushing

A : Alloy Thickness
L : Press-fit Location

W1020043



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Torsion Bar and Top Link Bracket

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion (**A**), replace it.

(When installing)

- When press-fitting a new bushing, apply transmission fluid to the bushing press in position.
- When press-fitting a new bushing of top link bracket, the seam of bushing face to rear.
- When press-fitting a new bushing of torsion bar, the hole of bushing face lower to align with grease gallery.

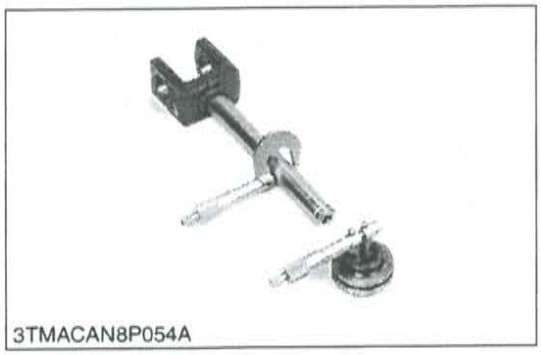
(Reference)

Lift arm bushing	Alloy thickness (**A**)	0.57 mm 0.0224 in.

A : Alloy Thickness

W1026668

[2] HYDRAULIC CYLINDER


3TMACAN8P054A

Hydraulic Cylinder Head Bushing

1. Measure the cylinder head bushing I.D. with an inside micrometer.
2. Measure the cylinder rod O.D. with an outside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between cylinder head bushing and cylinder rod	Factory spec.	0.081 to 0.199 mm 0.0032 to 0.0079 in.
	Allowable limit	0.25 mm 0.0098 in.

Hydraulic cylinder head bushing I.D.	Factory spec.	30.056 to 30.153 mm 1.1834 to 1.1871 in.
Hydraulic cylinder rod O.D.	Factory spec.	29.954 to 29.975 mm 1.1793 to 1.1801 in.

W1025705


3TMACAN8P055A

Hydraulic Cylinder I.D.

1. Measure the hydraulic cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceed the allowable limit, replace the cylinder tube.

Hydraulic cylinder I.D.	Factory spec.	55.000 to 55.074 mm 2.1654 to 2.1682 in.
	Allowable limit	55.100 mm 2.1693 in.

W1019902

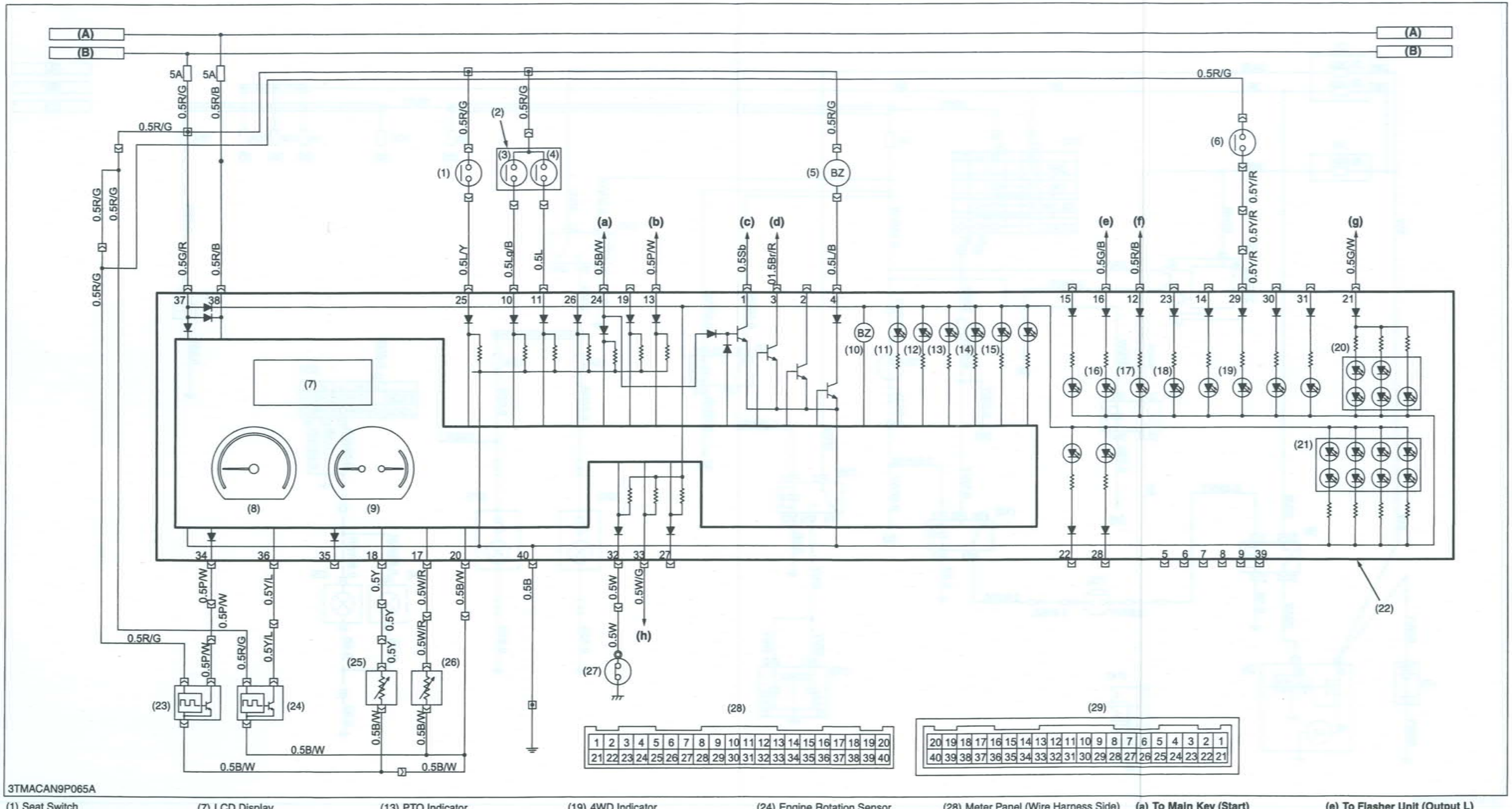
9 ELECTRICAL SYSTEM

MECHANISM

CONTENTS

1. ELECTRICAL CIRCUIT RETAILED CHART

[1] INSTRUMENT PANEL BOARD (METER PANEL)



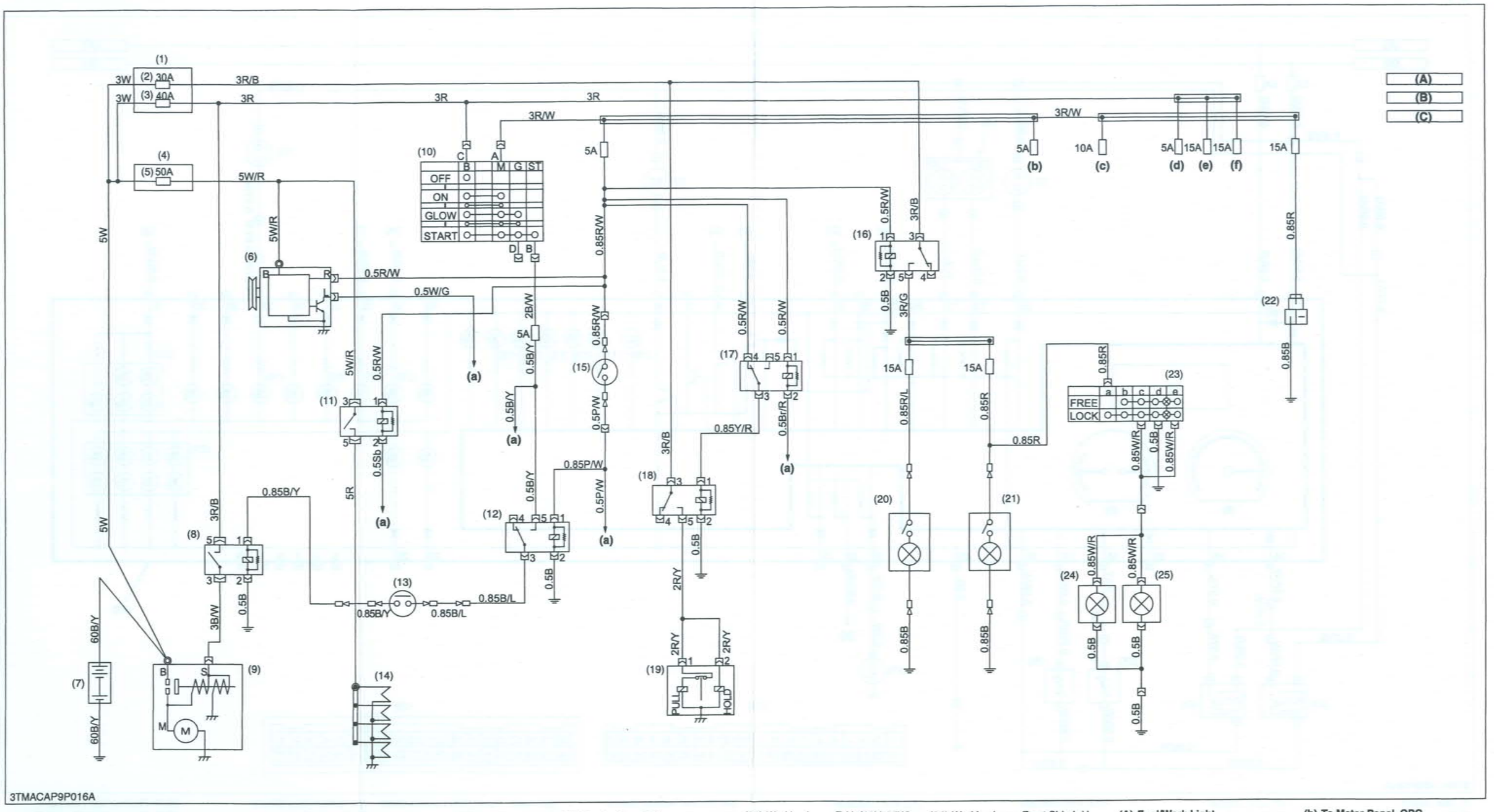
(1) Seat Switch
(2) Display Mode Select Switch
(3) PTO/Hour
(4) Speed Unit
(5) OPC Buzzer
(6) 4WD Switch
(7) LCD Display
(8) Tacho Meter
(9) Fuel/Temperature Meter
(10) Buzzer
(11) Engine Oil Pressure Indicator
(12) Charge Indicator
(13) PTO Indicator
(14) Heater Indicator
(15) Fuel Level Indicator
(16) Turn Signal (L.H.) Indicator
(17) Turn Signal (R.H.) Indicator
(18) Hazard Indicator
(19) 4WD Indicator
(20) Back Light
(21) LCD Back Light
(22) Meter Panel
(23) Traveling Speed Sensor
(24) Engine Rotation Sensor
(25) Fuel Sensor
(26) Engine Coolant Temperature Sensor
(27) Engine Oil Pressure Switch
(28) Meter Panel (Wire Harness Side)
(29) Meter Panel Side

(A) Light / Defogger
(B) ACC

(a) To Main Key (Start)
(b) To PTO Switch
(c) To Heater Relay
(d) To Engine Stop Relay
(e) To Flasher Unit (Output L)
(f) To Flasher Unit (Output R)
(g) To Light Switch
(h) To Alternator

[2] ROPS MODEL

(1) Starting System, Charging System and Working Light



3TMACAP9P016A

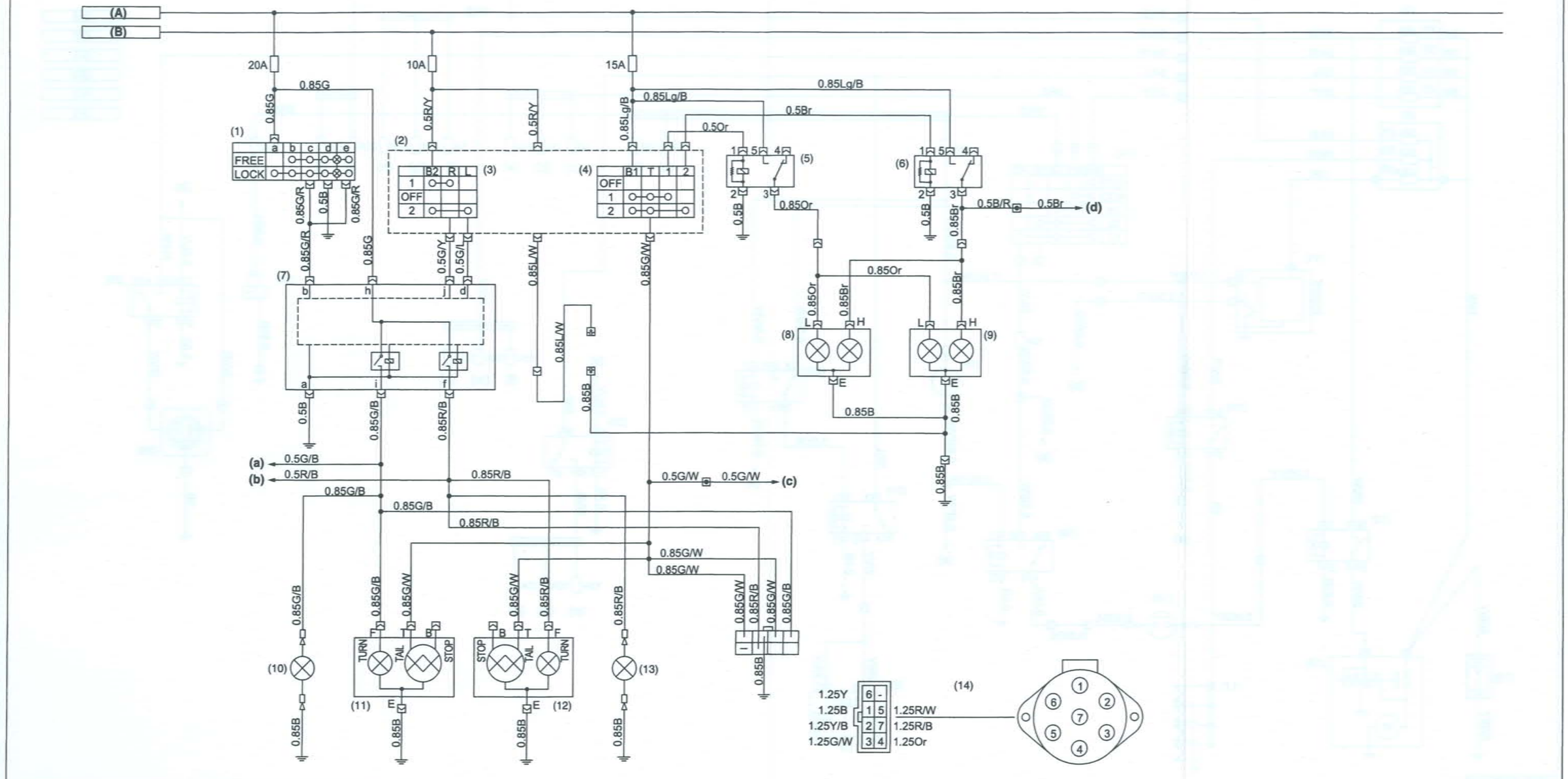
(1) Slow Blow Fuse Box
(2) Fuel/Work Light
(3) Key/Light
(4) Slow Blow Fuse
(5) Charge/Heater
(6) Alternator
(7) Battery
(8) Starter Relay
(9) Starter Motor
(10) Main Key Switch
(11) Glow Relay
(12) PTO Safety Relay
(13) Shuttle Neutral Switch
(14) Glow Plug
(15) PTO Switch
(16) Working Light Relay
(17) Engine Stop Relay
(18) Key Stop Relay
(19) Key Stop Solenoid
(20) Working Lamp L.H. (12V, 35W) (Option)
(21) Working Lamp R.H. (12V, 35W) (Option)
(22) Auxiliary Power Connector
(23) Working Lamp Front Side Switch (14V, 1.4W)
(24) Working Lamp Front Side L.H. (12V, 21W)
(25) Working Lamp Front Side R.H. (12V. 21W)

(A) Fuel/Work Light
(B) Key/Light
(C) Key/IG

(a) To Meter Panel

(b) To Meter Panel, OPC
(c) To Turn Signal
(d) To Meter (Back Up)
(e) To Head Light, Tail Lamp
(f) To Flasher (Hazard)

(2) Lighting System



3TMACAN9P067B

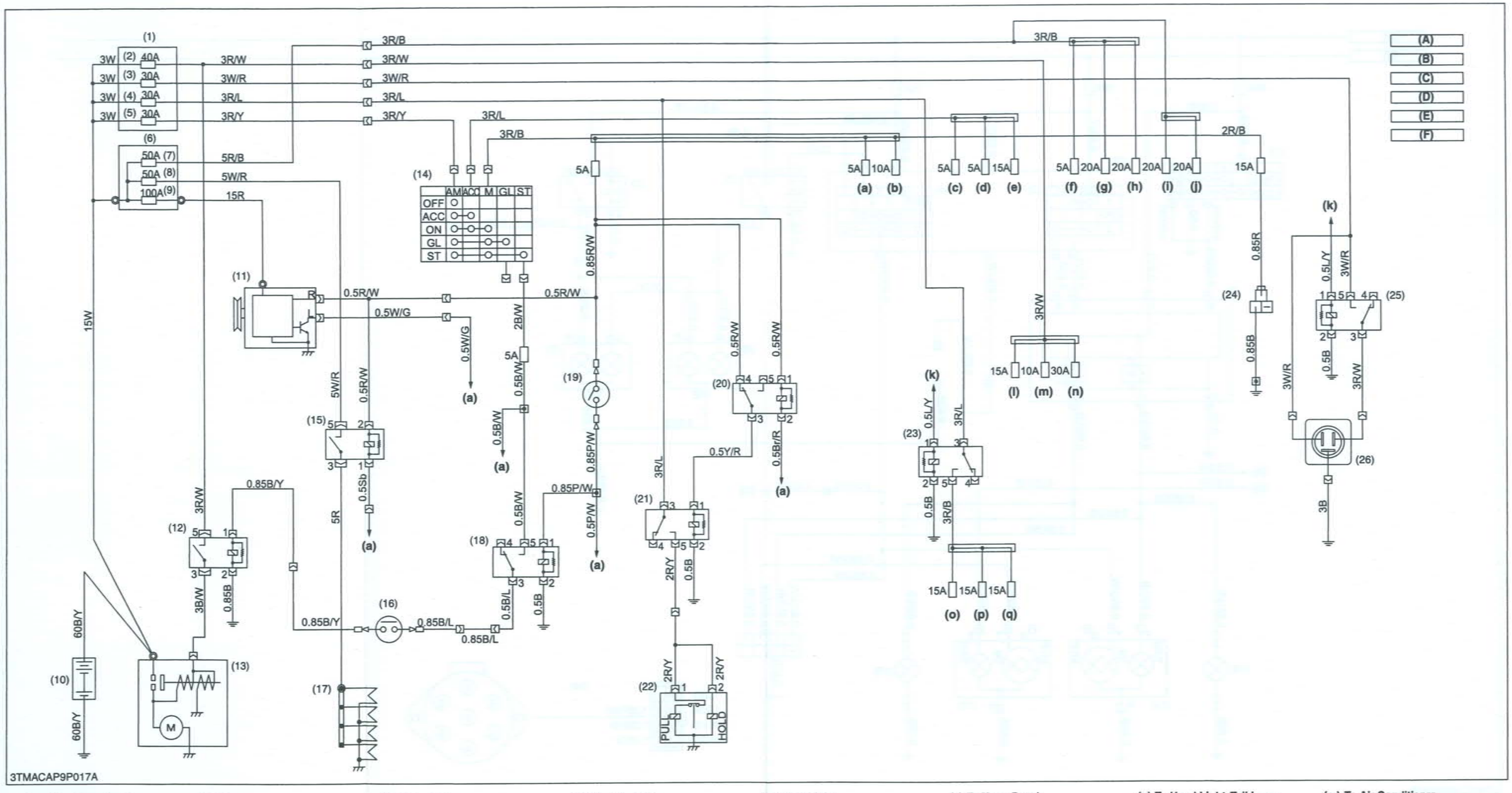
(1) Hazard Switch (14V, 1.4W)
(2) Combination Light Switch
(3) Turn Switch
(4) Head Light Switch
(5) Head Light LO Relay
(6) Head Light HI Relay
(7) Flasher Relay
(8) Head Light L.H. (H4 12V, 55/60 W)
(9) Head Light R.H. (H4 12V, 55/60 W)
(10) Hazard Lamp L.H. (12V, 21W)
(11) Rear Combination Lamp L.H. (12V, 5/21W, 21W)
(12) Rear Combination Lamp R.H. (12V, 5/21W, 21W)
(13) Hazard Lamp R.H. (12V, 21W)
(14) Trailer Socket Assembly

(A) Key/Light
(B) Key/IG

(a) To Meter Panel (Turn L.H.)
(b) To Meter Panel (Turn R.H.)
(c) To Meter Panel (Illumination)
(d) To Meter Panel

[3] CABIN MODEL

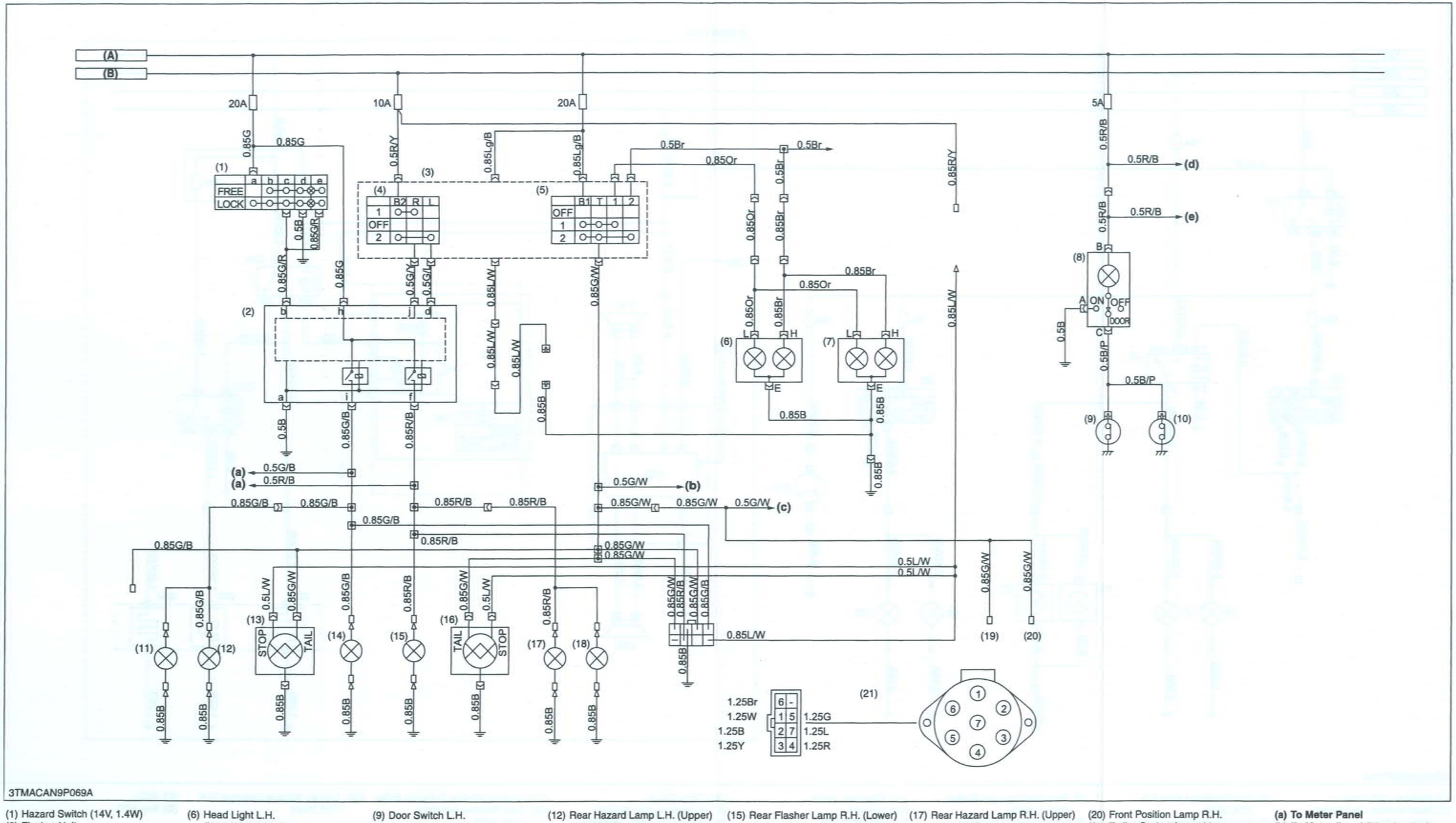
(1) Starting System and Charging System



3TMACAP9P017A

(1) Slow Blow Fuse Box 2
(2) Blower
(3) B
(4) ACC
(5) KEY
(6) Slow Blow Fuse Box 1
(7) Light/Defogger
(8) Heater
(9) Charge
(10) Battery
(11) Alternator
(12) Starter Relay
(13) Starter Motor
(14) Main Key Switch
(15) Glow Relay
(16) Shuttle Neutral Switch
(17) Glow Plug
(18) PTO Safety Relay
(19) PTO Switch
(20) Engine Stop Relay
(21) Key Stop Relay
(22) Key Stop Solenoid
(23) Working Light Relay
(24) Auxiliary Power Connector
(25) Auxiliary Power Relay
(26) Auxiliary Power Socket (Option)
(A) Head Light
(B) Blower Motor
(C) Auxiliary Power
(D) ACC
(E) Key ACC
(F) Key IG
(a) To Meter Panel
(b) To Combination Light Switch
(c) To Radio
(d) To Air Conditioner (Control)
(e) To Wiper
(f) To Meter, Radio
(g) To Head Light, Tail Lamp
(h) To Flasher (Hazard)
(i) To Rear Window Defogger
(j) To Quarter Window Defogger
(k) To Radio Fuse 5A
(l) To Working Light (Front Side)
(m) To Air Conditioner (Compressor)
(n) To Air Conditioner (Fan Motor)
(o) To Working Light (Rear)
(p) To Working Light (Front)
(q) To Cigarette Lighter

(2) Lighting System



3TMACAN9P069A

(1) Hazard Switch (14V, 1.4W)
(2) Flasher Unit
(3) Combination Light Switch
(4) Turn Switch
(5) Head Light Switch

(6) Head Light L.H. (H4 12V, 55/60W)
(7) Head Light R.H. (H4 12V, 55/60W)
(8) Dome Light (Room) (12V, 5W)

(9) Door Switch L.H.
(10) Door Switch R.H.
(11) Front Flasher Lamp L.H. (12V, 21W)

(12) Rear Hazard Lamp L.H. (Upper) (12V, 21W)
(13) Rear Combination Lamp L.H. (12V, 5/21W)
(14) Rear Flasher Lamp L.H. (Lower) (12V, 21W)

(15) Rear Flasher Lamp R.H. (Lower) (12V, 21W)
(16) Rear Combination Lamp R.H. (12V, 5/21W)

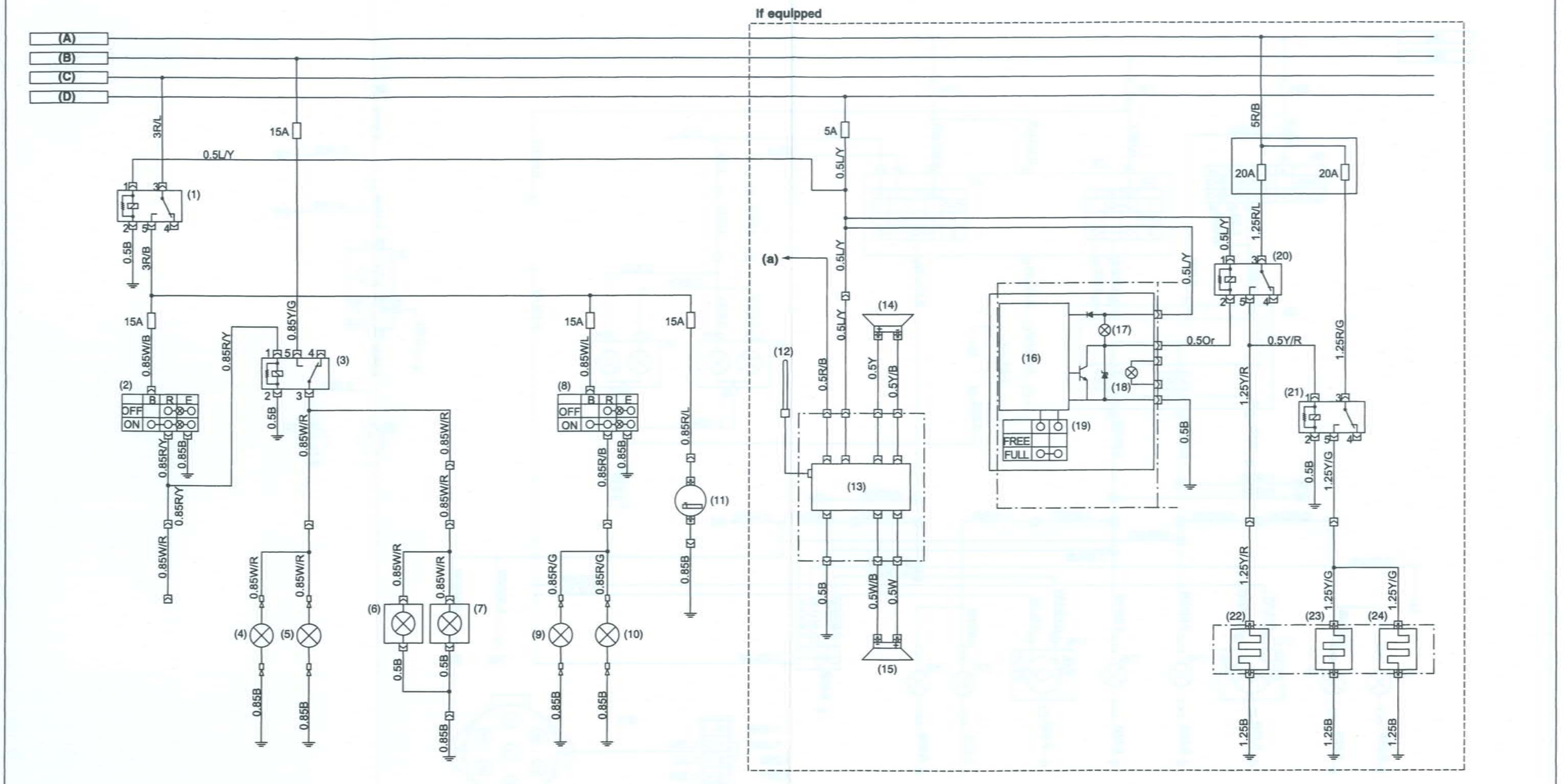
(17) Rear Hazard Lamp R.H. (Upper) (12V, 21W)
(18) Front Flasher Lamp L.H. (12V, 21W)
(19) Front Position Lamp L.H.

(20) Front Position Lamp R.H.
(21) Trailer Socket Assembly

(A) Head Light
(B) Key IG

(a) To Meter Panel
(b) To Meter Panel (Illumination)
(c) To A/C Control Panel
(d) To Meter Panel (Back Up)
(e) To Radio (Back Up)

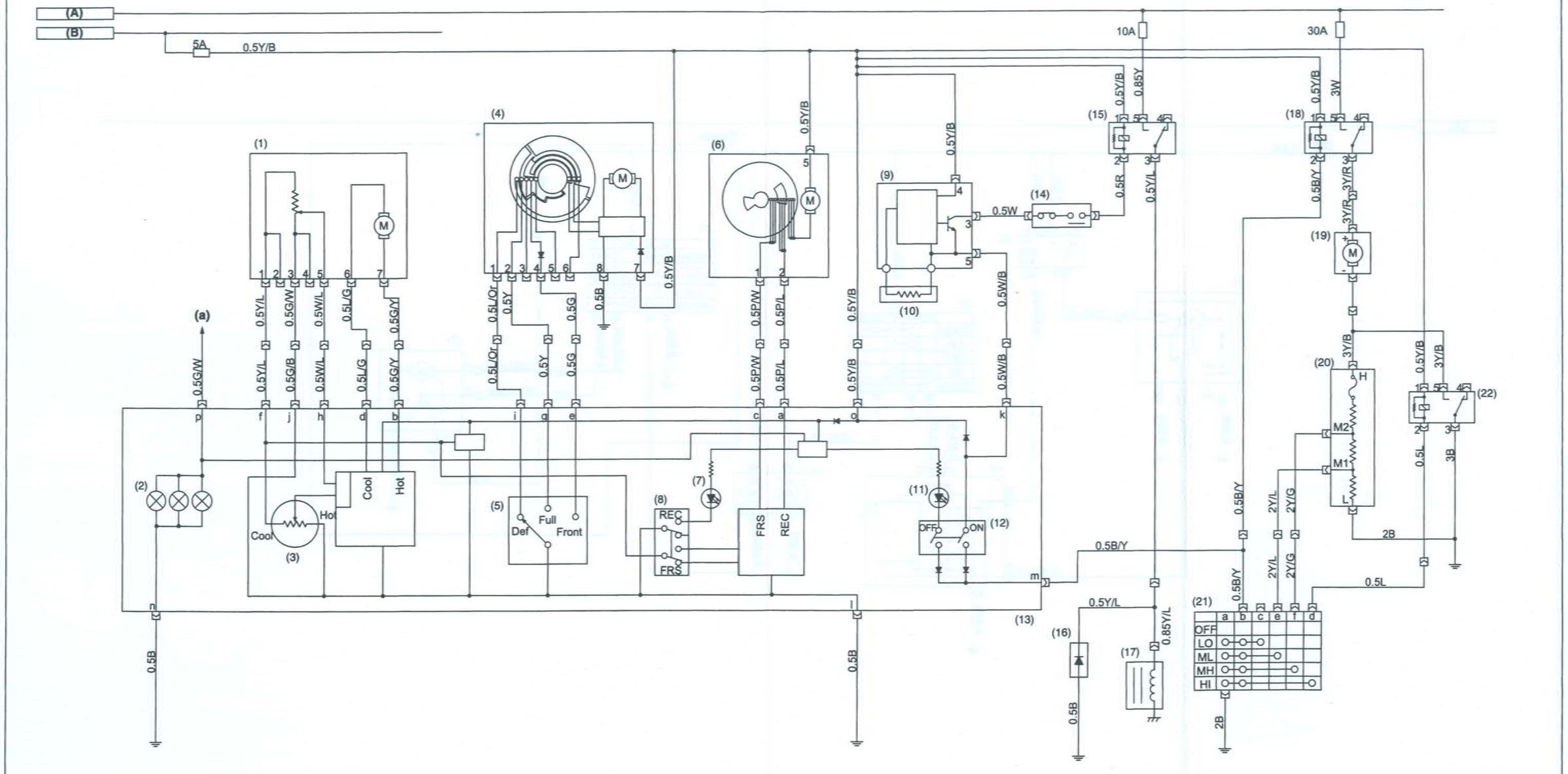
(3) Working Light, Radio and Defogger



3TMACAN9P070A

(1) Working Light Relay
(2) Front Working Light Switch (14V, 1.12W)
(3) Front Side Working Light Relay
(4) Front Working Lamp L.H. (12V, 55W)
(5) Front Working Lamp R.H. (12V, 55W)
(6) Front Side Working Lamp L.H. (12V, 21W)
(7) Front Side Working Lamp L.H. (12V, 21W)
(8) Rear Working Light Switch (14V, 1.12W)
(9) Rear Working Lamp L.H. (12V, 55W)
(10) Rear Working Lamp R.H. (12V, 55W)
(11) Cigarette Lighter
(12) Antenna
(13) Radio/CD Unit
(14) Speaker R.H.
(15) Speaker L.H.
(16) Timer Circuit
(17) Indication Lamp (0.91W)
(18) Illumination Lamp (0.91W)
(19) Defogger Switch (Timer)
(20) Rear Window Defogger Relay
(21) Quarter Window Defogger Relay
(22) Rear Window Defogger (12V, 98W)
(23) Quarter Window Defogger L.H. (12V, 70W)
(24) Quarter Window Defogger R.H. (12V, 70W)
(A) Light/DEF
(B) Blower Motor
(C) ACC
(D) Key ACC
(a) To Dome Light

(4) Air Conditioner



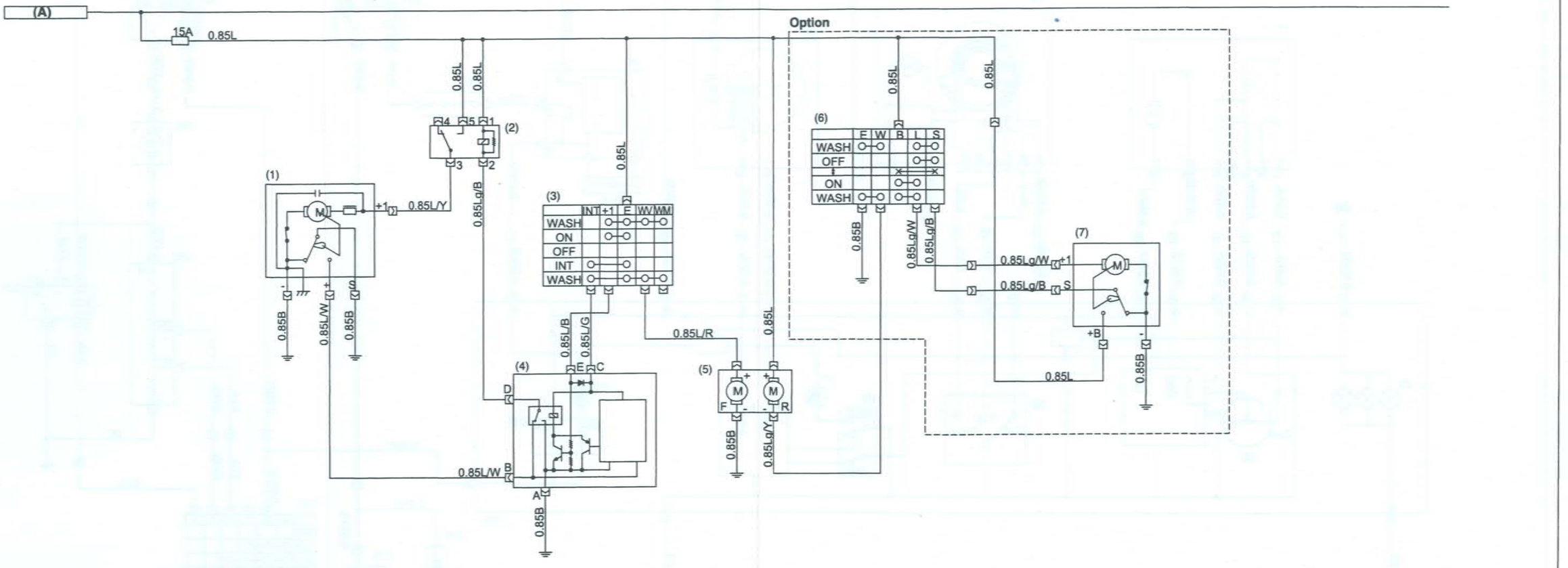
3TMACAN9P071A

(1) Servomotor Temperature Control
(2) Illumination Lamp (14V, 1.96W)
(3) Temperature Control Volume
(4) Servomotor Mode
(5) Mode Select Switch
(6) Servomotor FRS/REC
(7) F/R Indicator
(8) F/R Switch
(9) Thermo Amplifier
(10) Frost Thermistor
(11) A/C Indicator
(12) A/C Switch
(13) A/C Control Panel
(14) Dual Pressure Switch
(15) Compressor Relay
(16) Surge Cut Diode
(17) Magnetic Clutch Compressor
(18) Blower Relay
(19) Blower Motor
(20) Blower Motor Resistor
(21) Switch Blower Motor (A/C Control Panel)
(22) Blower High Relay

(A) Blower Motor
(B) Key ACC

(a) To Light Switch

(5) Wiper System



3TMACAN9P072A

(1) Front Wiper Motor (2) Front Wiper Motor Relay (3) Front Wiper Switch (4) Front Wiper Relay/Timer (5) Washer Motor (6) Rear Wiper Switch (7) Rear Wiper Motor **(A) Key ACC**

[4] WIRING COLOR

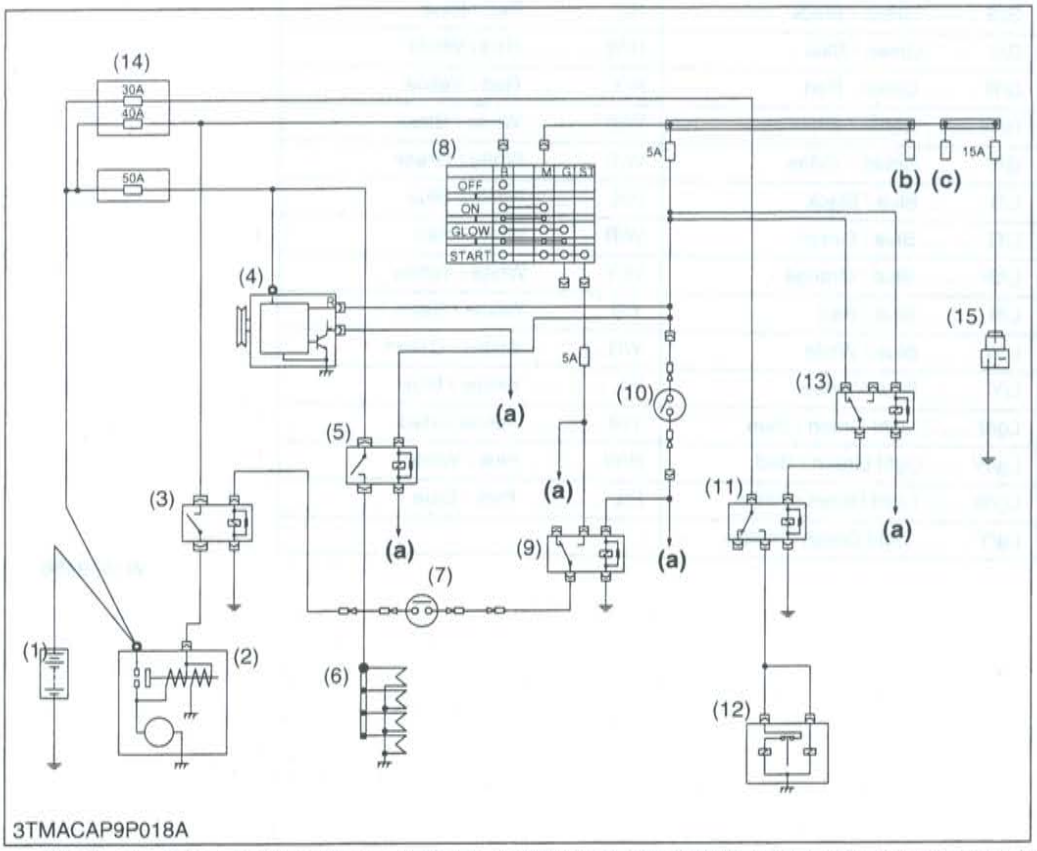
B ..... Black	Br/B ..... Brown / Black	Or/W ..... Orange / White
G ..... Green	Br/Y ..... Brown / Yellow	R/B ..... Red / Black
L ..... Blue	Br/R ..... Brown / Red	R/G ..... Red / Green
P ..... Pink	G/B ..... Green / Black	R/L ..... Red / Blue
R ..... Red	G/L ..... Green / Blue	R/W ..... Red / White
W ..... White	G/R ..... Green / Red	R/Y ..... Red / Yellow
Y ..... Yellow	G/W ..... Green / White	W/B ..... White / Black
Br ..... Brown	G/Y ..... Green / Yellow	W/G ..... White / Green
Lg ..... Light Green	L/B ..... Blue / Black	W/L ..... White / Blue
Or ..... Orange	L/G ..... Blue / Green	W/R ..... White / Red
Sb ..... Sky Blue	L/Or ..... Blue / Orange	W/Y ..... White / Yellow
B/G ..... Black / Green	L/R ..... Blue / Red	Y/B ..... Yellow / Black
B/L ..... Black / Blue	L/W ..... Blue / White	Y/G ..... Yellow / Green
B/P ..... Black / Pink	L/Y ..... Blue / Yellow	Y/L ..... Yellow / Blue
B/Pu ..... Black / Violet	Lg/B ..... Light Green / Blue	Y/R ..... Yellow / Red
B/R ..... Black / Red	Lg/R ..... Light Green / Red	P/W ..... Pink / White
B/W ..... Black / White	Lg/W ..... Light Green / White	P/L ..... Pink / Blue
B/Y ..... Black / Yellow	Lg/Y ..... Light Green / Yellow	

W1019456

2. STARTING SYSTEM

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT

(1) ROPS Model



3TMACAP9P018A

(1) Battery
(2) Starter Motor
(3) Starter Relay
(4) Alternator
(5) Glow Relay
(6) Glow Plug
(7) Neutral Safety Switch (Shuttle)
(8) Main Switch
(9) PTO Safety Relay
(10) PTO Switch
(11) Key Stop Relay
(12) Key Stop Solenoid
(13) Engine Stop Relay
(14) Slow Blow Fuse
(15) Auxiliary Power Connector

(a) To Meter Panel
(b) To Meter Panel/OPC
(c) To Turn Signal

W1020335

There are three key positions, **"OFF"**, **"ON"** and **"START"** on the main switch as shown above.

When the main switch is set **"ON"**, terminal **B** of the main switch is connected to terminal **M**.

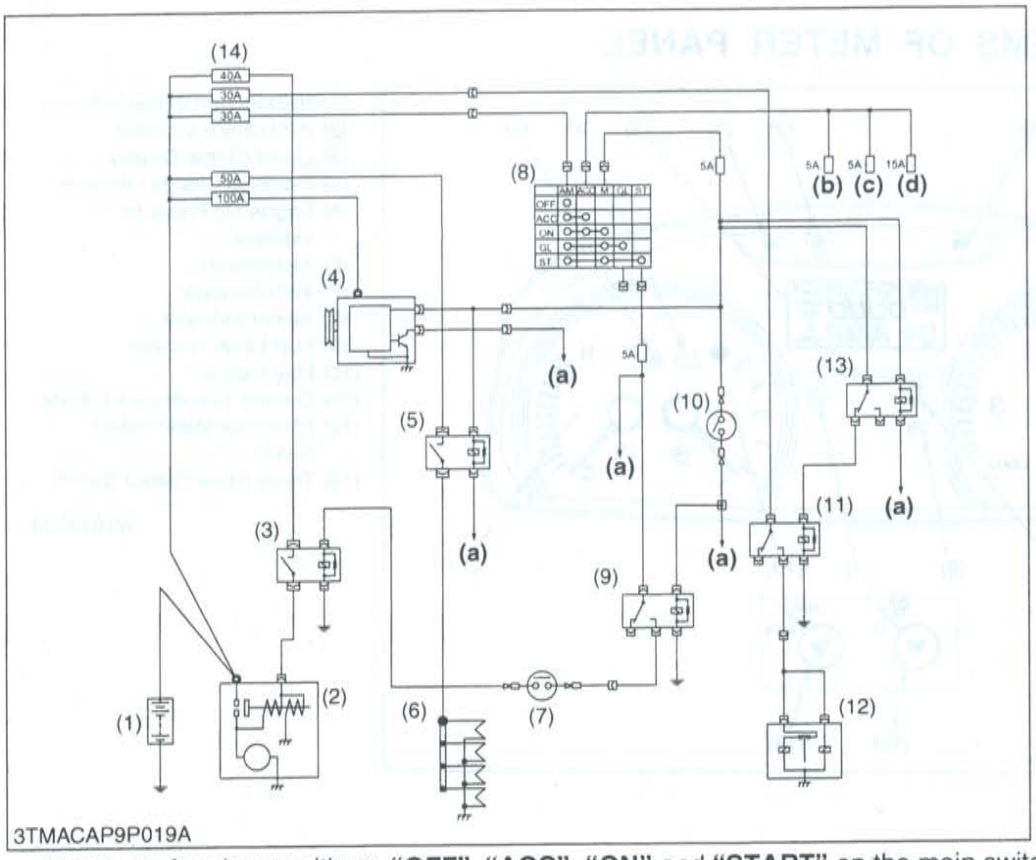
As a result, the battery current flows to the key stop relay (11) and the contact points of relay turned on **"ON"** position, and the key stop solenoid (12) is actuating for governor linkage, and linkage are connecting to the stop lever of injection pump, and stop lever move into **"START"** position.

When the main switch is set to **"START"** under the condition that the shuttle shift lever is neutral position and the safety switch (7) is turned on the PTO lever is in **"OFF"** position (PTO switch (10) is pushed to **"ON"**). Terminal **AM** of the main switch is connected to terminal **M** and terminal **ST**. Consequently, battery current flows to safety switches (7), (10), coil of starter relay (3), PTO safety relay (9). (When the PTO switches is set to **"OFF"**, battery current flows PTO switch (10) and coil of PTO safety relay (9).

This actuates starter (2).

When the main switch is released after starting the engine, the main switch returns to **"ON"** automatically. This stops the starter. Fuel supply and fuel stop to and from the injection pump are carried out by the key stop relay (11) and engine stop solenoid (12).

(2) CABIN Model



3TMACAP9P019A

(1) Battery
(2) Starter Motor
(3) Starter Relay
(4) Alternator
(5) Glow Relay
(6) Glow Plug
(7) Neutral Safety Switch (Shuttle)
(8) Main Switch
(9) PTO Safety Relay
(10) PTO Switch
(11) Key Stop Relay
(12) Key Stop Solenoid
(13) Engine Stop Relay
(14) Slow Blow Fuse

(a) To Meter Panel
(b) To Radio
(c) To Air Conditioner Controller
(d) To Wind Shield Wiper

W1013253

There are four key positions, **"OFF"**, **"ACC"**, **"ON"** and **"START"** on the main switch as shown above.

When the main switch is set to **"ACC"** (accessory), the radio, windshields wiper, work lights (front and rear), cigar lighter and blower fan can be used.

When the main switch is set **"ON"**, terminal **AM** of the main switch is connected to terminal **ACC** and terminal **M**.

As a result, the battery current flows to the key stop relay (11) and the contact points of relay turned on **"ON"** position, and the key stop solenoid (12) is actuating for governor linkage, and linkage are connecting to the stop lever of injection pump, and stop lever move into **"START"** position.

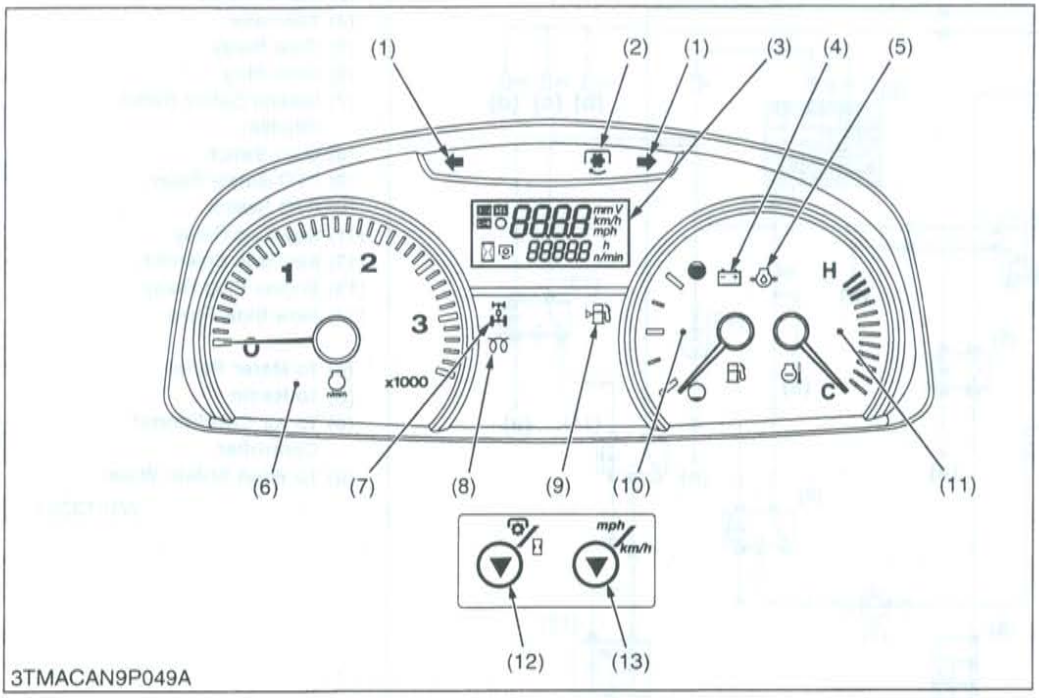
When the main switch is set to **"START"** under the condition that the shuttle shift lever is neutral position and the safety switch (7) is turned on the PTO lever is in **"OFF"** position (PTO switch (10) is pushed to **"ON"**). Terminal **AM** of the main switch is connected to terminal **M** and terminal **ST**. Consequently, battery current flows to safety switches (7), (10), coil of starter relay (3), PTO safety relay (9). (When the PTO switches is set to **"OFF"**, battery current flows PTO switch (10) and coil of PTO safety relay (9).

This actuates starter (2).

When the main switch is released after starting the engine, the main switch returns to **"ON"** automatically. This stops the starter. Fuel supply and fuel stop to and from the injection pump are carried out by the key stop relay (11) and engine stop solenoid (12).

3. INSTRUMENT PANEL

[1] INDICATION ITEMS OF METER PANEL

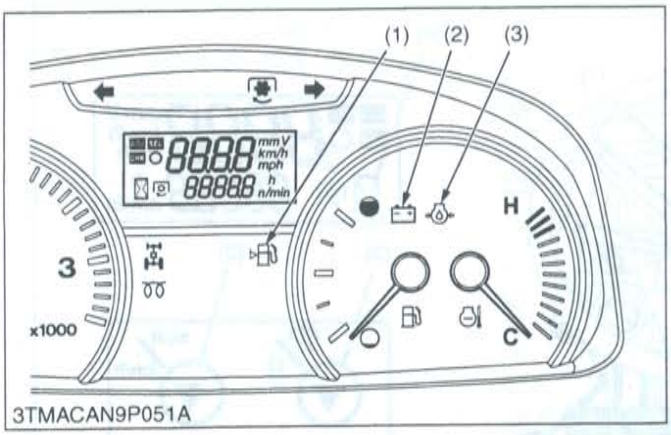


3TMACAN9P049A

(1) Hazard/Turn Signal Indicator
(2) PTO Clutch Indicator
(3) Liquid Crystal Display
(4) Electrical Charge Indicator
(5) Engine Oil Pressure Indicator
(6) Tachometer
(7) 4WD Indicator
(8) Heater Indicator
(9) Fuel Level Indicator
(10) Fuel Gauge
(11) Coolant Temperature Gauge
(12) PTO/Hour Meter Select Switch
(13) Travel Speed Select Switch

W1014393

[2] EASY CHECKER (TM)



3TMACAN9P051A

If the warning lamps in the Easy Checker (TM) come on during operation, immediately stop the engine, and find the cause as shown below.

Never operate the tractor while Easy Checker (TM) lamp is on.

■ Engine Oil Pressure

If the oil pressure in the engine goes below the prescribed level, the warning lamp in the Easy Checker (TM) will come on.

If this should happen during operation, and it does not go off when the engine is accelerated to more than 1000 min^{-1} (rpm), check level of engine oil.

■ Fuel Level

If the fuel in the tank goes below the prescribed level, the warning lamp in the Easy Checker (TM) will come on.

If this should happen during operation, refuel as soon as possible.

Prescribed level	ROPS model	20 L 5.3 U.S.gals 4.4 Imp.gals
	CABIN model	15 L 4.0 U.S.gals 3.3 Imp.gals

■ Electrical Charge

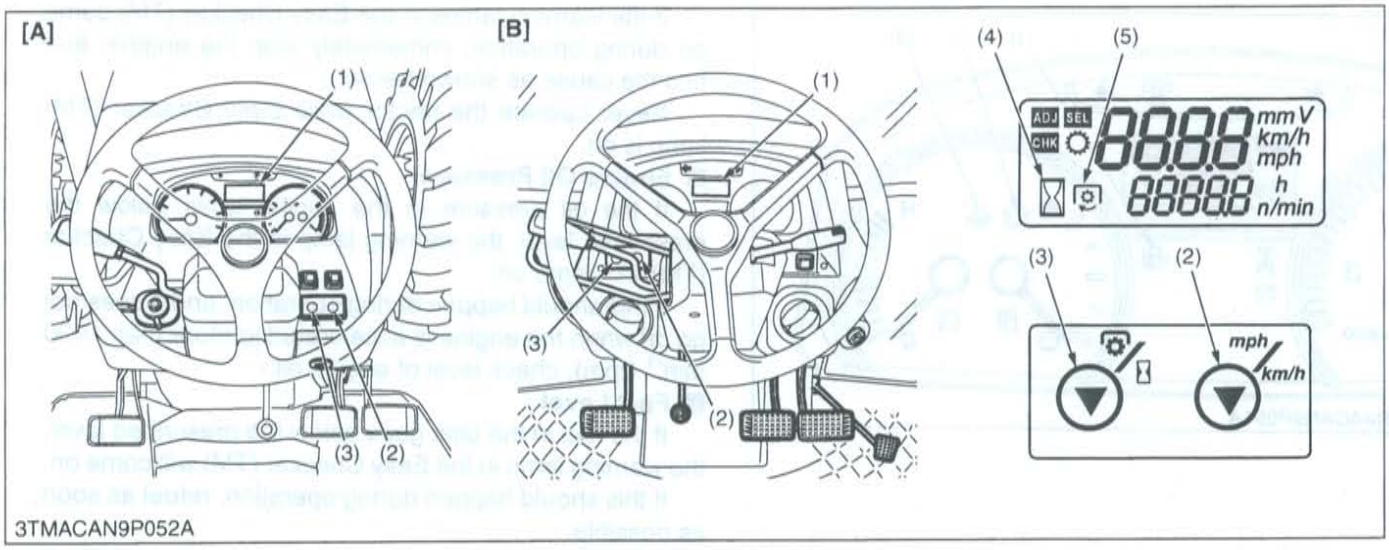
If the alternator is not charging battery, the Easy Checker will come on.

If this should happen during operation, check the electrical charging system.

(1) Fuel Level Indicator
(2) Electrical Charge Indicator
(3) Engine Oil Pressure Indicator

W1020575

[3] LCD MONITOR INDICATION



3TMACAN9P052A

(1) LCD Monitor
(2) Traveling Speed Select Switch
(3) PTO/Hour Meter Select Switch
(4) Hour Meter Indication
(5) PTO Indication
[A] ROPS Model
[B] CABIN Model

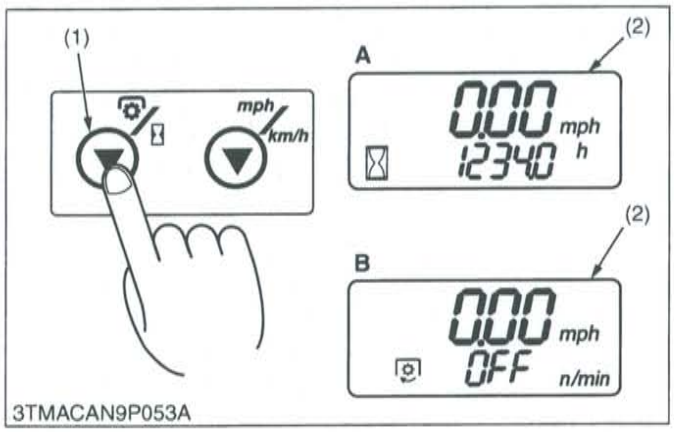
The LCD monitor gives three different modes : "display mode", "setting mode" and "checking mode".

■ **NOTE**

- **The travel speed displayed when the wheels slip under traction is different from the actual one.**
- **In cold weather the LCD monitor response will normally be slower and the visibility be less, than in the warmer weather.**

(1) Display Mode

1. The LCD monitor gives two different modes : "traveling speed and hour meter" and "traveling speed and PTO speed". Each time the PTO/Hour meter select switch is pressed, the mode is switched to the changing display.
2. To switch between "mph" and "km/h" for the traveling speed, use the traveling speed select switch.
3. The PTO clutch control lever works for the following automatic display modes.
   - PTO clutch control lever **"ON"** : traveling speed and PTO speed are displayed.
   - PTO clutch control lever **"OFF"** : traveling speed and hour meter are displayed.



3TMACAN9P053A

■ **Switching Hour Meter Mode and PTO Speed Mode**

Press the PTO/Hour meter select switch (1) to change the "hour meter mode" and "PTO speed mode".

(Hour meter mode)

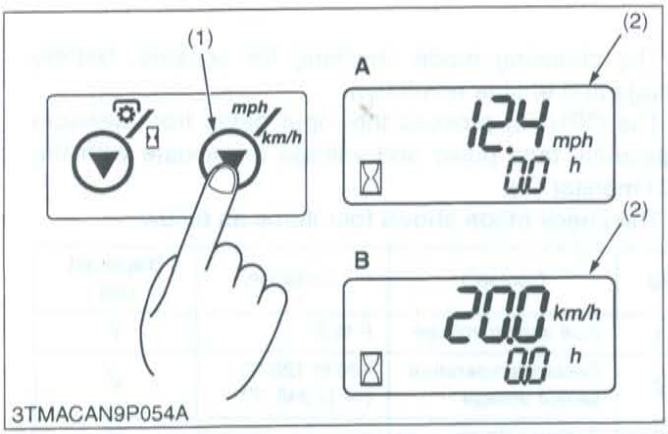
- Traveling speed and total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.

(PTO speed mode)

- Traveling speed and PTO speed are displayed.
- When the PTO clutch control lever is in **"OFF"** position, **"OFF"** is displayed.

(1) PTO/Hour Meter Select Switch
(2) LCD Monitor
A : Hour Meter Mode
B : PTO Speed Mode

W1015241



3TMACAN9P054A

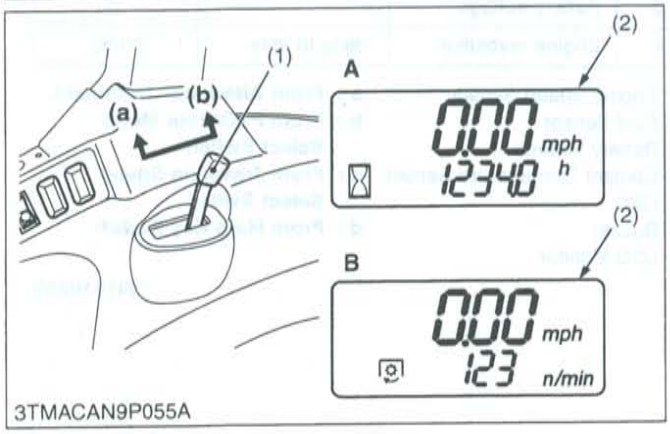
■ **Switching "km/h" and "mph" Indication**

Press the traveling speed select switch (1) to change the "km/h" and "mph" indication.

(1) PTO/Hour Meter Select Switch
(2) LCD Monitor

A : mph (Traveling Speed)
B : km/h (Traveling Speed)

W1015520



3TMACAN9P055A

■ **When Operate PTO Clutch Control Lever**

(At hour meter mode)

- Traveling speed and total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.
- When the PTO/Hour meter select switch is pressed in this state, **"OFF"** is displayed.

(At PTO speed mode)

- Traveling speed and PTO speed are displayed.
- When the PTO/Hour meter select switch is pressed in this state, the display mode switches to hour meter mode.

(1) PTO Clutch Control Lever
(2) LCD Monitor

A : PTO OFF (Hour Meter Mode)
B : PTO ON (PTO Speed Mode)
(a) ON Position
(b) OFF Position

W1015719

(2) Setting Mode

- Input the various data to RAM.
- There are three different setting modes : "PTO speed display mode switching", "entering the traveling speed coefficient" and "model select mode".

■ **PTO Speed Display Mode Switching**

When dual speed PTO kit is installed, it is necessary to switch the PTO speed display mode. Otherwise the PTO speed will not get correctly displayed in the LCD monitor. When the PTO speed is changed from 540 to 1000 min^{-1} (rpm) or from 1000 to 540 min^{-1} (rpm), it is necessary to switch the PTO speed display mode.

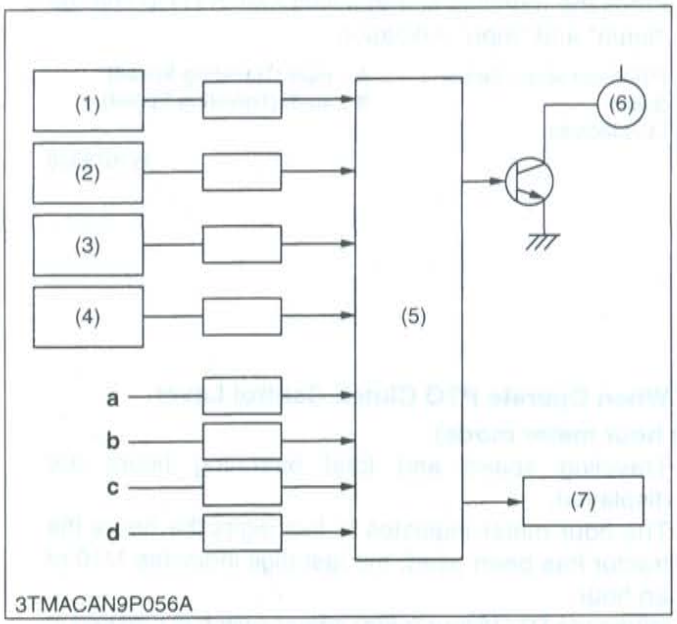
■ **Entering the Travel Speed Coefficient**

When optional different-diameter tires are fitted on the machine, the travel speed display mode must be changed. Otherwise the travel speed will not get correctly displayed. Such mode switching is also needed when the original tires are back on the machine.

■ **Mode Select Mode**

The mode select mode is set at factory. When replacing the instrument panel assembly, enter the model code.

(3) Checking Mode



The checking mode checking for sensors, battery voltage and engine revolution.

The CPU (5) process the input dates from sensors resistance, taco pulse and voltage to indicate with the LCD monitor (7).

The check mode shows four items as below.

No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	–30 to 120 °C (–4 to 248 °F)	V
3	Battery voltage	–	V
4	Engine revolution	Idling to max.	n/min

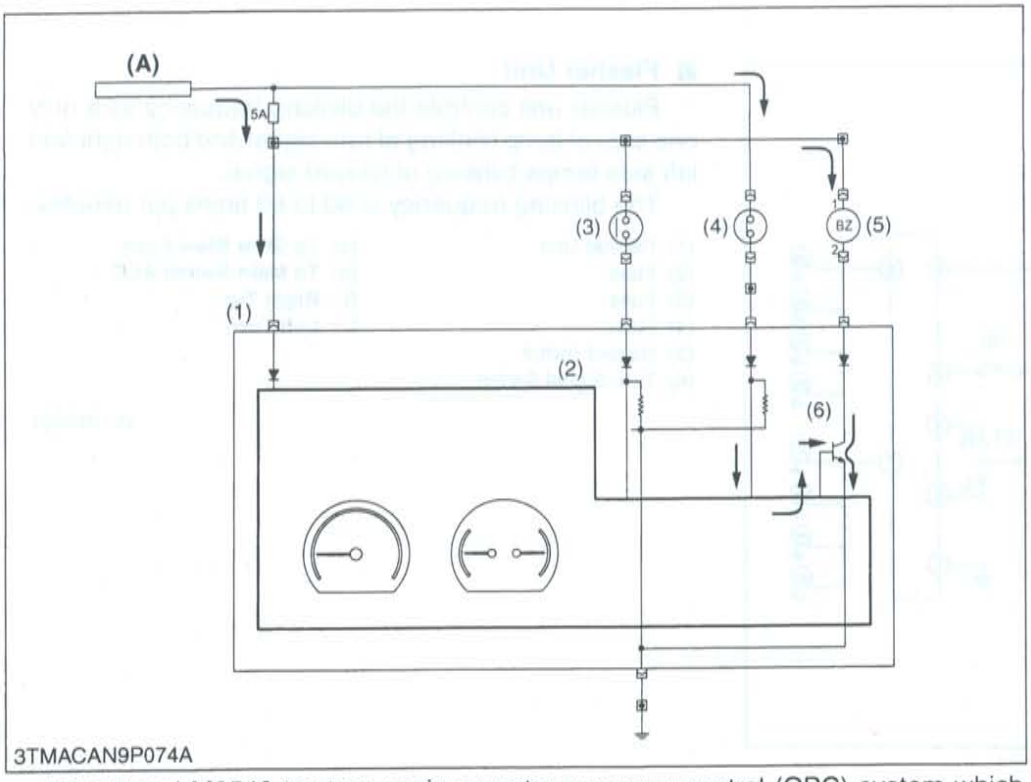
(1) Engine Speed Sensor
(2) Fuel Sensor
(3) Battery Voltage
(4) Coolant Temperature Sensor
(5) CPU
(6) Buzzer
(7) LCD Monitor

a : From Alternator Terminal L
b : From PTO/Hour Meter Select Switch
c : From Traveling Speed Select Switch
d : From Main Key Switch

W1016259

4. OPC (OPERATOR PRESENCE CONTROL)

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT



(1) Meter Panel
(2) CPU
(3) Seat Switch
(4) PTO Switch
(5) Buzzer
(6) Transistor

(A) Key Switch

W1014680

M8540 and M9540 tractors equip operator presence control (OPC) system which automatically whistling when operator stands from the seat while engaging PTO clutch.

This system is controlled by the seat switch (3), CPU (2), PTO switch (4) and buzzer (5).

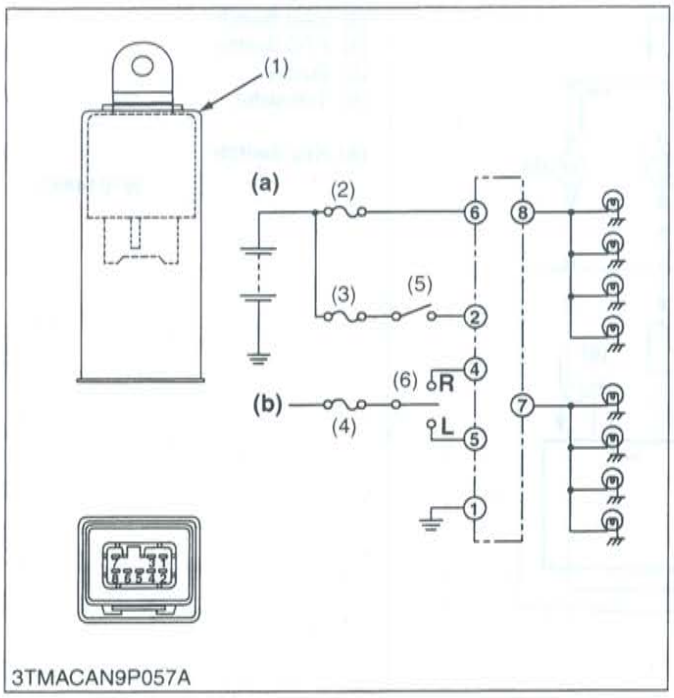
■ **Electric Circuit**

1. When sitting on the seat in the state of the key switch **"ON"** , the battery voltage passes the seat switch (3) and the CPU (2).
2. The CPU (2) detect the seat switch (3) and PTO switch (4) position.
3. When standing from the operators seat while shifting the PTO clutch lever at **"ON"** position, the CPU (2) turn on the transistor (6) and buzzer (5) is whistled.

5. LIGHTING SYSTEM

[1] COMPONENTS

(1) Flasher Unit



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■ **Flasher Unit**

Flusher unit controls the blinking frequency as a only one side of lamp blinking of turn signal and both right and left side lamps blinking of hazard signal.

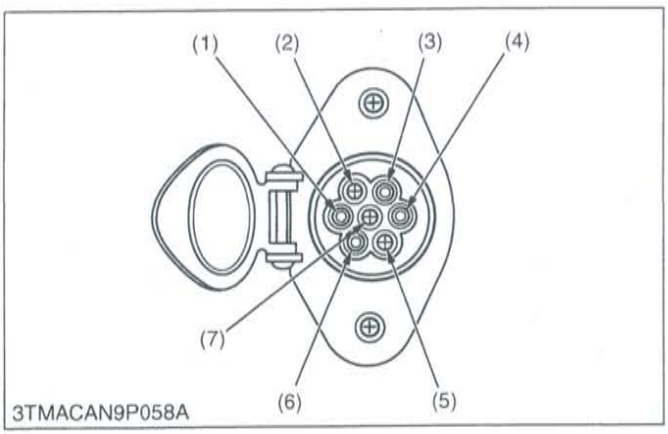
The blinking frequency is 60 to 80 times per minutes.

(1) Flasher Unit
(2) Fuse
(3) Fuse
(4) Fuse
(5) Hazard Switch
(6) Turn Signal Switch

(a) To Slow Blow Fuse
(b) To Main Switch ACC
R : Right Turn
L : Left Turn

W1015651

6. TRAILER SOCKET



The trailer socket is provided to take out the electrical power from tractor to trailer or implement.

The function of each terminal is shown below.

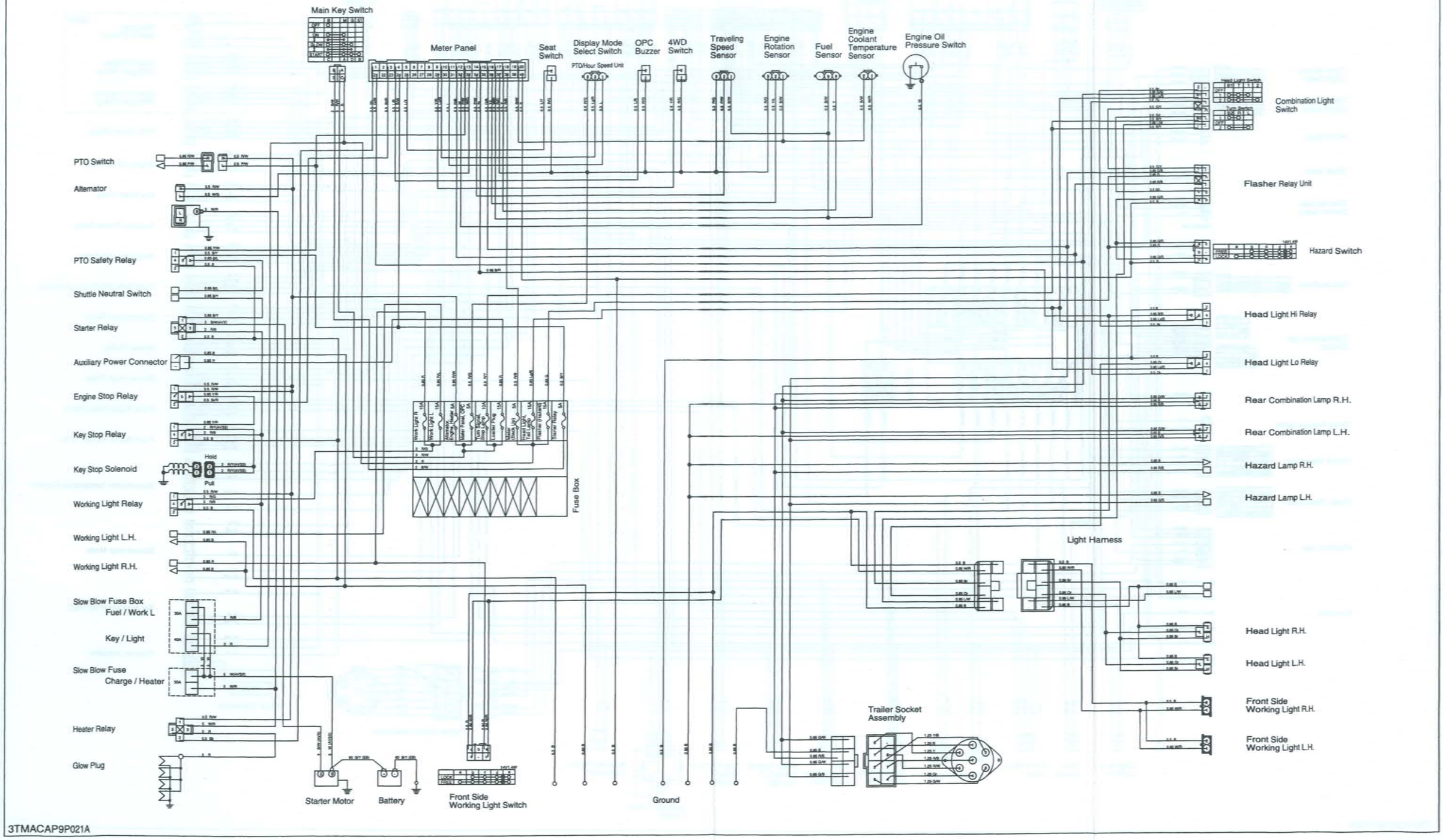
Terminal	Function	Color of wire harness	
		ROPS Model	CABIN Model
(1)	Ground	Black	White
(2)	Tail light Sidemarker light Parking light	Yellow / Black	Black
(3)	Turn signal light (L.H.)	Green / White	Yellow
(4)	Brake stop light	Orange	Red
(5)	Turn signal light (R.H.)	Red / White	Green
(6)	Number plate light	Yellow	Brown
(7)	–	Red / Black	Blue

(1) Terminal **1**
(2) Terminal **2**
(3) Terminal **3**
(4) Terminal **4**
(5) Terminal **5**
(6) Terminal **6**
(7) Terminal **7**

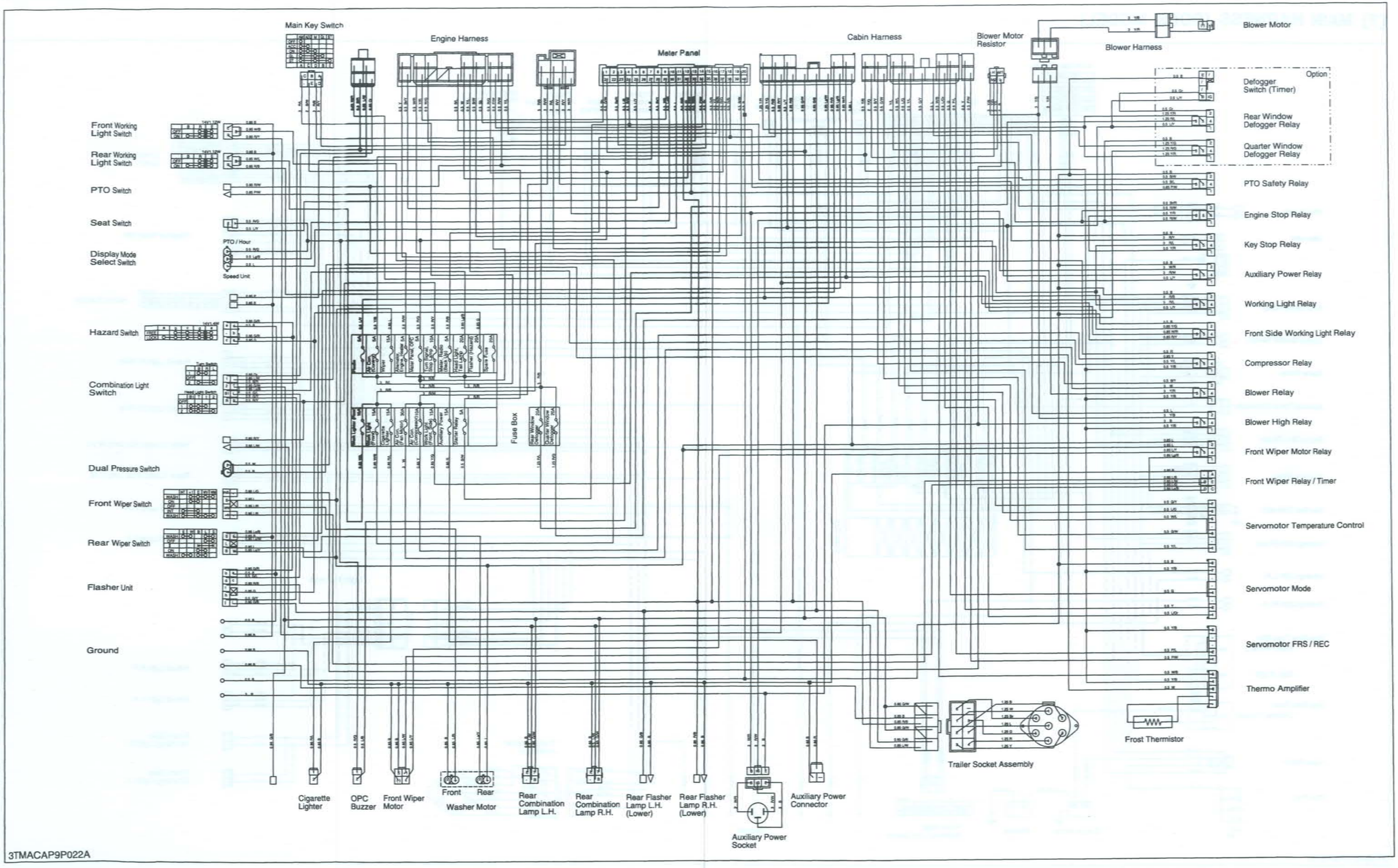
W1017401

1. WIRING DIAGRAM

[1] MAIN HARNESS (ROPS MODEL)



[2] MAIN HARNESS (CABIN MODEL)



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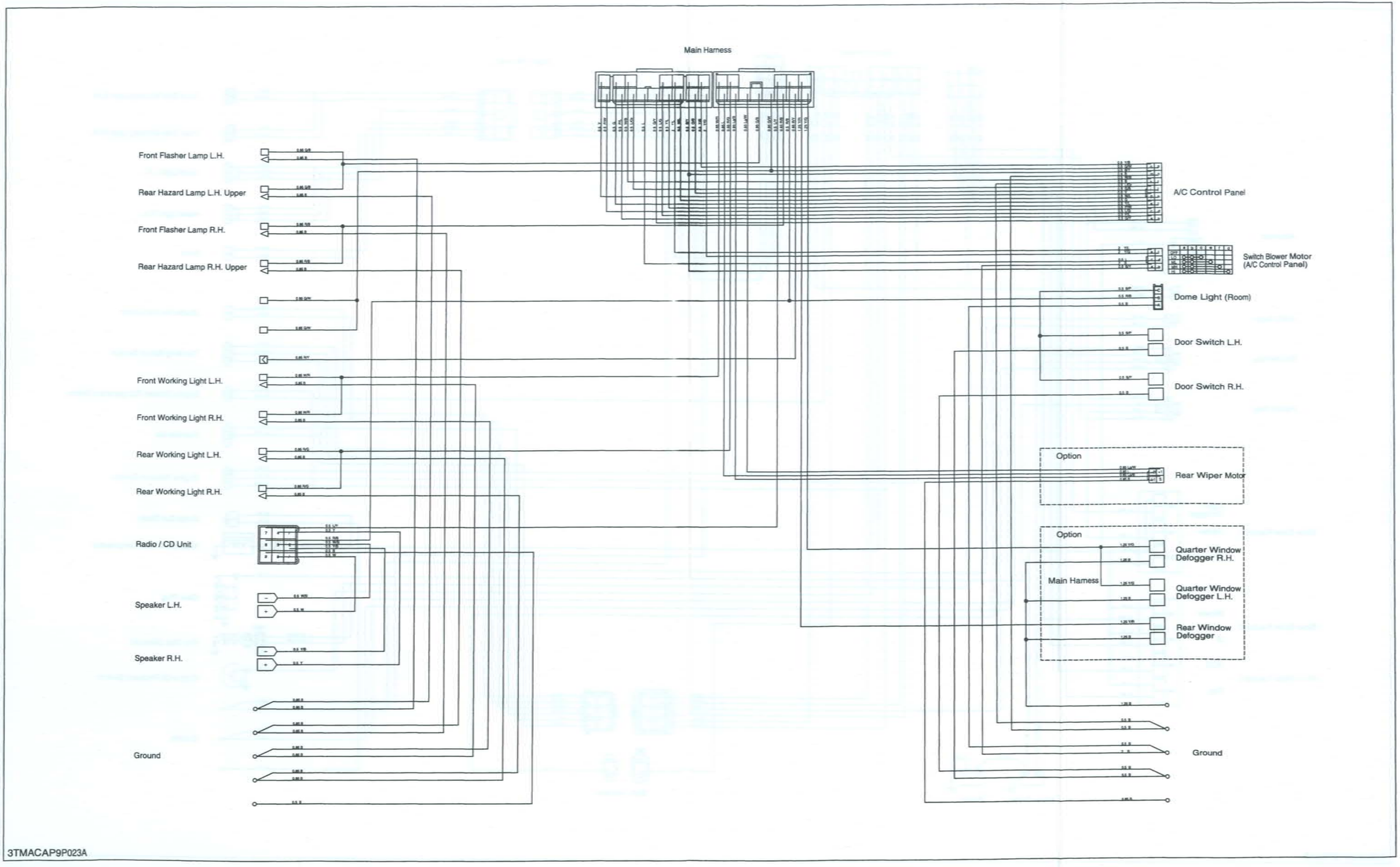
[3] CABIN HARNESS (CABIN MODEL)



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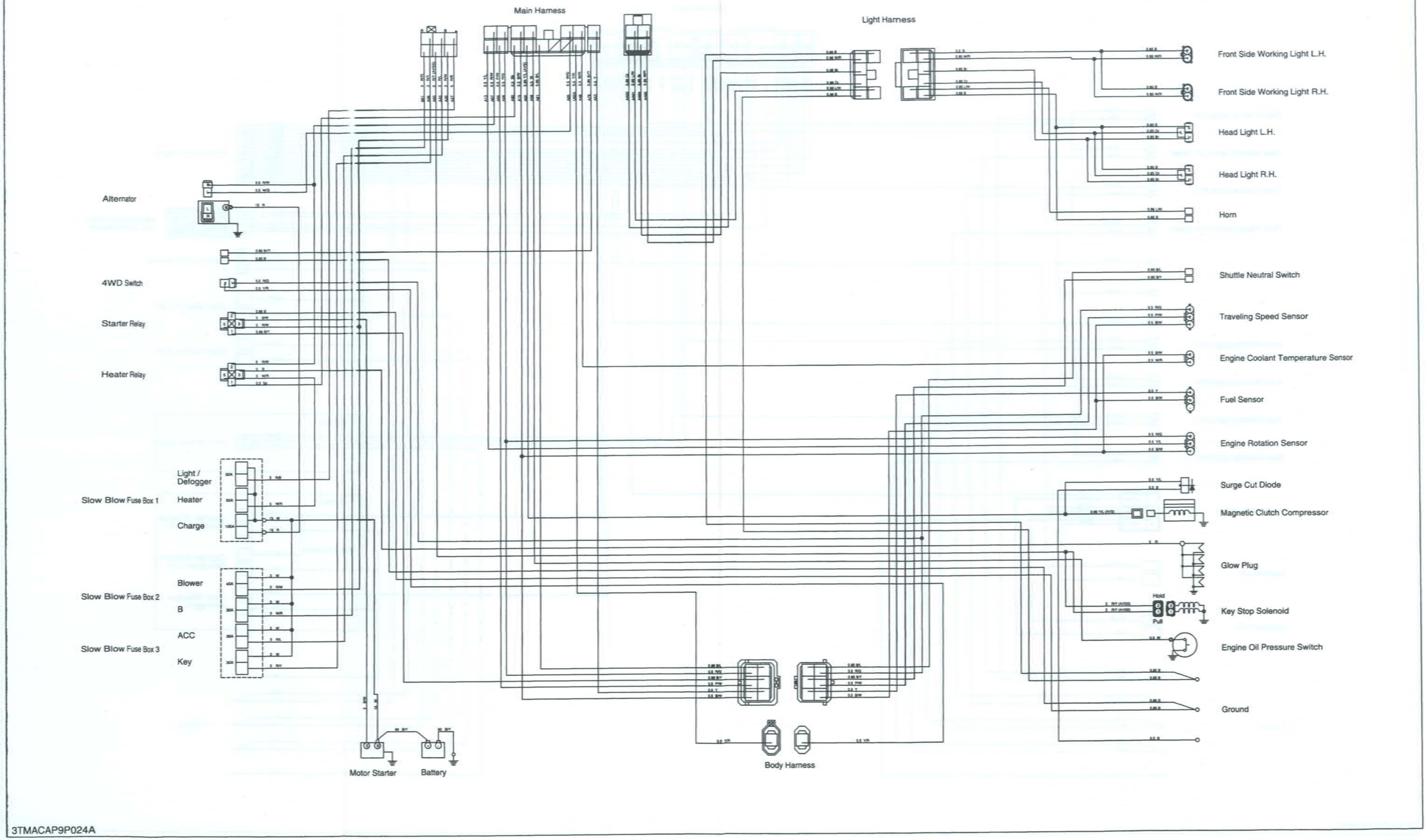
[4] ENGINE HARNESS (CABIN MODEL)



3TMACAP9P024A

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-37, 38
Fuse Blown Frequently	Short-circuited	Repair or replace	–

W1014322

BATTERY

Battery Discharges Too Quickly	Battery defective	Replace	9-S7
	Alternator defective	Repair or replace	9-S17
	Wiring harness disconnected or improperly connected (between battery positive terminal and alternator **B** terminal)	Repair or replace	–
	Cooling fan belt slipping	Adjust tension	G-24

W1013580

STARTING SYSTEM

Starter Motor Does Not Operate	Battery discharged or defective	Recharge or replace	9-S8
	Slow blow fuse blown	Replace	9-S37, 38
	Starter relay defective	Replace	9-S35
	PTO switch improperly adjusted or defective	Repair or replace	9-S26
	Wiring harness disconnected or improperly connected (between main switch **M** terminal and PTO switch, between main switch **ST** terminal and PTO relay, shuttle neutral switch, between safety switch and starter relay, between starter relay and ground, between starter relay and starter motor **S** terminal, between battery positive terminal and starter motor **B** terminal)	Repair or replace	–
	Starter motor defective	Repair or replace	9-S15
	Main switch defective	Replace	9-S12, 13

W1011018

OPC

Buzzer Does Not Buzz	Fuse blown	Replace	G-37, 38
	Buzzer defective	Replace	9-S38
	Seat switch defective	Replace	9-S37
	Wiring harness disconnected or improperly connected	Repair or replace	–

W1013580

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head Light Does Not Light	Fuse blown	Replace	G-37, 38
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or replace	9-S29, 30
Illumination Light Does Not Light	Fuse blown	Replace	G-37, 38
	Meter panel defective	Replace	9-S23
	Wiring harness disconnected or improperly connected	Repair or replace	9-S23
Tail Light Does Not Light	Fuse blown	Replace	G-37, 38
	Wiring harness disconnected or improperly connected	Repair or replace	9-S29, 30
Hazard Light Does Not Light	Fuse blown	Replace	G-37, 38
	Bulb blown	Replace	G-39
	Flasher unit defective	Replace	9-S32
	Hazard switch defective	Replace	9-S31
	Turn signal switch defective	Replace	9-S29, 30
Hazard and Turn Signal Indicator Lamp Does Not Light	Meter panel defective	Replace	9-S23
	Wiring harness disconnected or improperly connected	Repair or replace	9-S23
Hazard and Turn Signal Light Does Not Go ON and OFF	Flasher unit defective	Replace	9-S32
Work Light Does Not Light	Fuse blown	Replace	G-37, 38
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or replace	9-S33, 34

W1011496

EASY CHECKER

Symptom	Probable Cause	Solution	Reference Page
Engine Oil Pressure Lamp Lights Up When Engine is Running	Engine oil pressure too low	Repair	1-S15
	Engine oil insufficient	Replenish	G-10
	Engine oil pressure switch defective	Replace	9-S25
	Short circuit between engine oil pressure switch lead and chassis	Repair	9-S25
	Circuit in panel board defective	Replace	–
Engine Oil Pressure Lamp Does Not Light When Main Switch is Turned ON and Engine Is Not Running	Meter panel defective	Replace	9-S23
	Engine oil pressure switch defective	Replace	9-S25
	Wiring harness disconnected or improperly connected (between meter panel and engine oil pressure switch)	Repair or replace	9-S23
	Circuit in meter panel defective	Replace	–
Charge Lamp Does Not Go OFF When Engine Is Running	Alternator defective	Repair or replace	9-S17
	Short circuit between alternator terminal L and chassis	Repair	–
	Circuit in meter panel defective	Replace	–
Charge Lamp Does Not Light When Main Switch Is Turned ON	Wiring harness disconnected or improperly connected (between meter panel and alternator)	Repair or replace	–
	Circuit in meter panel defective	Replace	–
PTO Lamp Lights Up When PTO Switch Is OFF Position	PTO switch is defective	Replace	9-S26
PTO Lamp Does Not Light Up When PTO Switch Is ON Position	PTO switch is defective	Replace	9-S26
	Meter panel defective	Replace	9-S23
Fuel Level Indicator Lamp Lights Up	Fuel insufficient	Replenish	G-10
	Fuel level sensor defective	Replace	9-S27
	Short circuit between fuel unit lead and chassis	Repair	–
	Circuit in meter panel defective	Replace	–
Fuel Level Indicator Lamp Does Not Light When Fuel Tank Is Empty	Fuel level sensor defective	Replace	9-S27
	Wiring harness disconnected or improperly connected (between meter panel and fuel unit)	Repair or replace	–
	Circuit in meter panel defective	Replace	–

W1013580

ENGINE KEY SWITCH SHUT-OFF SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Stop When Main Switch Is Turned OFF	Fuse blown	Replace	G-37, 38
	Key stop relay defective	Replace	9-S36
	Engine stop relay defective	Replace	9-S36
	Meter panel defective	Replace	9-S23
	Wiring harness disconnected or improperly connected	Repair or replace	–
Engine Does Not Start	Fuse or slow blow fuse blown	Replace	G-37, 38
	Engine stop solenoid defective	Replace	9-S16
	Engine stop relay defective	Replace	9-S36
	Key stop relay defective	Replace	9-S36
	PTO switch defective	Replace	9-S26
	Shuttle neutral switch defective	Replace	9-S26

W1011890

GAUGES

Fuel Gauge Does Not Function	Fuel level sensor defective	Replace	9-S27
	Wiring harness disconnected or improperly connected (between meter panel and fuel unit)	Repair or replace	–
	Circuit in meter panel defective	Replace	–
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge defective	Replace	9-S23
	Coolant temperature sensor defective	Replace	9-S25
	Wiring harness disconnected or improperly connected (between meter panel and coolant temperature sensor)	Repair or replace	–
	Circuit in meter panel defective	Replace	–

W1011980

LCD MONITOR

Nothing is Displayed in LCD	Battery discharged or defective (Battery voltage is below 10 V)	Recharge or replace	9-S8
	Slow blow fuse blown	Replace	G-37, 38
	Meter panel connector disconnect	Connect	9-S23
	Meter panel defective	Replace	9-S23
Indication on LCD Does Not Change When Pushing the Display Mode Switch	Display mode select switch defective	Replace	9-S25
	Wiring harness disconnected	Repair	–
Traveling Speed is Not Indicating	Wiring harness disconnected	Repair	–
	Traveling speed sensor defective	Replace	9-S28
PTO Speed in Not Indicating	Wiring harness disconnected	Repair	–
	Engine tachometer sensor defective	Replace	9-S28

W1013580

2. SERVICING SPECIFICATIONS

STARTER MOTOR

Item		Factory Specification	Allowable Limit
Commutator	O.D.	32.0 mm 1.2598 in.	31.4 mm 1.2362 in.
Mica	Undercut	0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.2 mm 0.0079 in.
Brush	Length	18.0 mm 0.7086 in.	11.0 mm 0.4331 in.

W1013874

GLOW PLUG

Glow Plug	Resistance	Approx. 0.95 Ω	–

W1014914

ALTERNATOR

Brush	Length	18.5 mm 0.728 in.	5.0 mm 0.197 in.
Slip Ring	O.D.	22.7 mm 0.894 in.	22.1 mm 0.870 in.

W1013973

FUEL LEVEL SENSOR

Float at Uppermost Position	Resistance	3.0 to 5.0 Ω	–
Float at Lowermost Position	Resistance	107.5 to 112 Ω	–

W1014788

COOLANT TEMPERATURE SENSOR

Coolant Temperature at 120 °C (248 °F)	Resistance	Approx. 117 Ω	–
Coolant Temperature at 100 °C (212 °F)	Resistance	Approx. 189 Ω	–
Coolant Temperature at 80 °C (176 °F)	Resistance	Approx. 290 to 354 Ω	–
Coolant Temperature at 50 °C (122 °F)	Resistance	Approx. 808 Ω	–
Coolant Temperature at 20 °C (68 °F)	Resistance	Approx. 2.21 to 2.69 kΩ	–

W1014851

FLASHER UNIT

Flasher Blinking	Times	60 to 80 times / minutes	–

W1014977

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "5. TIGHTENING TORQUES" at "G.GENERAL" section)

Item	N·m	kgf·m	ft-lbs
Pulley nut (Alternator)	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2

W1012736

4. CHECKING AND ADJUSTING

⚠ 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 alternator and regulator may result.**

[1] BATTERY, FUSE, GROUNDING AND CONNECTOR

(1) Battery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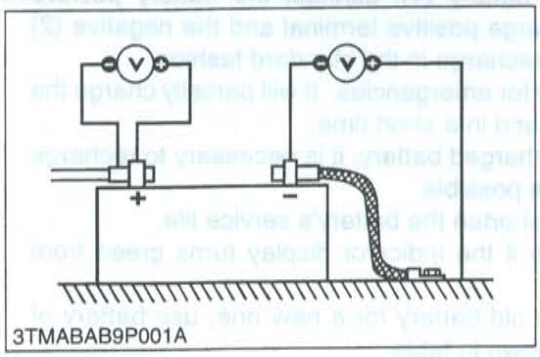

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Battery Voltage

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

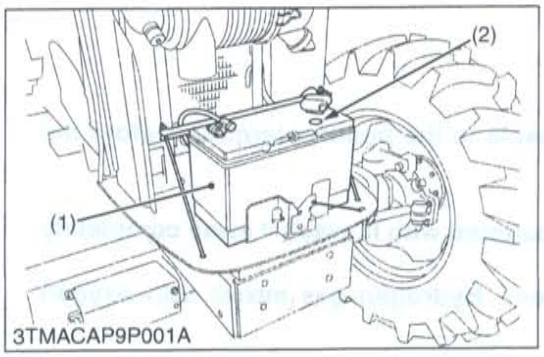
W1015899

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

W1016279



Battery Condition Indicator

1. Check the battery condition by reading the indicator (2).

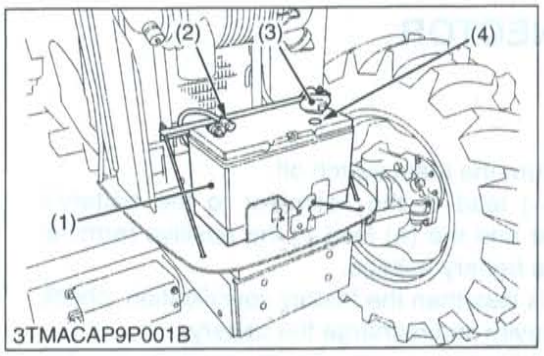
State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery
White	Needs changing battery

■ **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. (A.H.)
GP31 (105E41R)	12	85.3

Reserve Capacity (min)	Cold Cranking Amps	Normal Charging Rate (A)
160	900	11

(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 storaging the battery mounted on the tractor, disconnect the ground cable from the battery's negative terminal post.

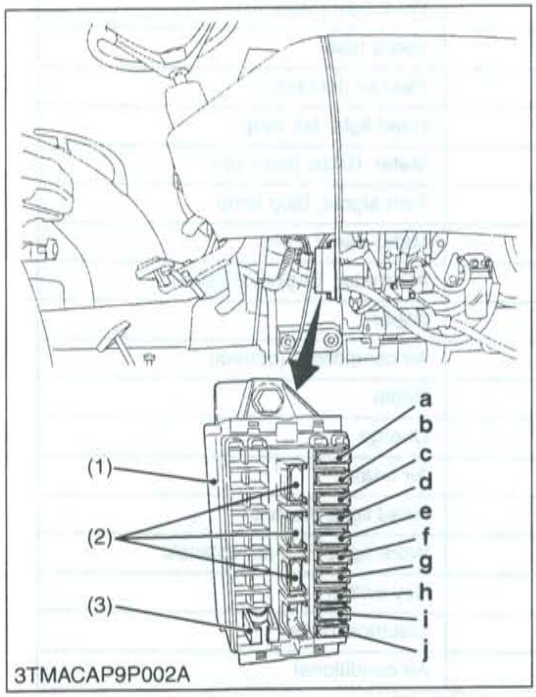
(Reference)

- 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) Checking Fuse



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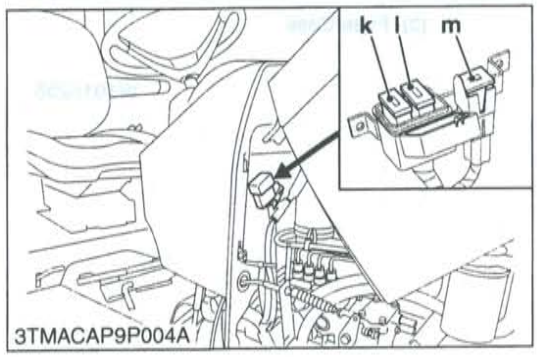


3TMACAP9P004A

Fuse (ROPS Model)

1. When inspect the circuit line, check the related fuses.
2. If any of the fuse is blown, replace with a new one of the same capacity.

■ **IMPORTANT**

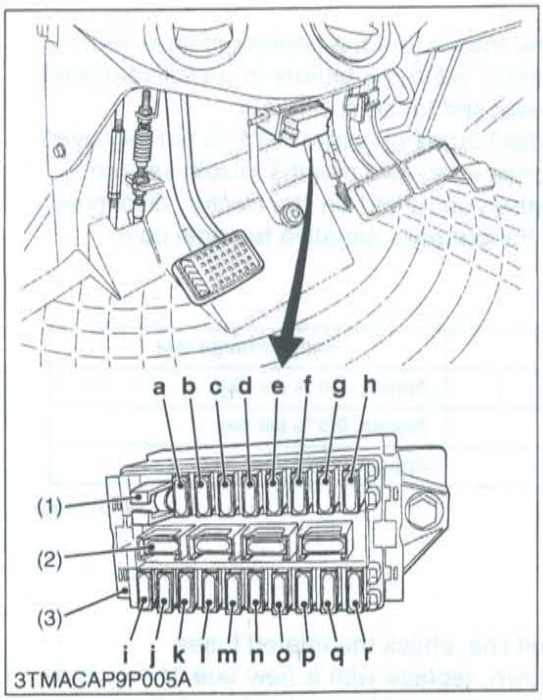
- **If a fuse is blown, check the cause and be sure to replace it with a new one of the same capacity.**

■ **Protected Circuit**

Fuse I.D.	Capacity (A)	Protected circuit
a	15	Work light R
b	15	Work light L
c	5	Alternator, Engine, Glow plug
d	5	Meter panel, OPC
e	10	Turn signal
f	15	Auxiliary power
g	5	Meter (Back up)
h	15	Head light, Tail lamp
i	15	Flasher (Hazard)
j	5	Starter relay
k	40	Key switch, Head light, Hazard
l	30	Fuel cut solenoid, Work light
m	50	Charge, Glow plug

(1) Fuse Case
(2) Spare Fuse
(3) Fuse Puller

W1015983



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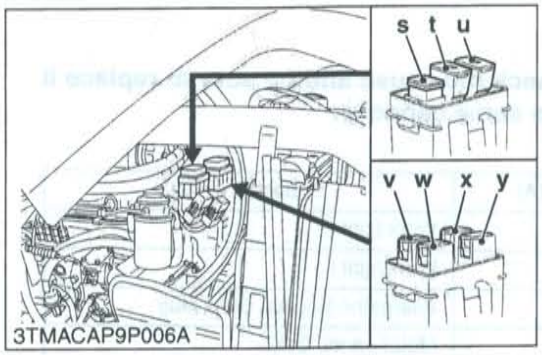


3TMACAP9P006A

Fuse (CABIN Model)

1. When inspect the circuit line, check the related fuses.
2. If any of the fuse is blown, replace with a new one of the same capacity.

■ **IMPORTANT**

- **If a fuse is blown, check the cause and be sure to replace it with a new one of the same capacity.**

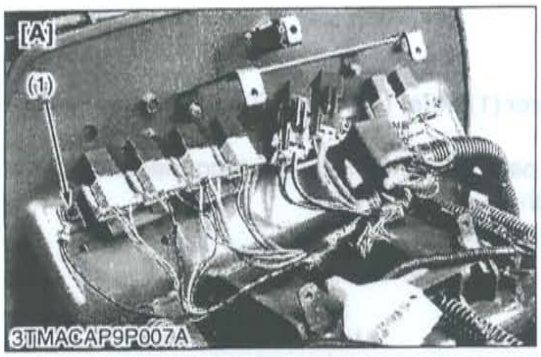
■ **Protected Circuit**

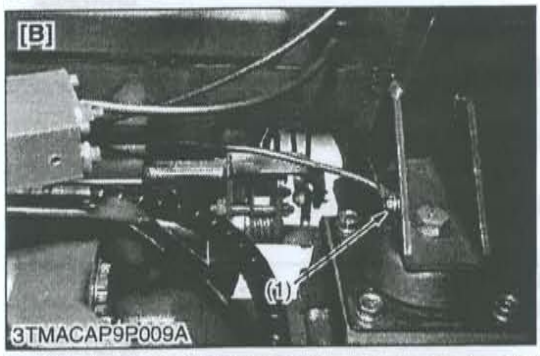
Fuse I.D.	Capacity (A)	Protected circuit
a	5	Starter relay
b	15	Auxiliary power
c	15	Work light (front, side)
d	10	Air conditioner (compressor)
e	30	Air conditioner (fan motor)
f	15	Cigarette lighter
g	15	Work light (front)
h	15	Work light (rear)
i	20	Spare fuse
j	20	Flasher (hazard)
k	20	Head light, tail lamp
l	5	Meter, Radio (back up)
m	10	Turn signal, Stop lamp
n	5	Meter panel, OPC
o	5	Alternator, Engine, Heater
p	15	Wiper
q	5	Air conditioner (control)
r	5	Radio
s	100	Charge
t	50	Air heater
u	50	Head light, Hazard
v	30	Work light, Fuel cut solenoid
w	30	Key switch
x	30	Electrical outlet
y	40	Air conditioner

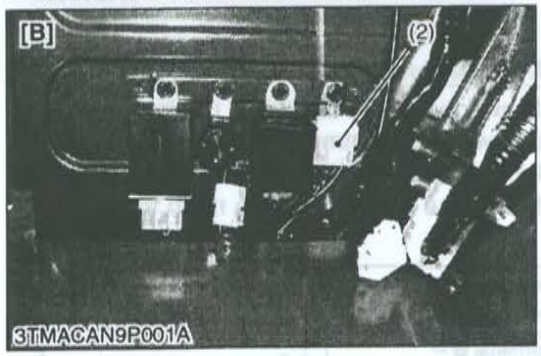
(1) Fuse Puller
(2) Spare Fuse
(3) Fuse Case

W1016255

(3) Checking Grounding Wires







Grounding Wire

1. Check the whether the grounding wire (1) is connected securely to the tractor chassis.
2. If the grounding wire is broken or disconnected, replace it.

(1) Grounding Wire
(2) Grounding Connector

[A] ROPS Model
[B] CABIN Model

W1037688

(4) Connector

Checking Connector

1. When inspect the circuit line, check the related connectors.
2. Disconnect the connectors and check their terminals for contamination and deformation.
3. Check to see that cable does not broken or terminals are not shelled off.
4. If any defective parts are found, repair or replace them.

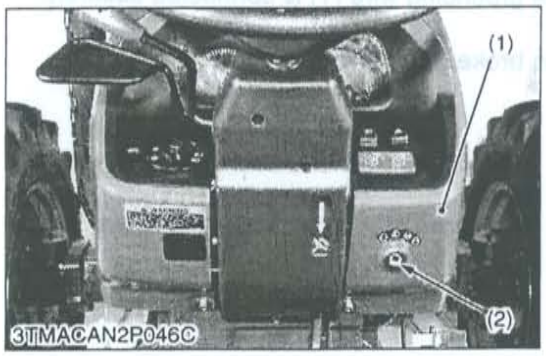
■ **IMPORTANT**

- **Connect connector surely after checked.**

W1017143

[2] MAIN SWITCH

(1) Main Switch (ROPS Model)

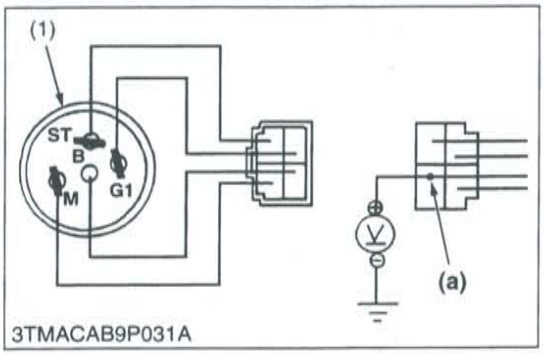


(1) Panel Cover (2) Main Switch

W1017484

Main Switch

1. Remove the panel cover (1), refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section.
2. Disconnect the meter panel and the main switch connectors after turning the main switch off.
3. Perform the following checking.



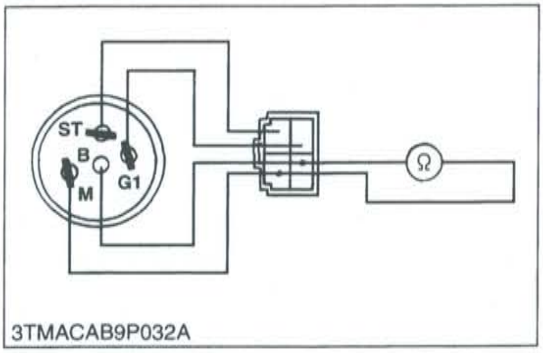
(1) Main Switch **(a) From Battery Positive Terminal**

W1014366

Connector Voltage

1. Measure the voltage with a voltmeter across the connector terminal **B** and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector terminal **B** – Chassis	Approx. battery voltage

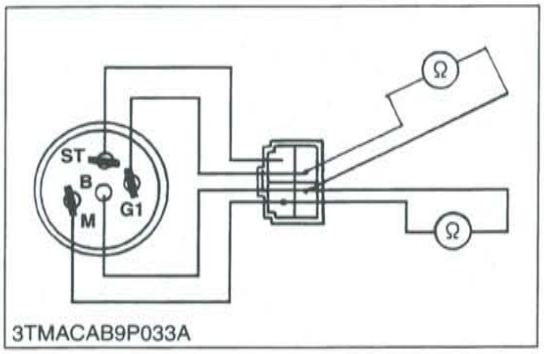


Main Switch at ON Position

1. Turn the main switch to **ON** position.
2. Measure the resistance with an ohmmeter across the terminal **B** and the terminal **M**.
3. If 0 ohm is not indicated, the **B** – **M** contacts of the main switch are faulty.

Resistance	Terminal **B** – Terminal **M**	0 Ω

W1014494

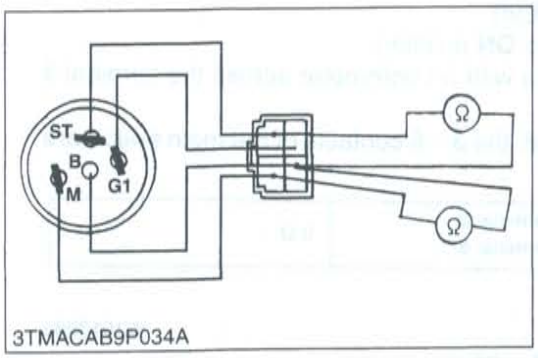


Main Switch at PREHEAT Position

1. Turn and hold the main switch at the **PREHEAT** position.
2. Measure the resistances with an ohmmeter across the terminal **B** and the terminal **G1** and across terminal **B** and terminal **M**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal **B** – Terminal **G1**	0 Ω
	Terminal **B** – Terminal **M**	0 Ω

W1014641



3TMACAB9P034A

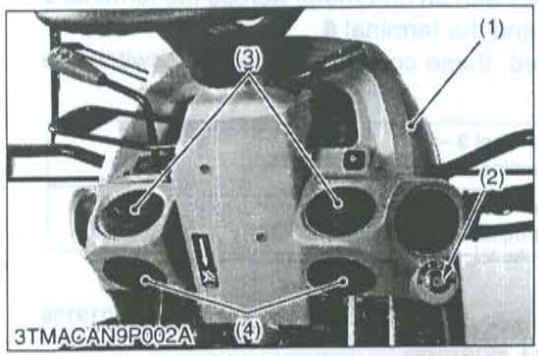
Main Switch at START Position

1. Turn and hold the main switch at the **START** position.
2. Measure the resistances with an ohmmeter across the terminal **B** and the terminal **ST** and across terminal **B** and the terminal **M**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal **B** – Terminal **ST**	0 Ω
	Terminal **B** – Terminal **M**	0 Ω

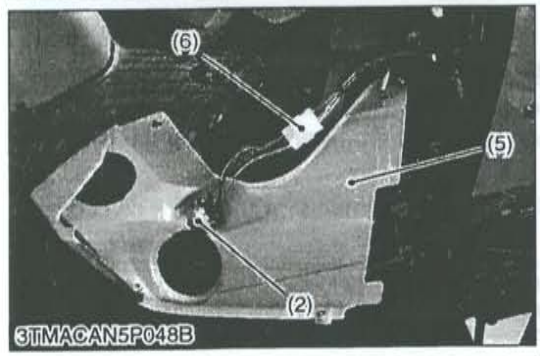
W1014907

(2) Main Switch (CABIN Model)



3TMACAN9P002A

3TMACAN5P047B



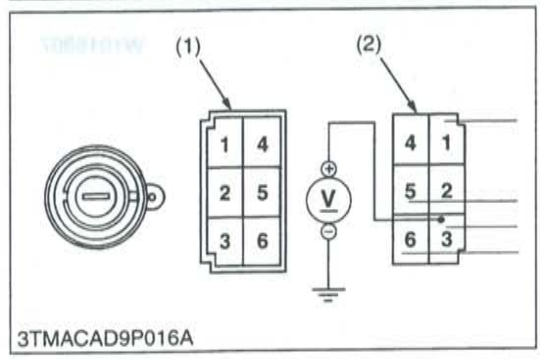
3TMACAN5P048B

Main Switch

1. Remove the panel cover (1).
2. Remove the air outlet (3) and (4).
3. Remove the panel under cover R.H. (5) and disconnect the connector.
4. Perform the following checking.

(1) Panel Cover
(2) Main Switch
(3) Air Outlet
(4) Air Outlet
(5) Panel Under Cover R.H.
(6) Connector

W1018558



3TMACAD9P016A

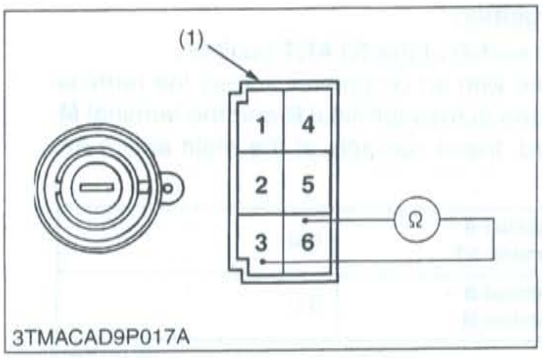
Connector Voltage

1. Measure the voltage with a voltmeter across the connector terminal **3** and chassis.
2. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	Connector terminal **3** – Chassis	Approx. battery voltage

(1) Main Switch
(2) Main Switch Connector (Wire Harness Side)

W1018767



3TMACAD9P017A

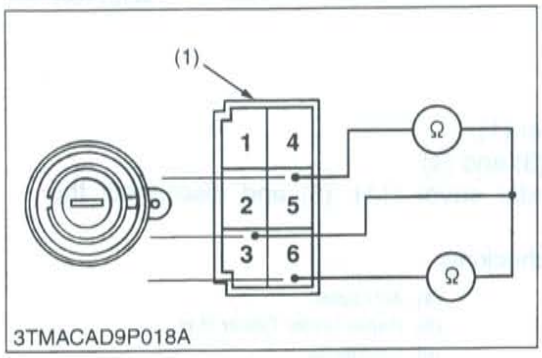
Main Switch at ON Position

1. Turn the main switch to **ON** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, the **3 – 6** contacts of the main switch are faulty.

Resistance	Terminal **3** – Terminal **6**	0 Ω

(1) Main Switch Connector

W1018982



3TMACAD9P018A

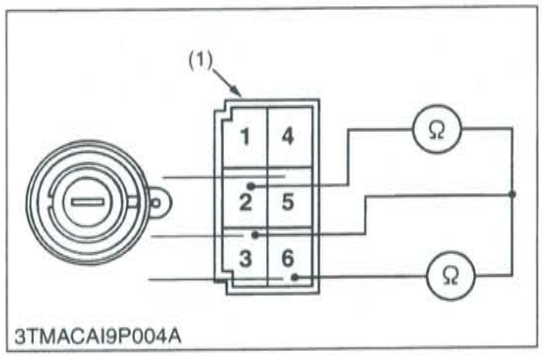
Main Switch at START Position

1. Turn and hold the main switch at the **START** position.
2. Measure the resistances with an ohmmeter across the terminal **5** and across terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal **3** – Terminal **5**	0 Ω
	Terminal **3** – Terminal **6**	0 Ω

(1) Main Switch Connector

W1019166



3TMACAI9P004A

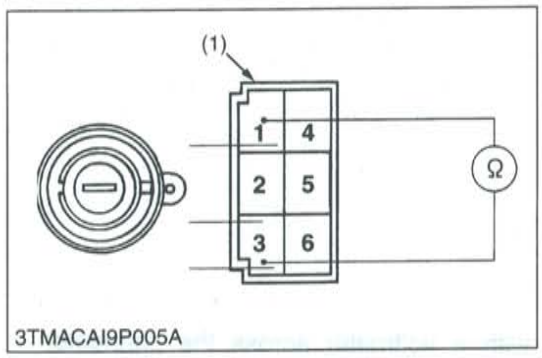
Main Switch at PREHEAT Position

1. Turn and hold the main switch key at the **PREHEAT** position.
2. Measure the resistances with an ohmmeter across the terminal **3** and terminal **2**, and the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal **3** – Terminal **2**	0 Ω
	Terminal **3** – Terminal **6**	0 Ω

(1) Main Switch Connector

W1018647



3TMACAI9P005A

Main Switch at ACC Position

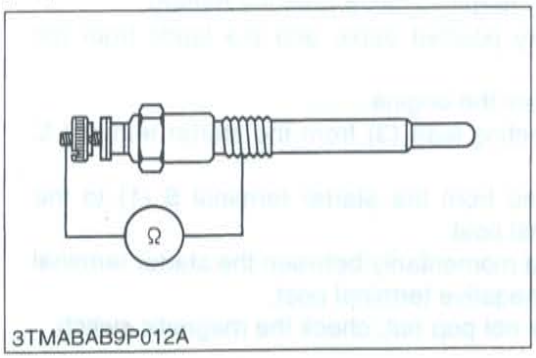
1. Turn the main switch key at the **ACC** position.
2. Measure the resistances with an ohmmeter across the terminal **3** and the terminal **1**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal **3** – Terminal **1**	0 Ω

(1) Main Switch Connector

W1018807

[3] GLOW PLUG



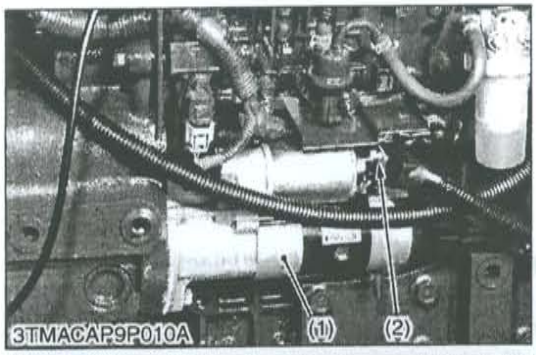
Glow Plug

1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter across the glow plug terminal and chassis.
3. If 0 ohm 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, renew the glow plug.

Glow plug resistance	Factory spec.	Approx. 0.95 Ω

W1015115

[4] STARTER MOTOR



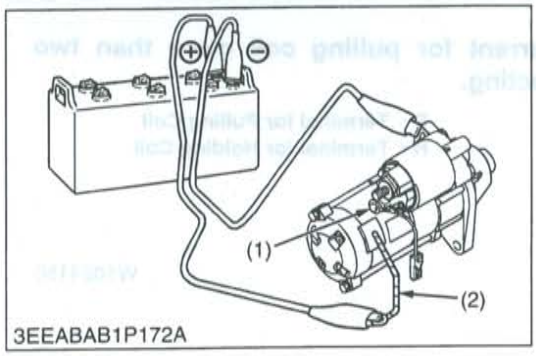
Starter Motor Terminal B Voltage

1. Measure the voltage with a voltmeter across the terminal **B** and chassis.
2. If the voltage differs from the battery voltage, the battery's positive cable or the battery negative cable is faulty.

Voltage	Factory spec.	Approx. battery voltage

(1) Starter Motor (2) Terminal **B**

W1022522



Motor Test

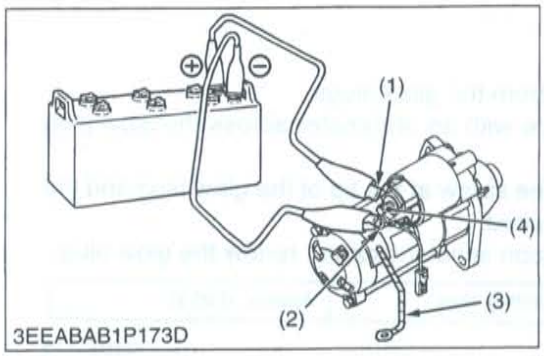
CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **C** (1).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (2) from the starter terminal **C** (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) Terminal **C** (2) Connecting Lead

W1022645



Magnet Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **B** (4).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter terminal **C** (2).
5. Connect a jumper lead from the starter terminal **S** (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter terminal **C** (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

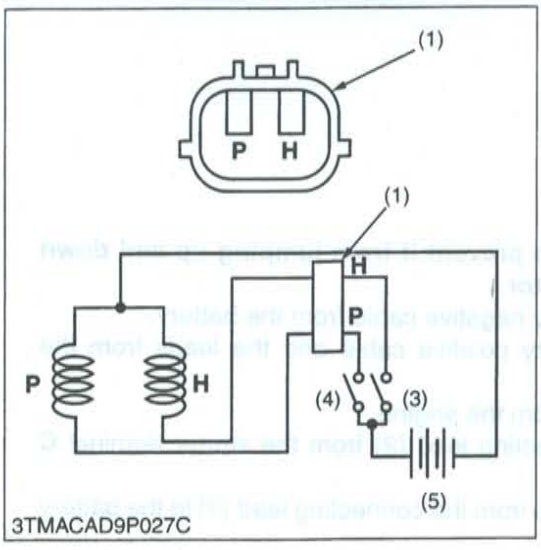
■ **NOTE**

- **This test should be carried out for a short time, about 3 to 5 seconds.**

(1) Terminal **S**
(2) Terminal **C**
(3) Connecting Lead
(4) Terminal **B**

W1023186

[5] ENGINE STOP SOLENOID



Functional Check

1. Remove the engine stop solenoid (2) from the injection pump.
2. Connect the leads as shown in the figure.
   - Connect the jumper leads from terminal **P** through the switch (4) to the battery positive terminal
   - Connect the jumper leads from terminal **H** through the switch (3) to the battery positive terminal
   - Connect the jumper leads from the negative terminal to the engine stop solenoid body
3. When switch (4) is turn **ON**, the plunger is pulled into the solenoid body and then turn **OFF** the switch (4), the plunger comes out.
4. Turn on the switch (3) then turn **ON** the switch (4), the plunger is pulled into the solenoid body and it is kept in **HOLDING** position after turning **OFF** the switch (4).
5. If the plunger is not attracted, the engine stop solenoid is faulty.

■ **IMPORTANT**

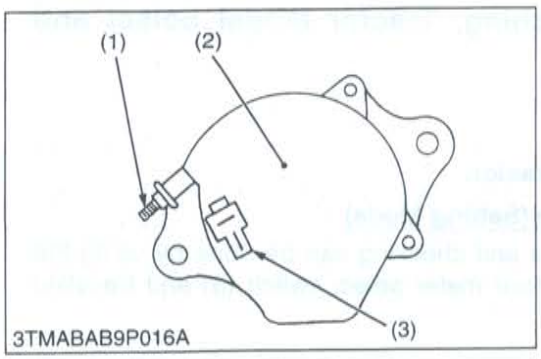
- **Never apply the current for pulling coil more than two seconds when inspecting.**

(1) Connector
(2) Engine Stop Solenoid
(3) Switch for Holding Coil
(4) Switch for Pulling Coil
(5) Battery

P : Terminal for Pulling Coil
H : Terminal for Holding Coil

W1024150

[6] ALTERNATOR

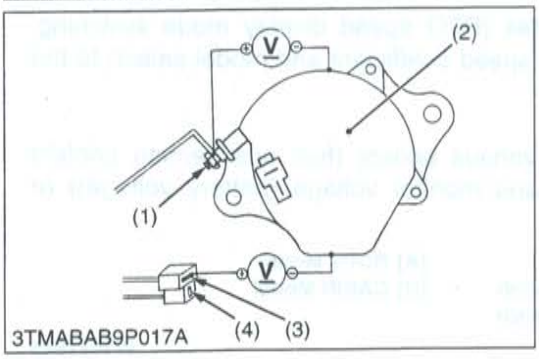


Preparation

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

(1) Terminal **B**
(2) Alternator
(3) **2P** Connector

W1030485



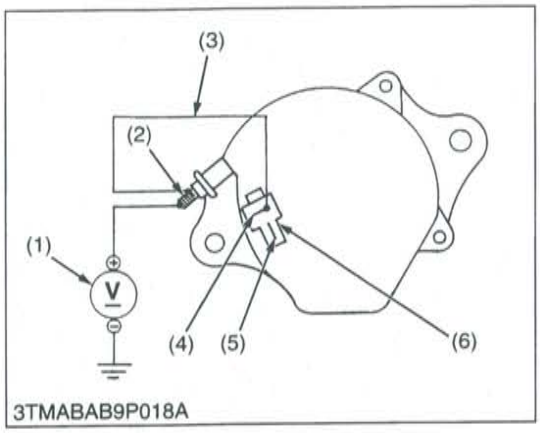
Connector Voltage

1. Turn off the main switch. Measure the voltage between the terminal **B** (1) and the chassis.
2. Turn on the main switch. Measure the voltage between the terminal **IG** (3) and the chassis.

Voltage (Main switch at **OFF**)	Terminal **B** – Chassis	Approx. battery voltage
Voltage (Main switch at **ON**)	Terminal **IG** – Chassis	Approx. battery voltage

(1) Terminal **B**
(2) Alternator
(3) Terminal **IG**
(4) Terminal **L**

W1030607



No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning off the main switch.
2. Connect the jumper lead (3) between terminal **IG** (4) and terminal **B** (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the terminal **B** (2) and the chassis.
6. If the measurement is less than the factory specifications, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V

(Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

(1) Voltmeter
(2) Terminal **B**
(3) Jumper Lead
(4) Terminal **IG**
(5) Terminal **L**
(6) **2P** Connector

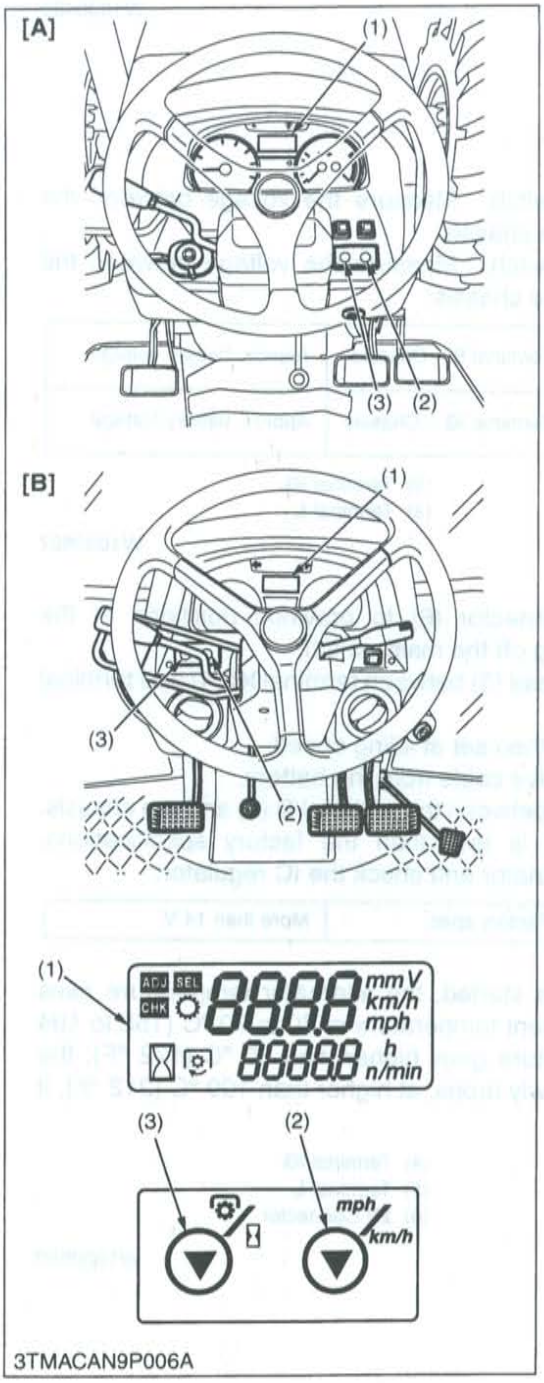
W1030850

[7] METER PANEL

(1) Setting Mode (Select the PTO Display Mode Switching, Tractor Model Select and Entering Travel Speed Coefficient)

CAUTION

- **To perform the meter panel, the operator must be seated on the tractor.**



LCD Monitor Indication (Setting Mode)

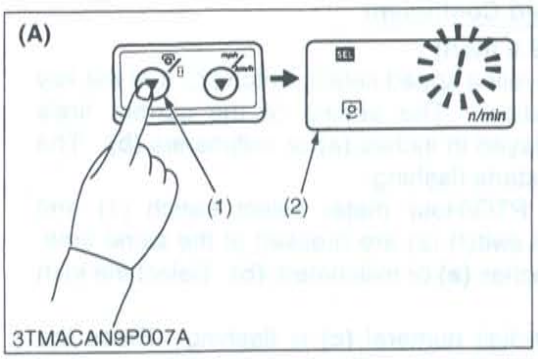
The following settings and checking can be done by using the LCD monitor (1), PTO/Hour meter select switch (3) and traveling speed select switch (2).

1. Setting Mode :
   Input the various dates (PTO speed display mode switching, entering the traveling speed coefficient and model select) to the meter panel.
2. Checking Mode :
   Check a voltage of various sensor (fuel unit sensor, coolant temperature sensor and monitor voltage (battery voltage)) or rotation of engine.

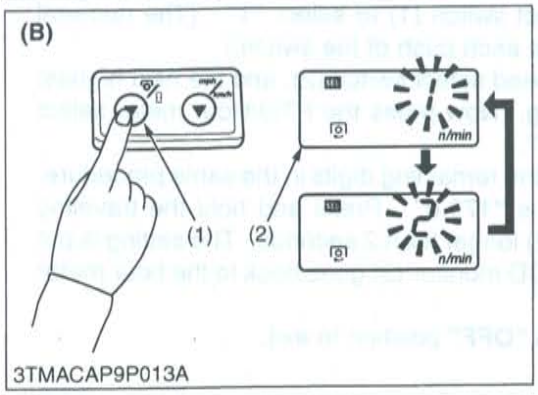
(1) LCD Monitor
(2) Traveling Speed Select Switch
(3) PTO/Hour Meter Select Switch

[A] ROPS Model
[B] CABIN Model

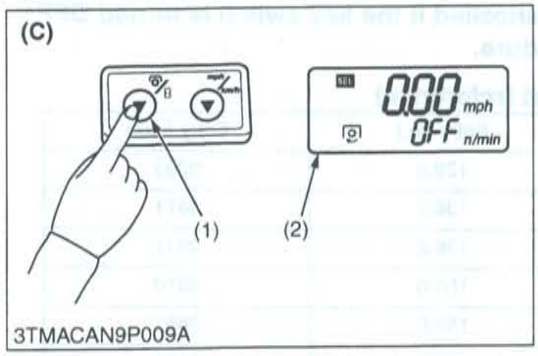
W1021685



3TMACAN9P007A



3TMACAP9P013A



3TMACAN9P009A

PTO Speed Display Mode Switching (Setting Mode)

1. While pressing the PTO/Hour meter select switch (1), turn the key switch to **"ON"** position.
   The current numerical code starts flashing.
2. Each time the PTO/Hour meter select switch (1) is pressed, the code changes in the order of **[1]** → **[2]** → **[1]**. Select the appropriate code according to the table below.
3. Press and hold the PTO/Hour meter select switch (1) longer than 2 seconds. The setting is put in memory, and the LCD monitor (2) goes back to the PTO speed display mode.
4. Turn the key switch to **"OFF"** position to exit.

■ **NOTE**

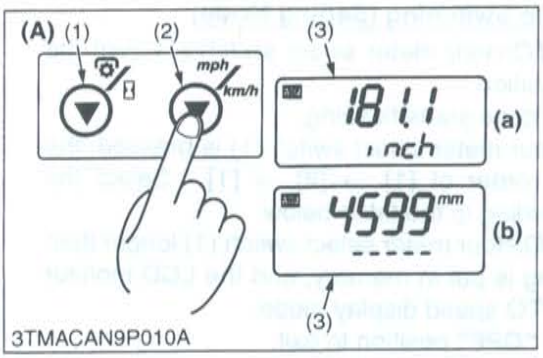
- **The setting will be cancelled if the key switch is turned OFF halfway in the procedure.**

Numerical code	PTO speed (min^{-1} (rpm))
1	540 (Standard)
2	540 (Dual speed PTO kit)

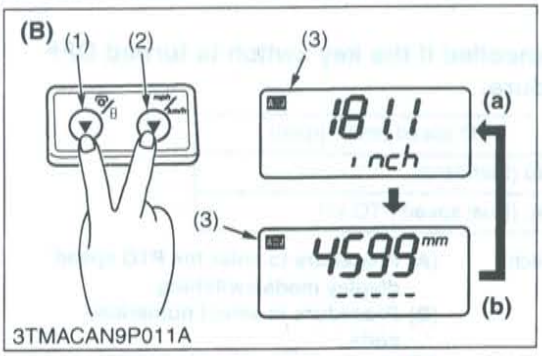
(1) PTO/Hour Meter Select Switch
(2) LCD Monitor

(A) Procedure to enter the PTO speed display mode switching
(B) Procedure to select numerical code
(C) Procedure to put in memory

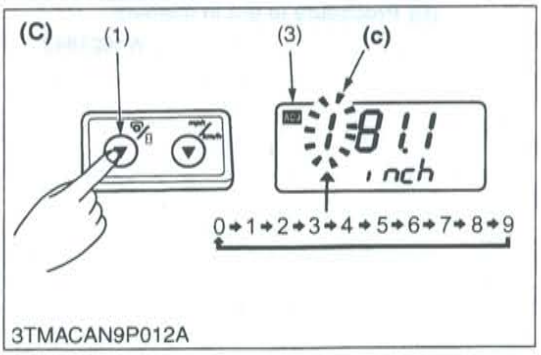
W1021843



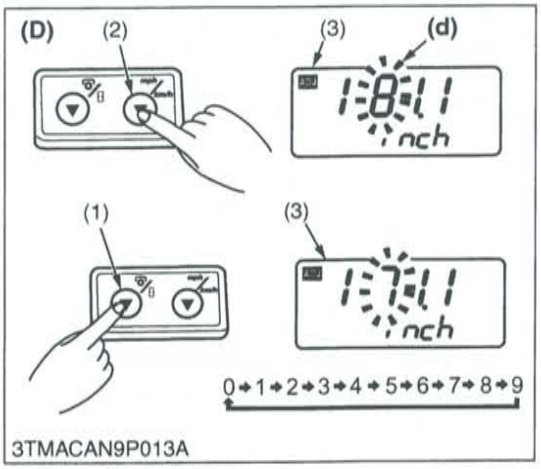
3TMACAN9P010A



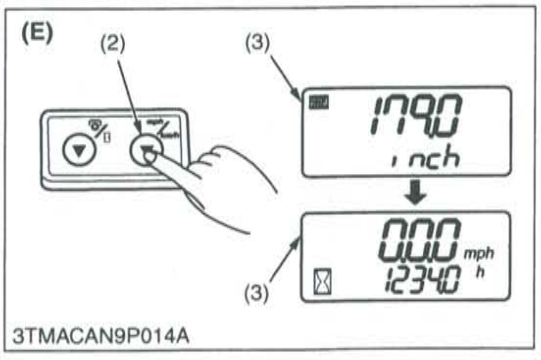
3TMACAN9P011A



3TMACAN9P012A



3TMACAN9P013A



3TMACAN9P014A

Entering Traveling Speed Coefficient

[Example : Entering 179.0 inch]

1. While pressing the traveling speed select switch (2), turn the key switch to **"ON"** position. The setting of the current tire's circumference is displayed in inches **(a)** or millimeters **(b)**. The highest-digit numeral starts flashing.
2. Each time both the PTO/Hour meter select switch (1) and traveling speed select switch (2) are pressed at the same time, the unit changes for inches **(a)** or millimeters **(b)**. Select the inch display mode.
3. Note that the highest-digit numeral **(c)** is flashing. Press the PTO/Hour meter select switch (1) to select **"1"**. (The numeral changes from 0 to 9 at each push of the switch.)
4. Press the traveling speed select switch (2), and the next highest digit **(d)** starts flashing. Now press the PTO/Hour meter select switch (1) to select **"7"**.
5. Enter **"9"** and **"0"** for the remaining digits in the same procedure.
6. Make sure the entry is **"179.0"**. Press and hold the traveling speed select switch (2) longer than 2 seconds. The setting is put in memory, and the LCD monitor (3) goes back to the hour meter mode.
7. Turn the key switch to **"OFF"** position to exit.

■ **NOTE**

- **The setting will be cancelled if the key switch is turned OFF halfway in the procedure.**

Tire circumference chart (reference)

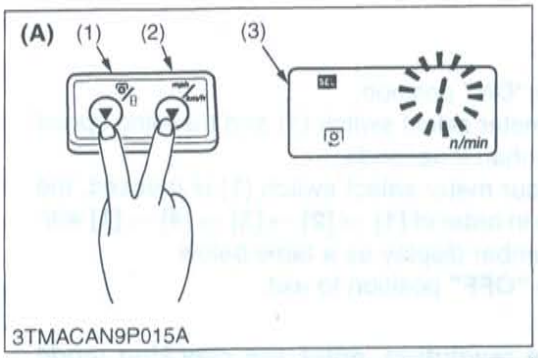
Rear tire size	Entry (in.)	Entry (mm)
21.5L-16.1 R3 Turf	129.5	3289
570-648 LSW Turf	136.7	3471
22.5LL-16.1 Galaxy	138.2	3511
16.9-24 R4 IND	150.0	3810
16.9-24 R3	152.0	3861
14.9-28 R1	159.0	4039
16.9-28 R1	165.0	4191
16.9-30 R1	171.0	4343

(1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

(A) Procedure to enter the traveling speed coefficient mode
(B) Procedure to select display for inches or millimeters
(C) Procedure to select numerical at highest digit
(D) Procedure to change next highest digit and select numerical
(E) Procedure to put in memory

(a) Displayed in inches
(b) Displayed in millimeters
(c) Highest-digit numerical
(d) Next Highest-digit numerical

W1022482



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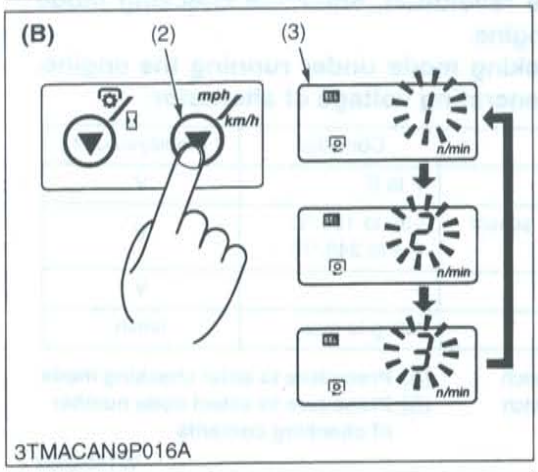

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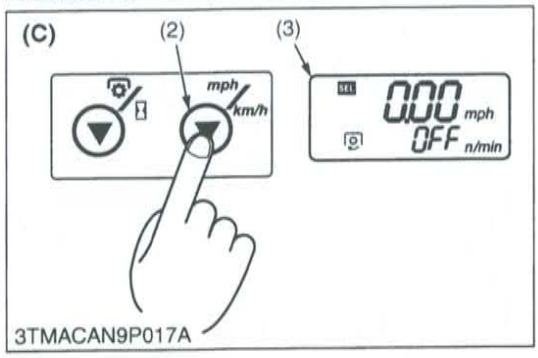


3TMACAN9P017A

Model Select (Setting Mode)

1. While pressing the PTO/Hour meter select switch (1) and traveling speed select switch (2), turn the key switch to **"ON"** position.
   The current numerical code starts flashing.
2. Each time the traveling speed select switch (2) is pressed, the code changes in order of **[1]** → **[2]** → **[3]** → **[1]**. Select the appropriate code according to the table below.
3. Press and hold the traveling speed select switch (2) longer than 2 seconds. The setting is put in memory, and the LCD monitor (3) goes back to the PTO speed display or hour meter display mode.
4. Turn the key switch to **"OFF"** position to exit.

■ **NOTE**

- **The setting will be cancelled if the key switch is turned OFF halfway in the procedure.**

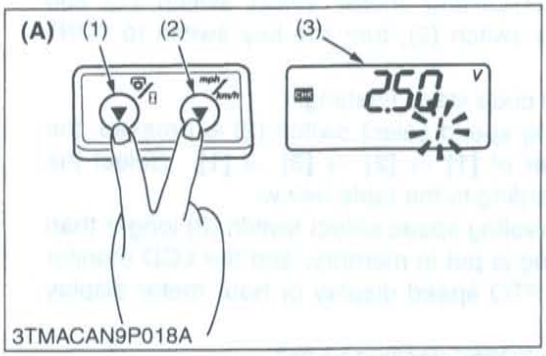
Numerical code	Tractor model
1	M8540, M9540
2	M5040, M6040, M7040
3	Void

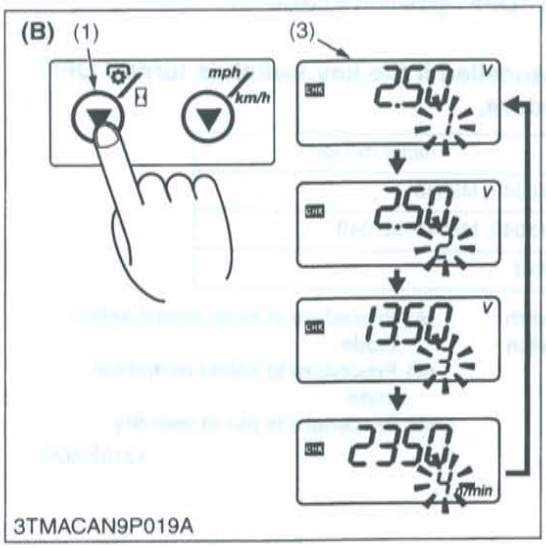
(1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

(A) Procedure to enter model select mode
(B) Procedure to select numerical code
(C) Procedure to put in memory

W1023923

(2) Checking Mode





Checking Mode

1. Turn the key switch to **"ON"** position.
2. Press the PTO/Hour meter select switch (1) and traveling speed select switch (2) more than 2 seconds.
3. Each time the PTO/Hour meter select switch (1) is pressed, the code number changes in order of **[1]** → **[2]** → **[3]** → **[4]** → **[1]** with flashing. The code number display as a table below.
4. Turn the key switch to **"OFF"** position to exit.

■ **NOTE**

- **To check the engine revolution, enter the checking mode under running the engine.**
- **When enter the checking mode under running the engine, code 3 display the generating voltage of alternator.**

No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	–30 to 120 °C (–4 to 248 °F)	V
3	Battery voltage	–	V
4	Engine revolution	Idling to max.	n/min

(1) PTO/Hour Meter Select Switch
(2) Traveling Speed Select Switch
(3) LCD Monitor

(A) Procedure to enter checking mode
(B) Procedure to select code number of checking contents

W1024533

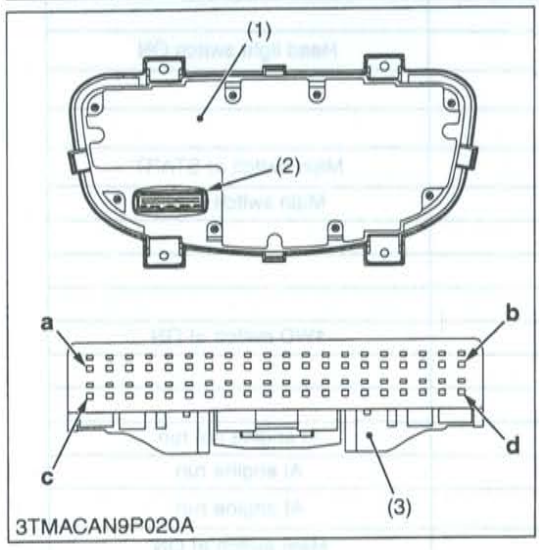
(3) Checking Meter Panel, PTO/Hour Meter Select Switch and Traveling Speed Select Switch

⚠ CAUTION

- **For checking of electric circuit, use the circuit tester.**
- **As for the checking of sensors and switches, do the following order; check the battery, fuse and grounding line first, check by the test function of meter panel next, and check the connectors of panel or related electronic switch or sensor. If any defect is found there, check individual sensors or switches to see whether the defect exists at the sensor and switch side or at the wire harness side.**
- **When any defect is not found for sensors, switches and harness, replace meter panel with new one.**

■ IMPORTANT

- **When connecting or disconnecting the connector for the purpose of checking, be sure to turn OFF the main switch before hand. Moreover, pay attention not to allow the terminal to come in contact with other terminal or chassis while checking.**
- **When applying the test pin of the tester to the connector terminals, use care not to damage to the connector terminal.**



Checking Connector Voltage, Sensor Resistance and Switch Continuity

1. Remove the panel cover, refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section (for ROPS model).
2. Remove the meter panel (1).
3. DIsconnect the **40P** connector (2) from the meter panel.
4. Check the main voltage (battery voltage) first and check the connector voltage, sensor resistance or switch continuity which related for defective indication of meter panel as table below.

(When reassembling)

- Tighten the meter panel mounting screw evenly.

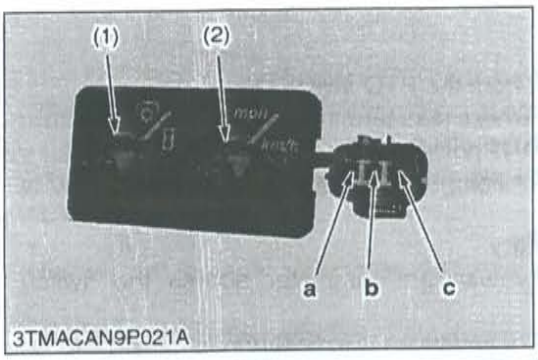
(1) Meter Panel
(2) **40P** Connector Meter Panel Side
(3) **40P** Connector Wire Harness Side

a : Terminal 1 (T1)
b : Terminal 20 (T20)
c : Terminal 21 (T21)
d : Terminal 40 (T40)

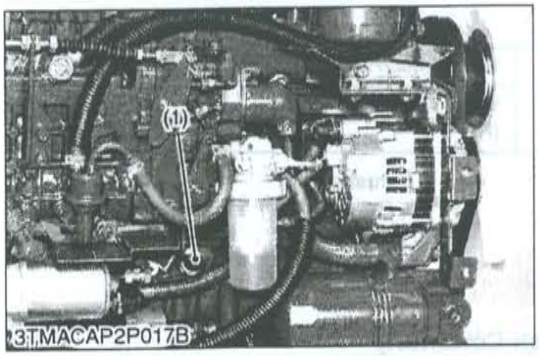
W1025566

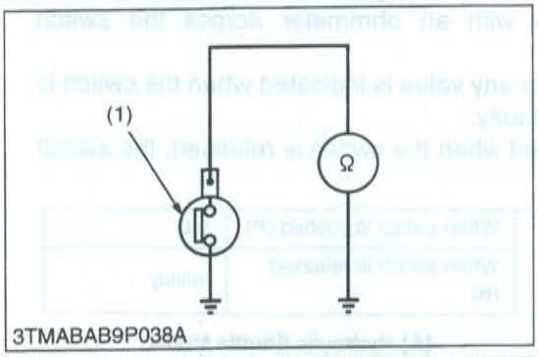
Connector (40P) of Wire Harness Side

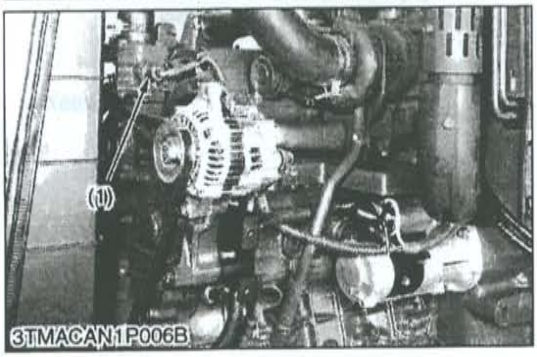
Terminal No.	Color of wiring	Terminal Name	Measuring across T40 (Ground)	Condition
T1	SB	Heater relay	Battery voltage	Main switch at ON
T2				
T3	Br/R	Engine stop relay	Battery voltage	Main switch at ON
T4	L/B	OPC buzzer	Battery voltage	Main switch at ON
T5				
T6				
T7				
T8				
T9				
T10	LG/B	PTO/Hour meter select switch	Battery voltage	Main switch at ON and PTO/Hour meter select switch ON
T11	L	Traveling speed select switch	Battery voltage	Main switch at ON and traveling speed select switch ON
T12	R/B	Turn signal switch (R.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (R.H.) ON
T13	P/W	PTO switch	Battery voltage	Main switch at ON and PTO switch OFF
T14				
T15	Br	dummy		
T16	G/B	Turn signal switch (L.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (L.H.) ON
T17	W/R	Coolant temperature switch	Approx. 117 Ω at 120 °C (248 °F) to 5.88 kΩ at 0 °C (32 °F)	Main switch at OFF
T18	Y	Fuel unit sensor	Approx. 3.0 (F) to 112 Ω (E)	Main switch at OFF
T19				
T20	B/W	GND (analogue)		
T21	G/W	Illumination light	Battery voltage	Head light switch ON
T22				
T23				
T24	B/W	Main switch (start position)	Battery voltage	Main switch at START
T25	L/Y	Seat switch	Battery voltage	Main switch at ON
T26				
T27	P	dummy		
T28	Br/Y	dummy		
T29	Y/R	4WD Switch	Battery voltage	4WD switch at ON
T30				
T31				
T32	W	Engine oil pressure switch	0 Ω	At engine not run
			Infinity	At engine run
T33	W/G	Alternator terminal L	Approx. 10 V	At engine run
T34	P/W	Traveling speed sensor	Battery voltage	Main switch at ON
T35				
T36	Y/L	Engine tachometer sensor	Battery voltage	Main switch at ON
T37	R/G	Main switch (ON position)	Battery voltage	Main switch at ON
T38	R/B	Main voltage (battery)	Battery voltage	
T39				
T40	B	GND		



(4) Switch and Sensor







PTO/Hour Meter Select Switch and Traveling Speed Select Switch

1. Check the resistance between terminal **a** and terminal **c** while pushing the PTO/Hour meter select switch (1).
2. It is OK if 0 ohm is indicated.
3. Check the resistance between terminal **b** and terminal **c** while pushing the traveling speed select switch (2).
4. It is OK if 0 ohm is indicated.

(1) PTO/Hour Meter Select Switch (2) Traveling Speed Select Switch

W1028780

Checking Engine Oil Pressure Switch

1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm 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

W1106807

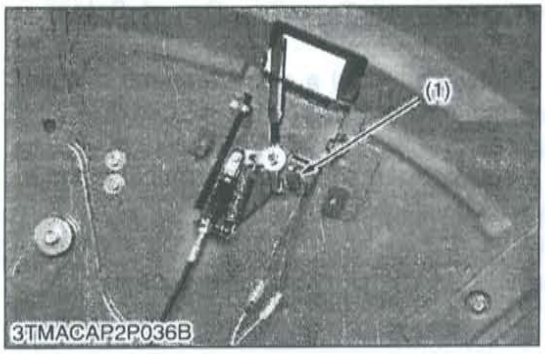
Checking Coolant Temperature Sensor

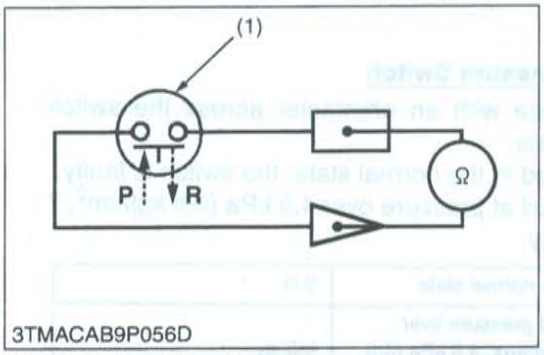
1. Disconnect the connector from the coolant temperature sensor (1).
2. Measure the resistance with an ohmmeter across the terminal **1** and **2** of coolant temperature sensor (1).
3. If the measurement is not indicated, the sensor is faulty.

Resistance (Sensor terminal **1** – terminal **2**)	Reference value	Approx. 117 Ω at 120 °C (248 °F) Approx. 189 Ω at 100 °C (212 °F) Approx. 290 to 354 Ω at 80 °C (176 °F) Approx. 808 Ω at 50 °C (122 °F) Approx. 2.21 to 2.69 kΩ at 20 °C (68 °F)

(1) Coolant Temperature Sensor

W1047287





PTO Switch

1) Wiring Harness

1. Disconnect the leads from the PTO switch (1).
2. Connect the wiring harness lead terminals to each other and turn the main switch to **"ON"** position.
3. If the indicator do not light, the fuse, wiring harness or bulb is faulty.

2) PTO Switch Continuity

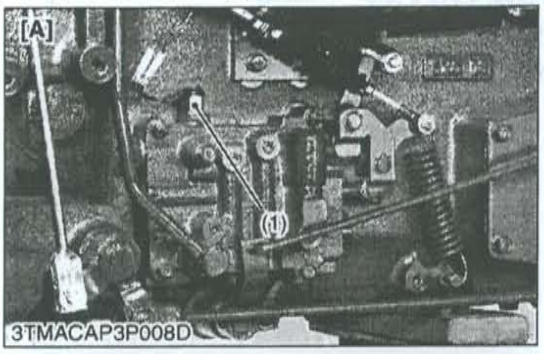
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (**P**)	0 Ω
		When switch is released (**R**)	Infinity

(1) PTO Switch

P : Pushed
R : Released

W1025931



Shuttle Neutral Switch

1) Shuttle Neutral Switch Continuity

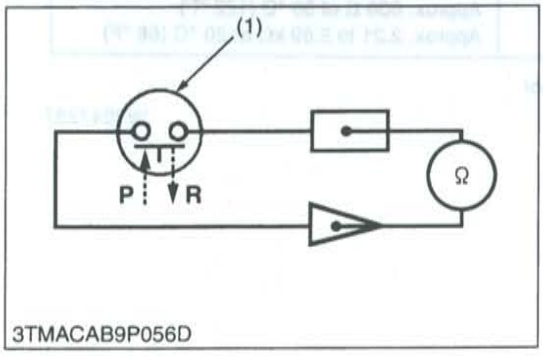
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

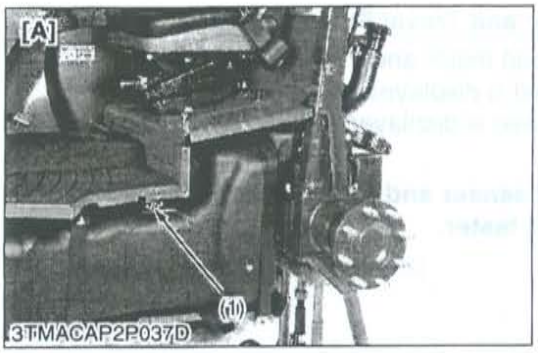
Resistance (Across switch terminals)	Reference value	When switch is pushed (**P**)	0 Ω
		When switch is released (**R**)	Infinity

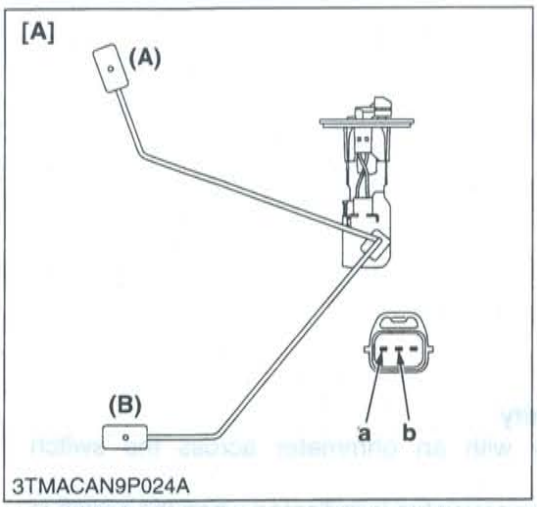
(1) Shuttle Neutral Switch

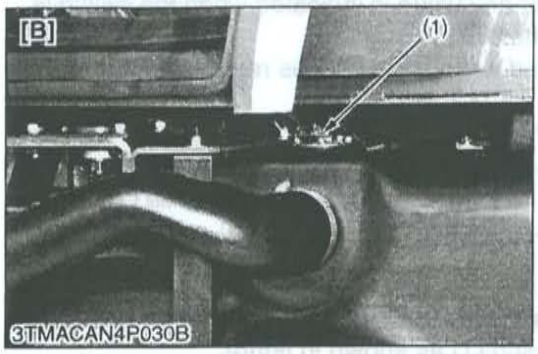
[A] Hydraulic Shuttle Model
[B] Synchro Shuttle Model
P : Pushed
R : Released

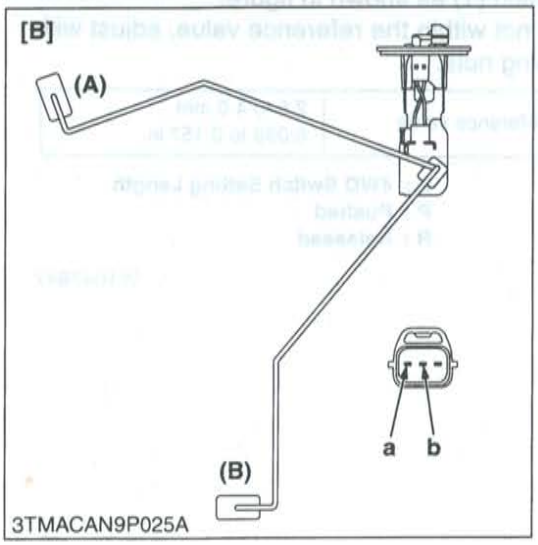
W1029574











Checking Fuel Level Sensor

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the terminal **a** and terminal **b**.
3. If the measurement is not indicated, the sensor is faulty.

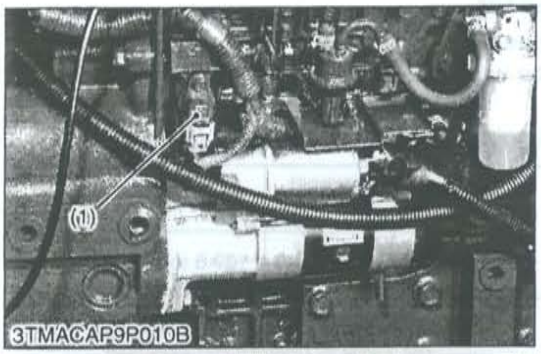
Resistance (Sensor terminal **a** – terminal **b**)	Factory spec.	Float at uppermost position	3.0 to 5.0 Ω
		Float at lowermost position	107.5 to 112.5 Ω

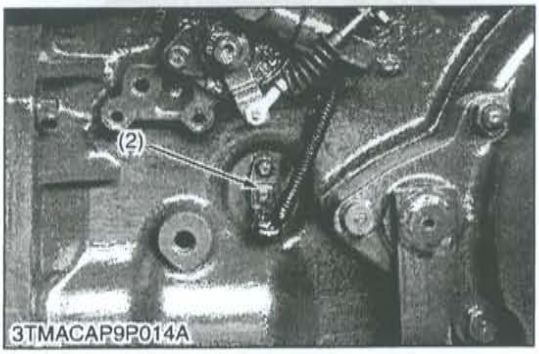
(1) Fuel Unit

[A] ROPS Model
[B] CABIN Model

(A) Float at Uppermost Position
(B) Float at Lowermost Position
a : Terminal 1
b : Terminal 2

W1190488





Engine Rotation Sensor and Travel Speed Sensor

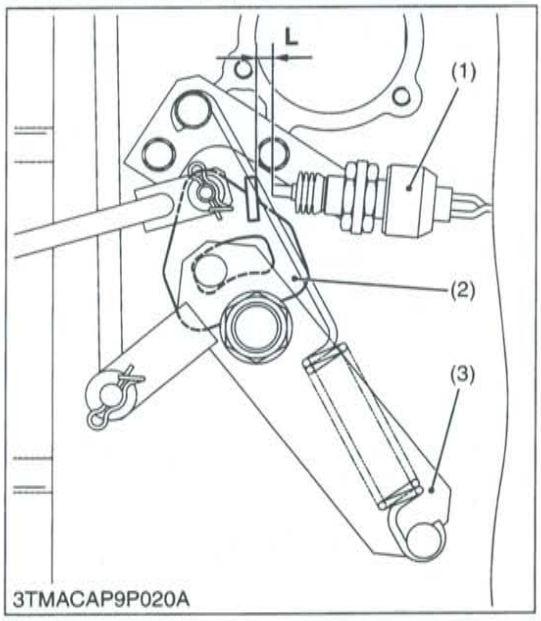
1. Check the engine speed meter and travel speed display.
2. It is OK if engine speed is displayed in the meter panel.
3. It is OK if traveling speed is displayed in the LCD monitor.

■ **NOTE**

- **As for engine speed sensor and travel speed sensor are not checking with circuit tester.**

(1) Engine Rotation Sensor (2) Travel Speed Sensor

W1051772



4WD Switch

1) 4WD Switch Continuity

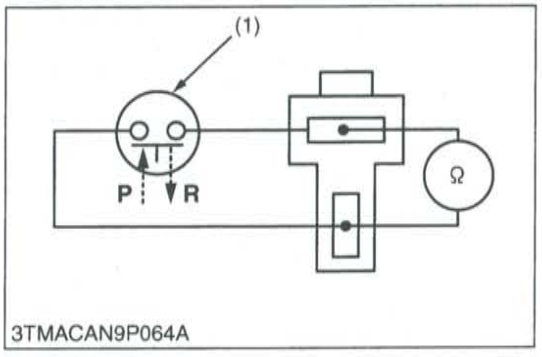
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (**P**)	0 Ω
		When switch is released (**R**)	Infinity

2) Setting 4WD Switch

1. Be sure to set the DT lever (2) at 2WD position.
2. Measure the setting length (**L**) between the plate of DT lever (2) and tip of the 4WD switch (1) as shown in figure.
3. If the measurement is not within the reference value, adjust with the 4WD switch retaining nuts.

4WD switch setting length (**L**)	Reference value	2.5 to 4.0 mm 0.099 to 0.157 in.



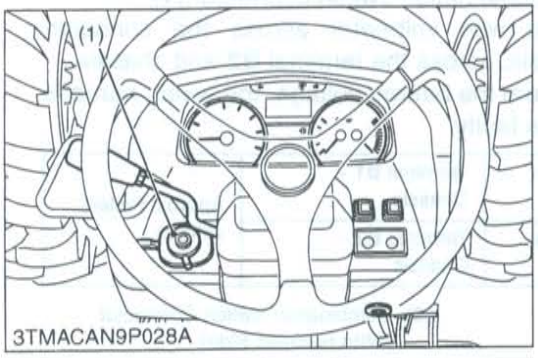
(1) 4WD Switch
(2) DT Lever
(3) DT Shift Lever

L : 4WD Switch Setting Length
P : Pushed
R : Released

W1047647

[8] LIGHTING SWITCHES AND FLASHER UNIT

(1) Combination Switch (ROPS Model)



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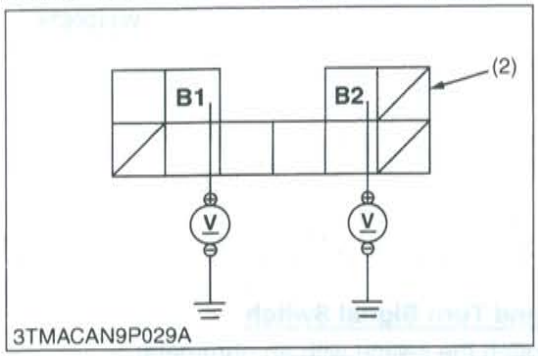

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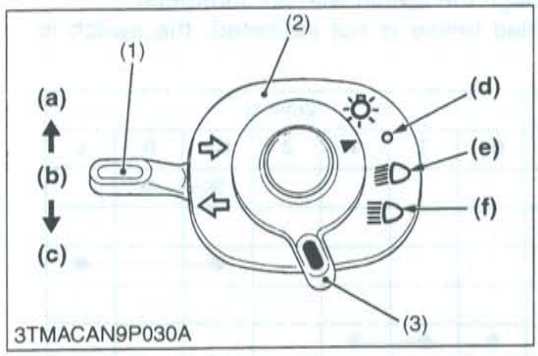

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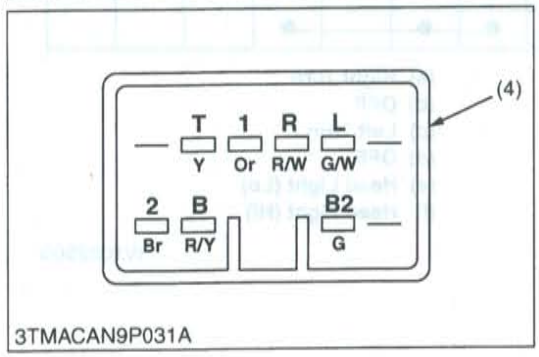


3TMACAN9P031A

Checking Connector Voltage

1. Disconnect the combination switch connector.
2. Measure the voltage with voltmeter across the connector terminal **B1** and chassis, across the terminal **B2** and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuses or main switch faulty.

Voltage	Main switch at "ON"	Terminal **B1** – Chassis	Approx. battery voltage
	Main switch at "OFF"	Terminal **B2** – Chassis	

(1) Combination Switch
(2) Combination Switch Connector (Wire Harness Side)

W1030781

Checking Light Switch and Turn Signal Switch

1. Test the continuity through the switch with an ohmmeter.

		Terminal						
Continuity	Position	B1	T	1	2	B2	R	L
Turn signal switch	R.H. **(a)**					●	●	
	OFF **(b)**							
	L.H. **(c)**					●		●
Light switch	OFF **(d)**							
	Lo **(e)**	●	●	●				
	Hi **(f)**	●	●		●			

(1) Turn Signal Switch
(2) Combination Switch
(3) Light Switch
(4) Combination Switch Connector (Switch Side)

(a) Right Turn
(b) OFF
(c) Left Turn
(d) OFF
(e) Head Light (Lo)
(f) Head Light (Hi)

W1031103

(2) Lever Combination Switch (CABIN Model)

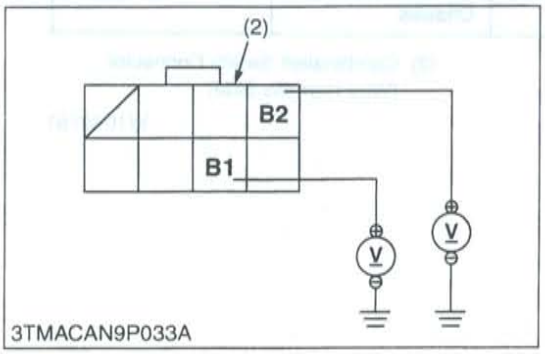
Checking Connector Voltage

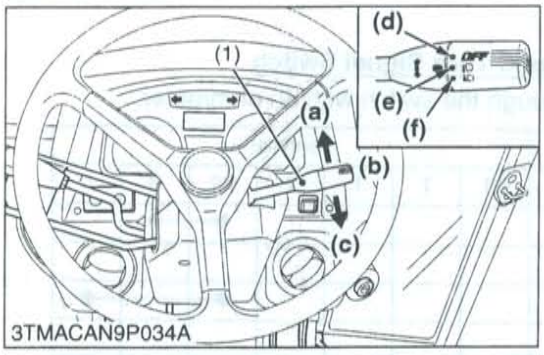
1. Disconnect the lever combination switch connector (1).
2. measure the voltage with voltmeter across the connector terminal **B1** and chassis, across the terminal **B2** and chassis.
3. if the voltage differs from the battery voltage, the wiring harness, fuses or main switch is faulty.

Voltage	Main switch at "OFF"	Terminal **B1** – Chassis	Approx. battery voltage
	Main switch at "ON"	Terminal **B2** – Chassis	

(1) Lever Combination Switch
(2) Combination Switch Connector (Wire Harness Side)

W1100674

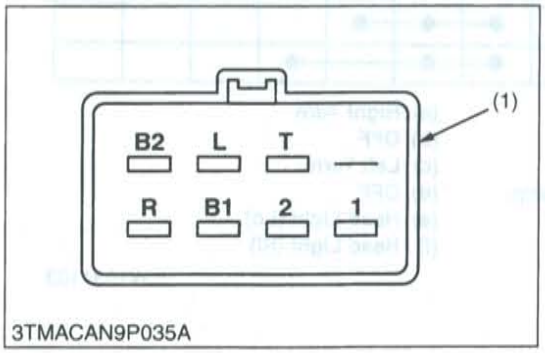




Checking Light Switch and Turn Signal Switch

1. Test the continuity through the switch with an ohmmeter.
2. If the continuity specified below is not indicated, the switch is faulty.

		Terminal						
Continuity	Position	B1	T	1	2	B2	R	L
Turn signal switch	R.H. **(a)**					●	●	
	OFF **(b)**							
	L.H. **(c)**					●		●
Light switch	OFF **(d)**							
	Lo **(e)**	●	●	●				
	Hi **(f)**	●	●		●			

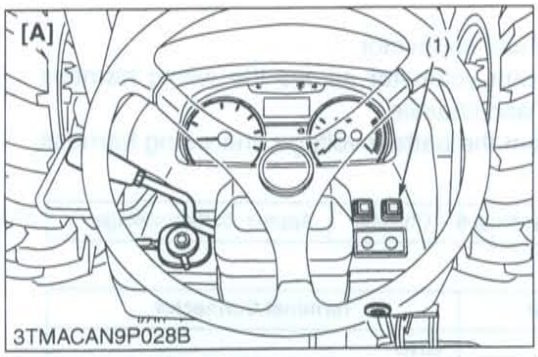


(1) Lever Combination Switch Connector (Switch Side)

(a) Right Turn
(b) OFF
(c) Left Turn
(d) OFF
(e) Head Light (Lo)
(f) Head Light (Hi)

W1032505

(3) Hazard Switch



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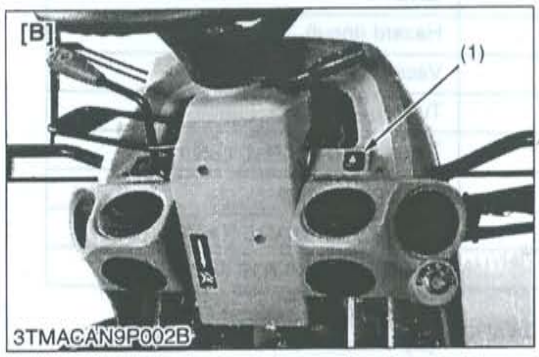

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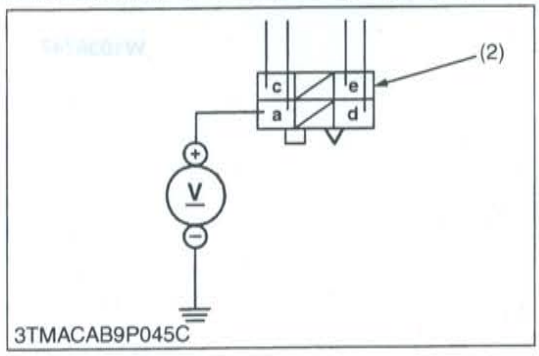

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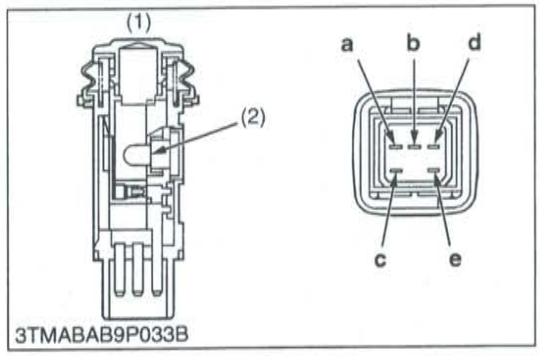


3TMABAB9P033B

Checking Connector Voltage

1. Connect the battery negative code, then measure the voltage with a voltmeter across the terminal **a** and chassis.
2. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal **a** – Chassis	Approx. battery voltage

(1) Hazard Switch
(2) **6P** Connector (Wire Harness Side)
[A] ROPS Model
[B] CABIN Model

W1033077

Checking Hazard Switch Continuity

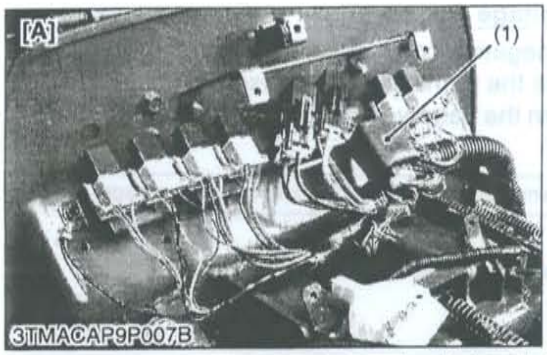
1. Measure the resistance with ohmmeter across the terminal **a** and terminal **c**, and across the terminal **d** and terminal **e**.
2. If the measurement is not following below, the hazard switch or the bulb are faulty.

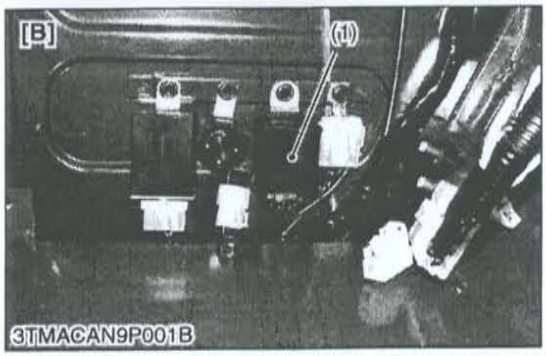
Resistance (Switch at **OFF**)	Terminal **a** – Terminal **c**	Infinity
Resistance (Switch at **ON**)	Terminal **a** – Terminal **c**	0 Ω
Resistance (Bulb)	Terminal **d** – Terminal **e**	Approx. 13 Ω

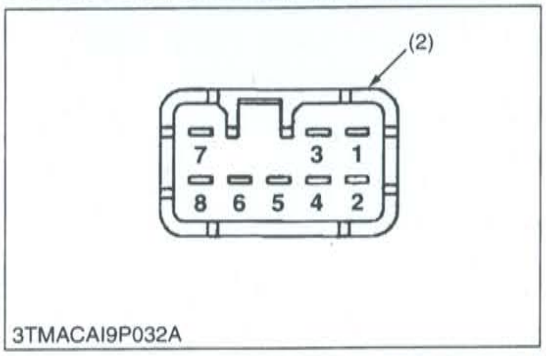
(1) Hazard Switch (2) Bulb

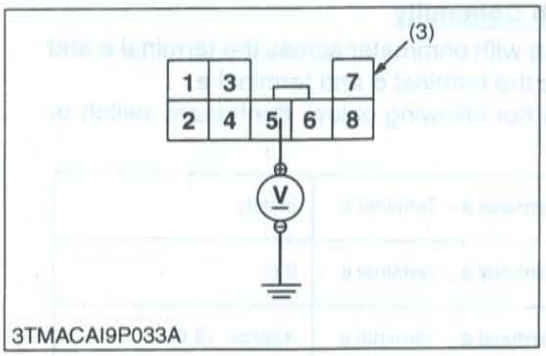
W1047271

(4) Flasher Unit









Connector Voltage

1. Disconnect the flusher unit connector.
2. Measure the voltage with voltmeter across the wiring harness connector's terminal **5** and chassis.
3. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Voltage	Terminal **5** – Chassis	Approx. battery voltage

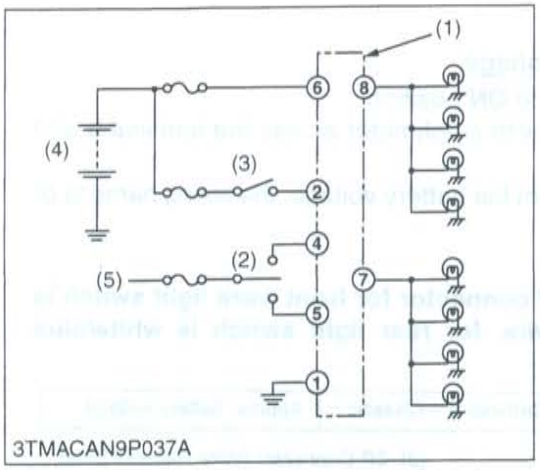
(Reference)

Terminal	Color	Terminal Connector
1	0.5 B	GND
2	0.85 G/R	Hazard (Input)
3	–	Vacancy
4	0.5 L	Turning signal L.H. (Input)
5	0.5 G/Y	Turning signal R.H. (Input)
6	0.85 G	Battery Voltage
7	0.5 G/B	Turning signal L.H. (Output)
8	0.5 R/B	Turning Signal R.H. (Output)

(1) Flusher Unit
(2) Flusher Unit Connector
(3) Wire Harness Connector

[A] ROPS Model
[B] CABIN Model

W1036747



Functional Check

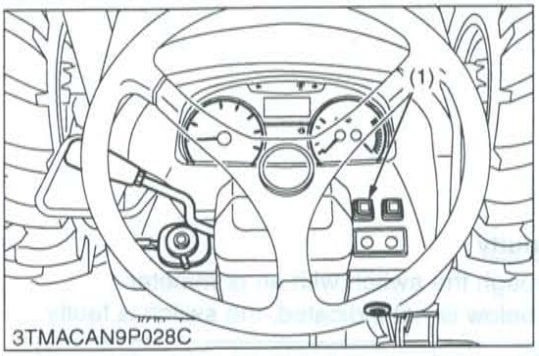
1. Turn on the turn signal switch (2) or hazard switch (3).
2. Count the number of blinking.
3. If the factory specification is not indicated, replace the flusher unit.

Times of blinking light	Factory spec.	60 to 80 times / minutes

(1) Flasher Unit
(2) Turn Signal Switch
(3) Hazard Switch
(4) Battery
(5) ACC

W1037638

(5) Front Work Light Switch (ROPS Model)



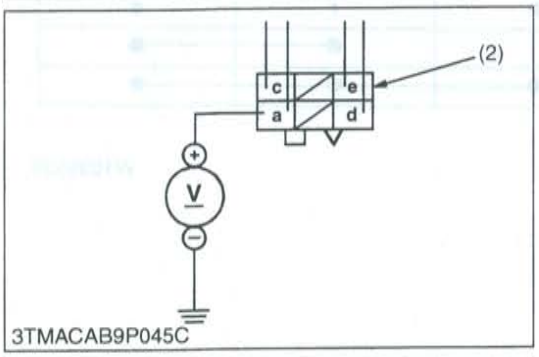
Checking Connector Voltage

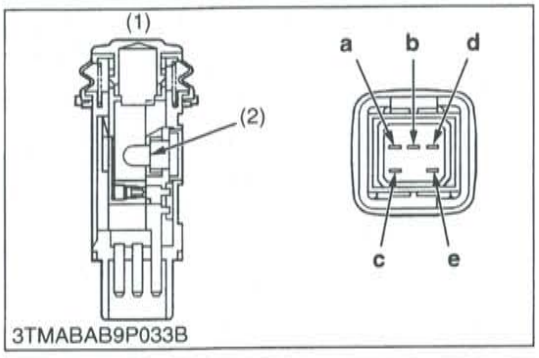
1. Turn the main switch to **ON** position.
2. Measure the voltage with a voltmeter across the terminal a and chassis.
3. If the voltage differ from the battery voltage, the wiring harness or fuse is faulty.

Voltage	Terminal **a** – Chassis	Approx. battery voltage

(1) Hazard Switch
(2) **6P** Connector (Wire Harness Side)

W1035385





Checking Hazard Switch Continuity

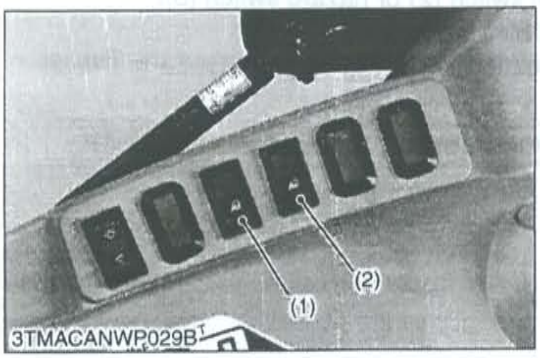
1. Measure the resistance with ohmmeter across the terminal **a** and terminal **c**, and across the terminal **d** and terminal **e**.
2. If the measurement is not following below, the switch or the bulb are faulty.

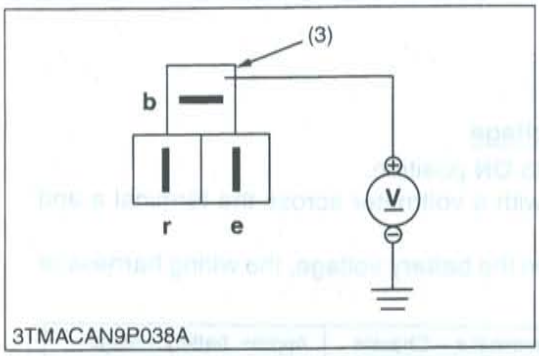
Resistance (Switch at **OFF**)	Terminal **a** – Terminal **c**	Infinity
Resistance (Switch at **ON**)	Terminal **a** – Terminal **c**	0 Ω
Resistance (Bulb)	Terminal **d** – Terminal **e**	Approx. 13 Ω

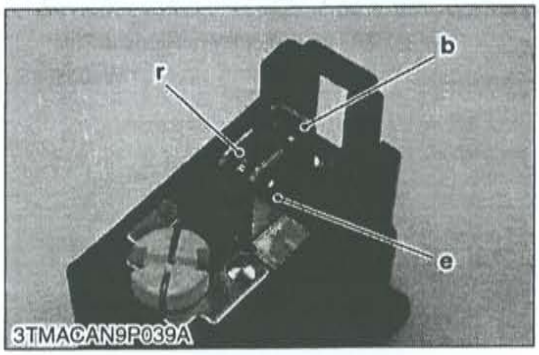
(1) Front Work Light Switch
(2) Bulb

W1035521

(6) Front and Rear Work Light Switch (CABIN Model)







Checking Connector Voltage

1. Turn the main switch to **ON** position.
2. Measure the voltage with a voltmeter across the terminal **b** and chassis.
3. If the voltage differ from the battery voltage, the wiring harness or fuse is faulty.

■ **NOTE**

- **The terminal b of 3P connector for front work light switch is white/black color wire, for rear light switch is white/blue color wire.**

Voltage	Terminal **b** – Chassis	Approx. battery voltage

(1) Work Light Switch (Front)
(2) Work Light Switch (Rear)
(3) **3P** Connector (Wire Harness Side)

W1036008

Checking Switch Continuity

1. Test the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

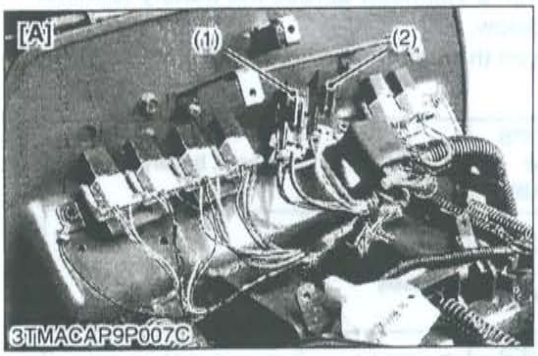
	b	r	e
OFF		●	●
ON	●	●	●

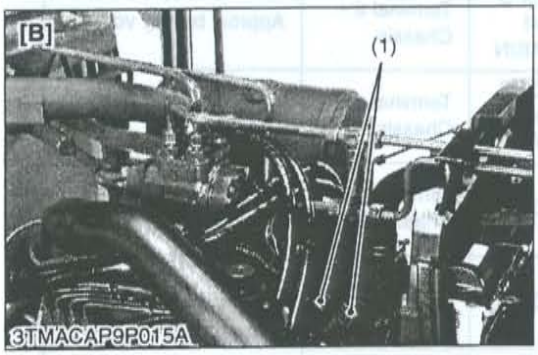
(1) Work Light Switch

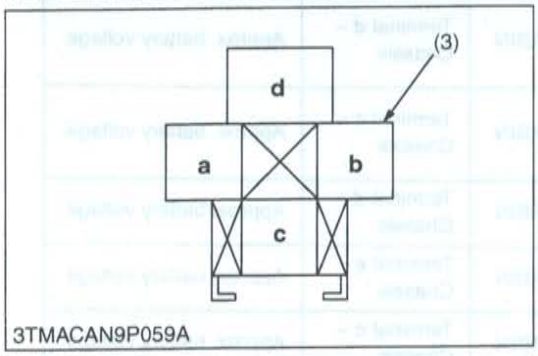
W1036530

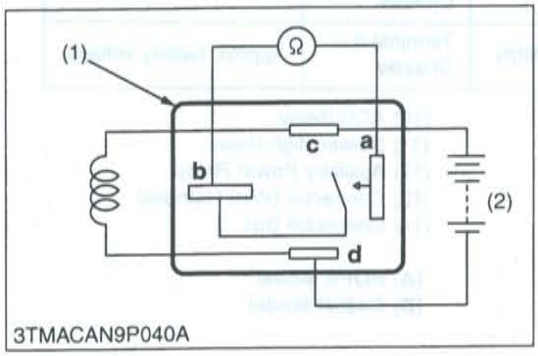
[9] RELAYS

(1) Starter Relay and Glow Relay









Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Starter relay	ROPS and CABIN	Terminal **d** – Chassis	Approx. battery voltage
Glow relay	ROPS	Terminal **c** – Chassis	Approx. battery voltage
	CABIN	Terminal **d** – Chassis	Approx. battery voltage

(1) Starter Relay
(2) Glow Relay
(3) Connector (Wire Harness)

[A] ROPS Model
[B] CABIN Model

W1043116

Functional Check

■ **NOTE**

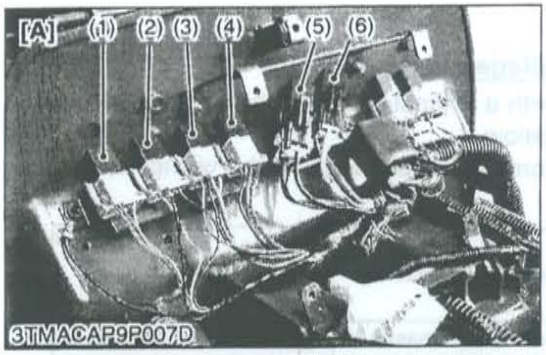
- **The relays described here are used same ones so that these are interchangeable.**

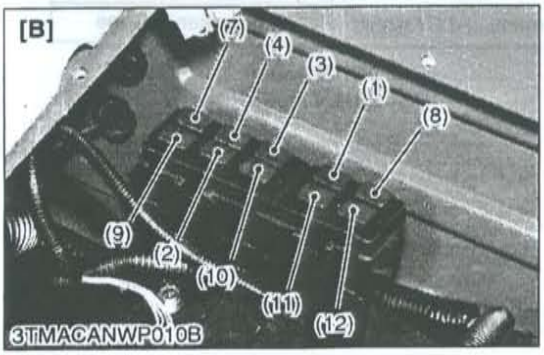
1. Apply battery voltage across the terminals **c** and **d**, and check for continuity across the terminals **a** and **b**.
2. If continuity is not established across the terminals **a** and **b**, replace it.

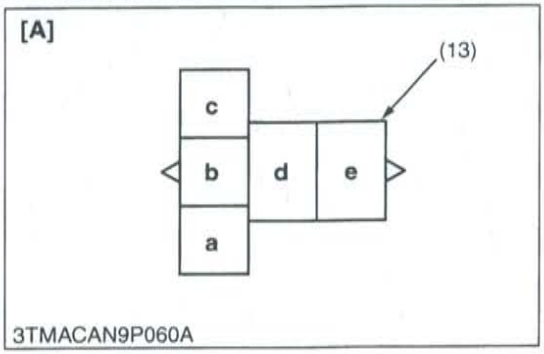
(1) Connector (Relay)
(2) Battery

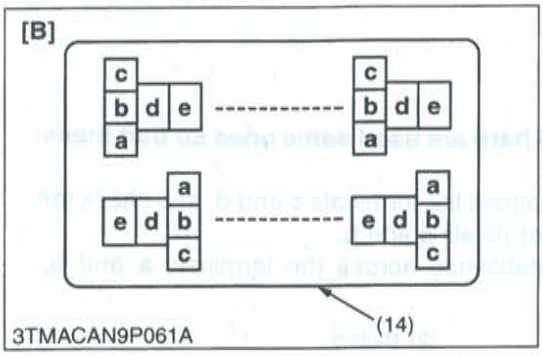
W1036849

(2) Relays (PTO Safety, Key Stop, Work Light, Auxiliary Power, A/C Compressor and A/C)









Checking Connector Voltage

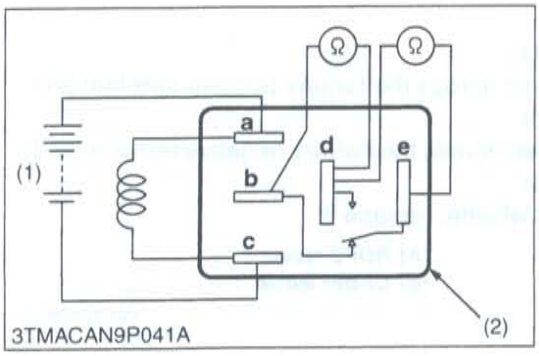
1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Engine stop relay (main switch at **ON** position)	ROPS and CABIN	Terminal **c** – Chassis	Approx. battery voltage
PTO safety relay (main switch at **ON** position and PTO lever **OFF** position)	ROPS and CABIN	Terminal **c** – Chassis	Approx. battery voltage
Work light relay (front) (main switch at **OFF** position)	ROPS and CABIN	Terminal **e** – Chassis	Approx. battery voltage
Key stop relay (main switch at **OFF** position)	ROPS and CABIN	Terminal **e** – Chassis	Approx. battery voltage
Head light relay (low) (main switch at **OFF** position)	ROPS	Terminal **d** – Chassis	Approx. battery voltage
Head light relay (high) (main switch at **OFF** position)	ROPS	Terminal **d** – Chassis	Approx. battery voltage
A/C compressor relay (main switch at **OFF** position)	CABIN	Terminal **d** – Chassis	Approx. battery voltage
Wiper relay (front) (main switch at **ACC** position)	CABIN	Terminal **c** – Chassis	Approx. battery voltage
Blower relay (main switch at **OFF** position)	CABIN	Terminal **d** – Chassis	Approx. battery voltage
ACC relay (main switch at **OFF** position)	CABIN	Terminal **e** – Chassis	Approx. battery voltage
Blower high relay (main switch at **ACC** position)	CABIN	Terminal **c** – Chassis	Approx. battery voltage
Auxiliary relay (main switch at **OFF** position)	CABIN	Terminal **d** – Chassis	Approx. battery voltage

(1) Engine Stop Relay
(2) PTO Safety Relay
(3) Work Light Relay (Front)
(4) Key Stop Relay
(5) Head Light Relay (Low)
(6) Head Light Relay (High)
(7) A/C Compressor Relay
(8) Wiper Relay (Front)
(9) Blower Relay
(10) ACC Relay
(11) Blower High Relay
(12) Auxiliary Power Relay
(13) Connector (Wire Harness)
(14) Connector Box

[A] ROPS Model
[B] CABIN Model

W1043911



3TMACAN9P041A

Functional Check

■ **NOTE**

- **The relays described here are used same ones so that these are interchangeable.**

1. Apply battery voltage across the terminals **a** and **c**, and check for continuity across the terminals **d** and **e**.
2. If continuity is not established across terminals **d** and **e**, replace it.

	b	d	e
At 0 voltage between terminal **a** and **c**	●		●
At battery voltage between terminal **a** and **c**		●	●

(1) Battery (2) Connector (Relay)

W1037072

(3) OPC (Operator Presence Control) System

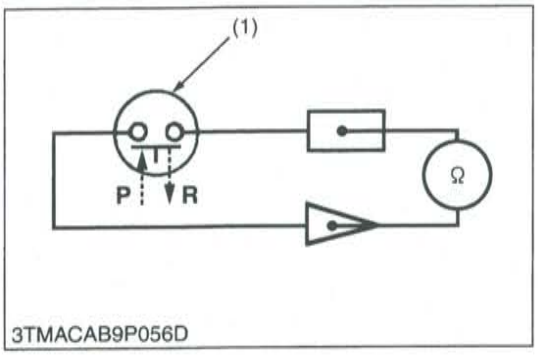
3TMACAN9P042A

Checking OPC System

1. Sit on the seat.
2. Turn the key to **"ON"** position.
3. Shift the PTO clutch control switch to **"ON"**. Make sure the warning buzzer does not whistle.
4. Stand up from the seat.
5. The warning buzzer whistles about one second after standing up. It whistles for 10 seconds.

(1) Seat Switch

W1097537



3TMACAB9P056D

Checking Seat Switch

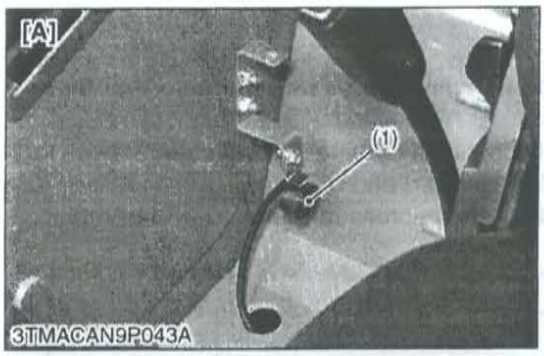
1. Disconnect the connector from the cabin wire harness.
2. Check the continuity with an ohmmeter across the switch terminals.
3. If it does not conduct or any value is indicated when the switch is pushed (**ON** seat), the switch is faulty.
4. If infinity is not indicated when the switch is released (**OFF** seat), the switch is faulty.

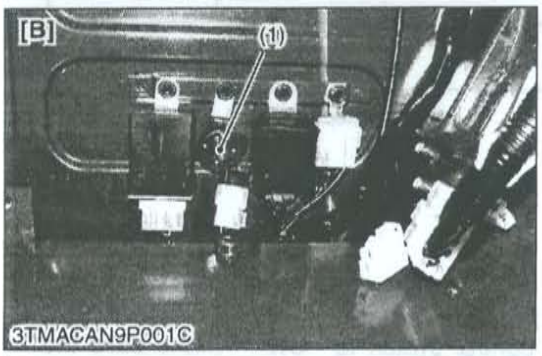
Resistance (Across switch terminals)	Reference value	When switch is pushed (**P**)	0 Ω
		When switch is released (**R**)	Infinity

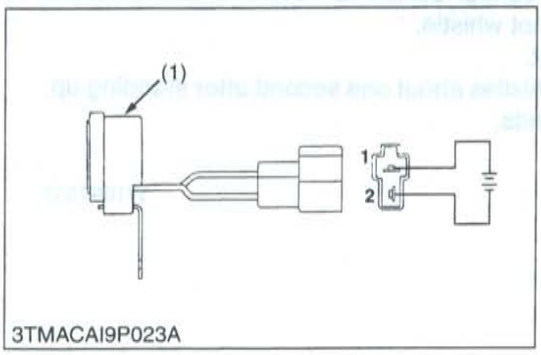
(1) Seat Switch

P : Pushed
R : Released

W1097695







Buzzer

1. Remove the buzzer (1).
2. Connect the jumper lead across the battery positive terminal and terminal **1** of connector.
3. Connect the jumper lead across the battery negative terminal and terminal **2** of connector.
4. If the buzzer does not whistle, replace it.

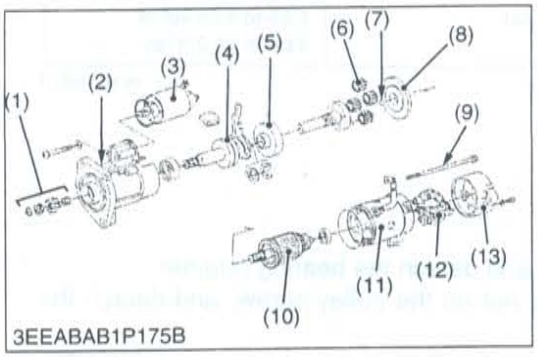
(1) Buzzer

[A] ROPS Model
[B] CABIN Model

W1028046

5. DISASSEMBLING AND ASSEMBLING

[1] STARTER MOTOR



3EEABAB1P175B

Disassembling Motor

1. Disconnect the solenoid switch (3).
2. Remove the 2 through screws (9) and the 2 brush holder lock screws. Take out the rear end frame (13) and the brush holder (12).
3. Disconnect the armature (10) and the yoke (11). Remove also the ball (7) from the tip of the armature.
4. Remove the set of packings (8), the 4 planetary gears and another packing.
5. Take out the shaft assembly. Take note of the position of the lever.

■ **IMPORTANT**

- **Before disconnecting the yoke, put tally marks on the yoke and the front bracket.**
- **Take note of the positions of the set of packings and the setup bolt.**
- **Apply grease to the gears, bearings, shaft's sliding part and ball.**

■ **NOTE**

- **Do not damage to the brush and commutator.**

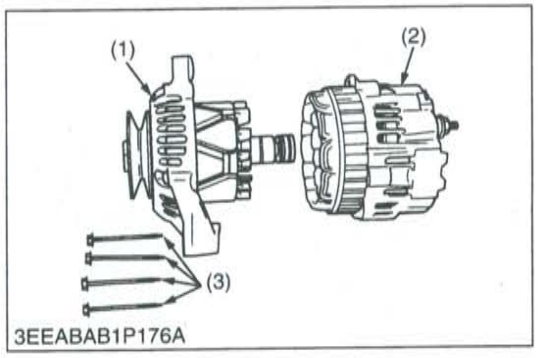
(When reassembling)

- Apply grease (DENSO CO. No. 50 or equivalent) to the parts indicated in the figure.

(1) Gear
(2) Front Bracket
(3) Solenoid Switch
(4) Overrunning Clutch
(5) Internal Gear
(6) Planetary Gear
(7) Ball
(8) Set of Packings
(9) Through Screw
(10) Armature
(11) Yoke
(12) Brush Holder
(13) Rear End Frame

W1110814

[2] ALTERNATOR



3EEABAB1P176A

Front Bracket

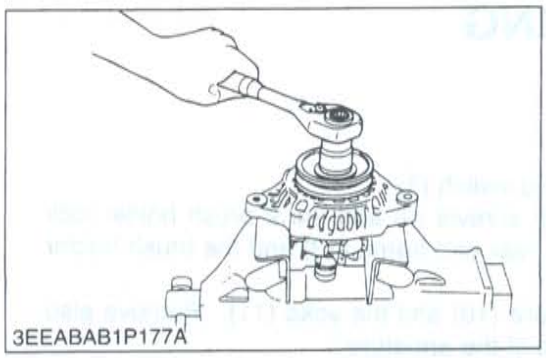
1. Remove the 4 screws.
2. Separate the front bracket (1) and the rear bracket (2) from each other.

■ **IMPORTANT**

- **Put a tally line on the front bracket and the rear bracket for reassembling them later.**

(1) Front Bracket
(2) Rear Bracket
(3) Screw

W1018481

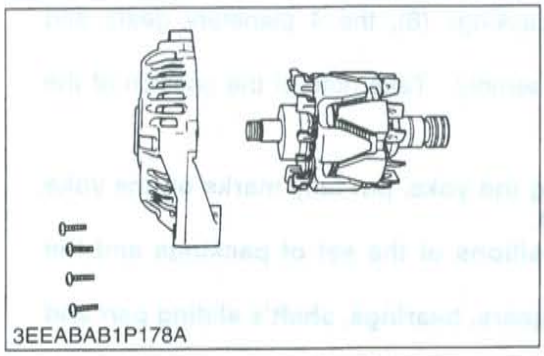

3EEABAB1P177A

Pulley

1. Hold the rotor (base of the claw) in a vise. Loosen the lock nut using a M24 box wrench.

Tightening torque	Pulley nut	58.3 to 78.9 N·m 5.95 to 8.05 kgf·m 43.0 to 58.2 ft-lbs

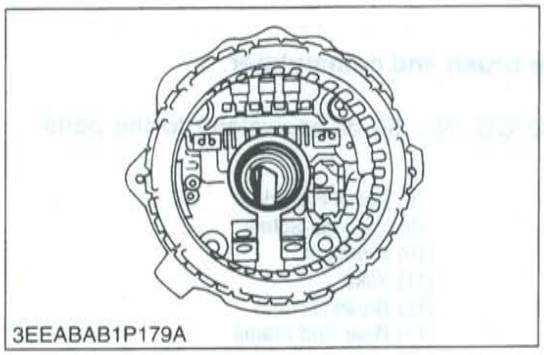
W1018613


3EEABAB1P178A

Rotor

1. Remove the 4 screws and detach the bearing retainer.
2. Temporarily install the nut on the pulley screw, and detach the rotor.

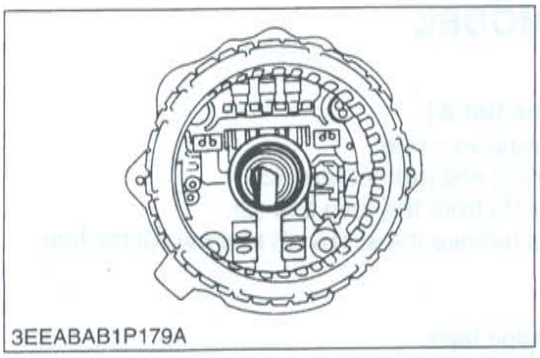
W1018685


3EEABAB1P179A

Brush

1. When the rotor is detached, the 2 brushes are found to stretch out of the shaft hole.

W1018748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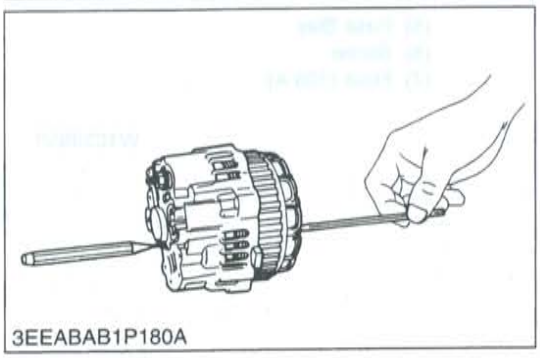
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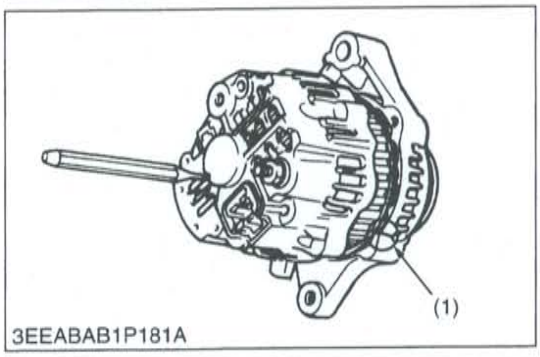

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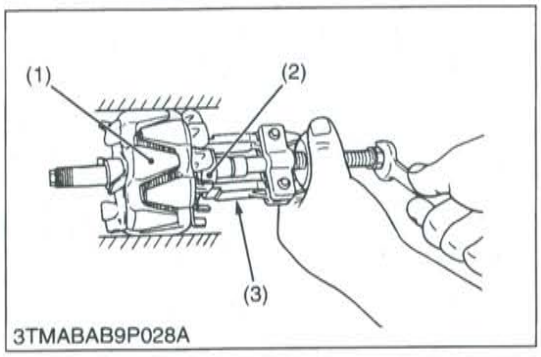


3TMABAB9P028A

Reassembling the Brush

1. Fit the brush with its sliding face in the clockwise direction when viewed from front.

■ **IMPORTANT**

- **Be sure to keep the 2 brushes deep in the brush holder. Otherwise the rotor and the rear section can not be fitted into position.**
- **Use a 4 mm hex. wrench to push the brushes into place.**
- **Using a pin-pointed (2 mm) punch, keep the brushes from popping out.**

2. Match the tally line of the front section with that of the rear section.
3. Tighten the 4 screws, and draw out the pin-pointed punch out of the brush holder.

(1) Marking

W1018847

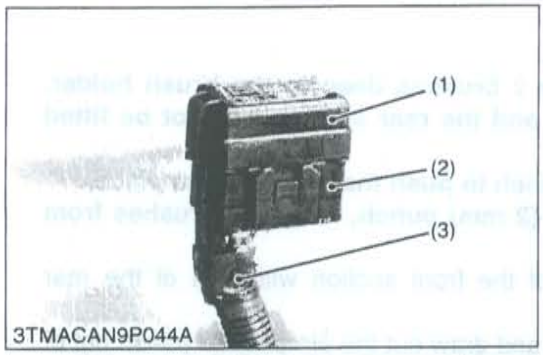
Bearing at Slip Ring Side

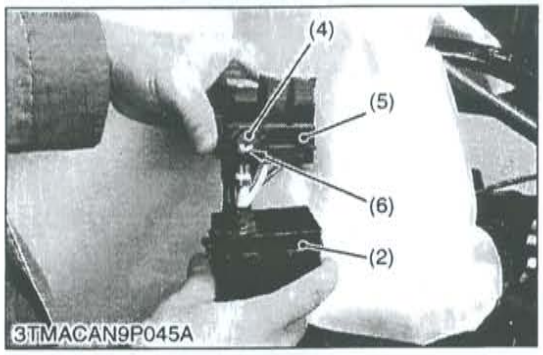
1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

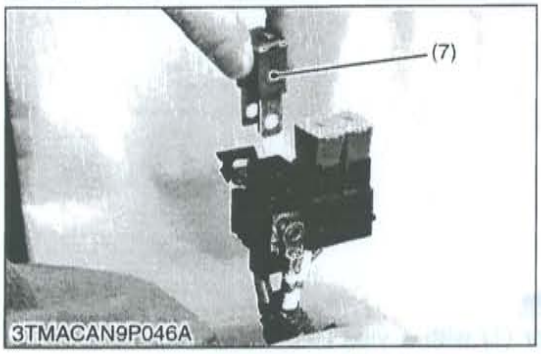
(1) Rotor
(2) Bearing
(3) Puller

W1019701

[3] FUSE (SLOW BLOW 100 A) FOR CABIN MODEL







Fuse

[Replacing procedure for 100 A]

1. Remove the battery negative cable.
2. Remove the top cover (1) and protect tape (3).
3. Draw out the fuse stay (5) from the fuse box (2).
4. Open the cover (4) and remove the screw (6) to draw out the fuse (100 A) (7).

(When reassembling)

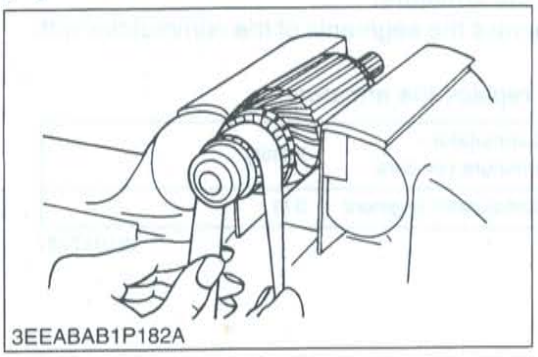
- Be sure to apply the nylon tape.

(1) Top Cover
(2) Fuse Box
(3) Tape
(4) Cover
(5) Fuse Stay
(6) Screw
(7) Fuse (100 A)

W1039550

6. SERVICING

[1] STARTER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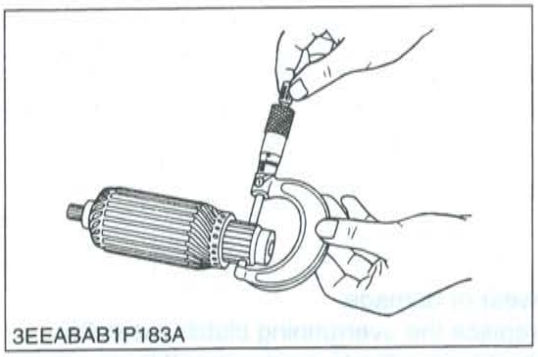
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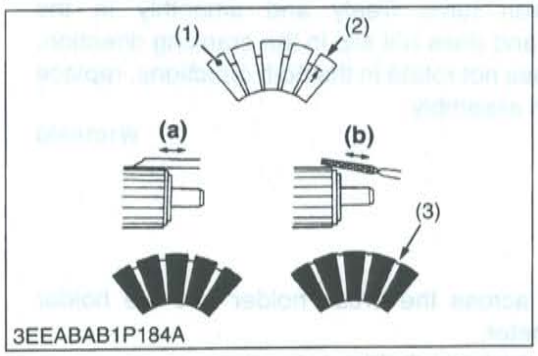

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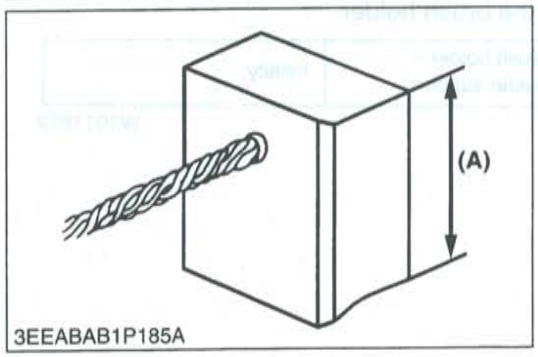

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Commutator and Mica

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, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. 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.	32 mm 1.2598 in.
	Allowable limit	31.4 mm 1.2362 in.

Mica undercut	Factory spec.	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.

(1) Segment
(2) Depth of Mica
(3) Mica

(a) Good
(b) Bad

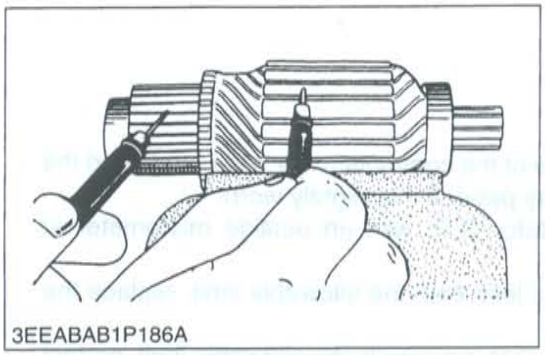
W1017092

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.	18.0 mm 0.7086 in.
	Allowable limit	11.0 mm 0.4331 in.

W1017544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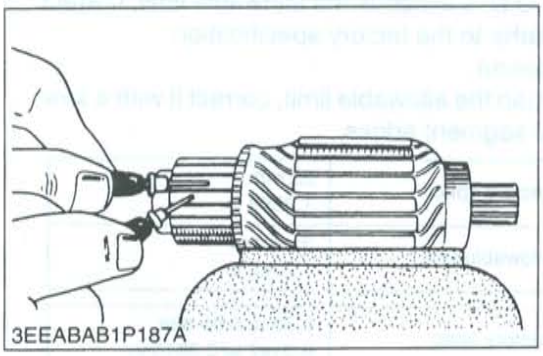
Armature Coil

1. Check the continuity across the commutator and armature coil core with an ohmmeter.
2. If it conducts, replace the armature.
3. Check the continuity across the segments of the commutator with an ohmmeter.
4. If it does not conduct, replace the armature.

Resistance	Commutator – Armature coil core	Infinity
	Commutator segment	0 Ω

W1017767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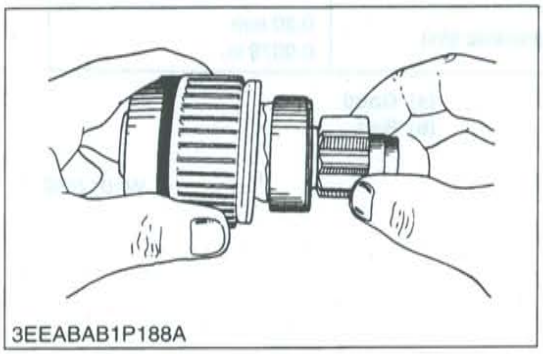
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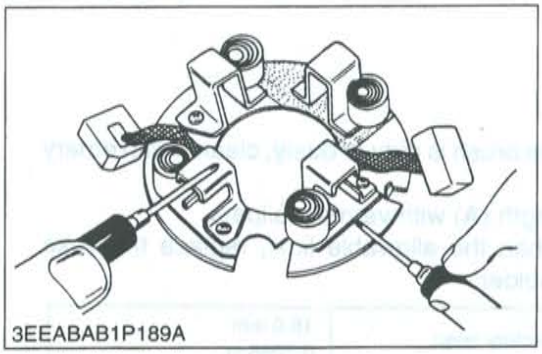
Overrunning Clutch

1. Inspect the pinion for wear or damage.
2. If there is any defect, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the overrunning direction and does not slip in the cranking direction.
4. If the pinion slips or does not rotate in the both directions, replace the overrunning clutch assembly.

W1016990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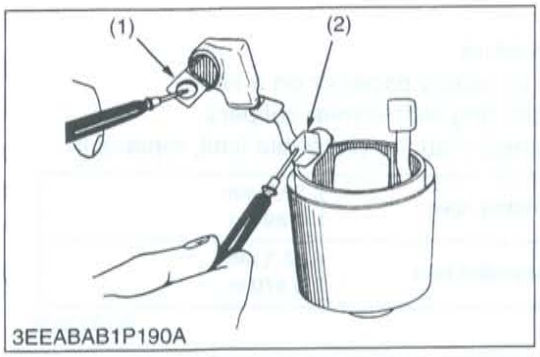
Brush Holder

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

W1017672



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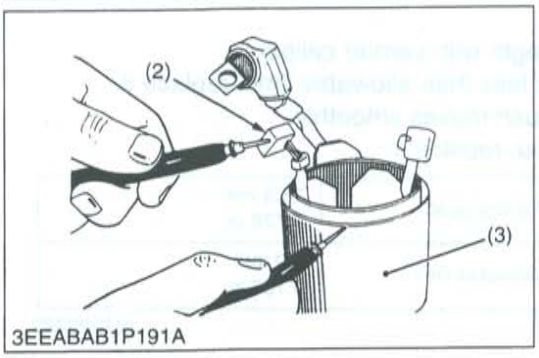

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Field Coil

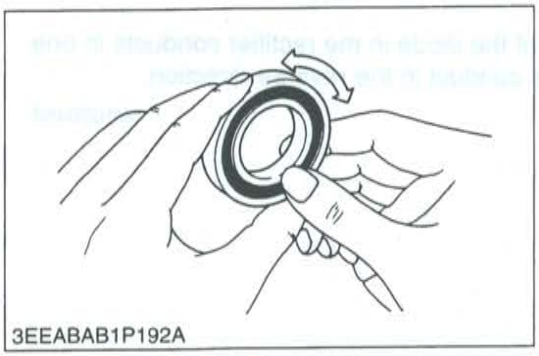
1. Check the continuity across the lead (1) and brush (2) with an ohmmeter.
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter.
4. If it conducts, replace the yoke assembly.

Resistance	Lead (1) – Brush (2)	0 Ω
	Brush (2) – Yoke (3)	Infinity

(1) Lead
(2) Brush
(3) Yoke

W1018015

[2] ALTERNATOR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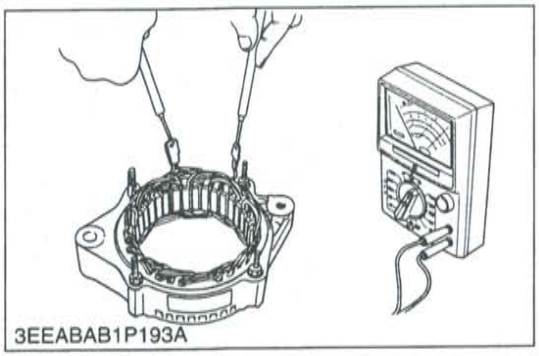
Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

W1019790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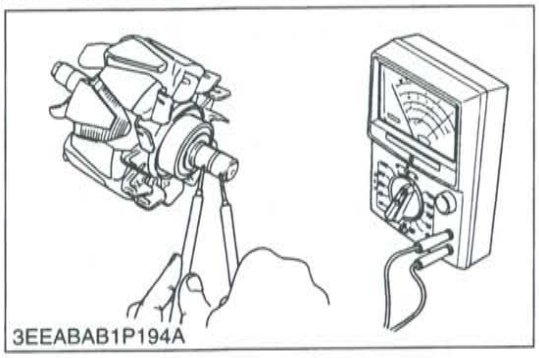
Stator

1. Measure the resistance across each lead of the stator coil with an ohmmeter.
2. If the measurement is not within factory specification, replace it.
3. Check the continuity across each stator coil lead and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	Less than 1.0 Ω

W1019964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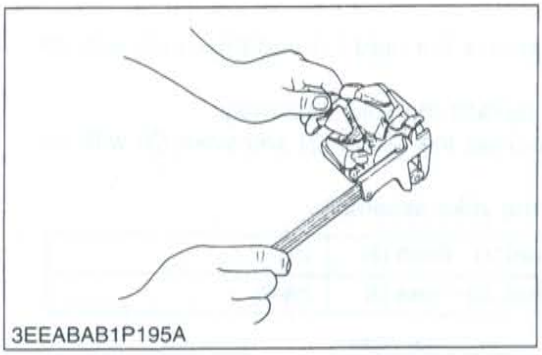
Rotor

1. Measure the resistance across the slip rings with an ohmmeter.
2. If the resistance is not the factory specification, replace it.
3. Check the continuity across the slip ring and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	2.8 to 3.3 Ω

W1020094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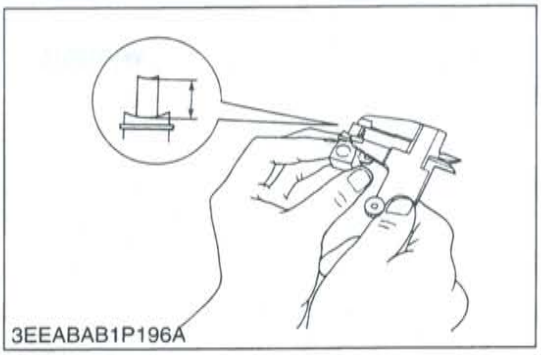
Slip Ring

1. Check the slip ring for score.
2. If scored, correct with an emery paper or on a lathe.
3. Measure the O.D. of slip ring with vernier calipers.
4. If the measurement is less than the allowable limit, replace it.

Slip ring O.D.	Factory spec.	22.7 mm 0.894 in.
	Allowable limit	22.1 mm 0.870 in.

W1020208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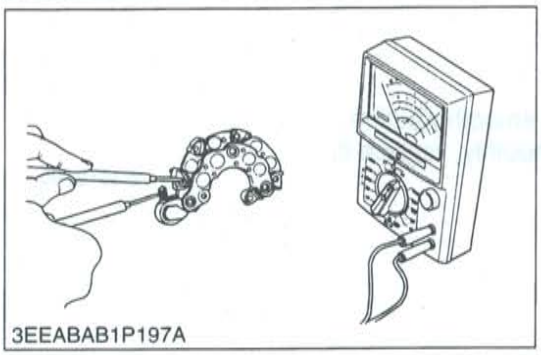
Brush Wear

1. Measure the brush length with vernier calipers.
2. If the measurement is less than allowable limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is defective, replace it.

Brush length	Factory spec.	18.5 mm 0.728 in.
	Allowable limit	5.0 mm 0.197 in.

W1020329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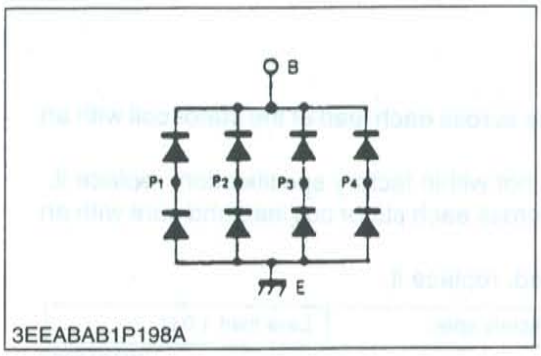
Rectifier

1. Check the continuity across each diode of rectifier with an ohmmeter.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

W1020452



3EEABAB1P198A

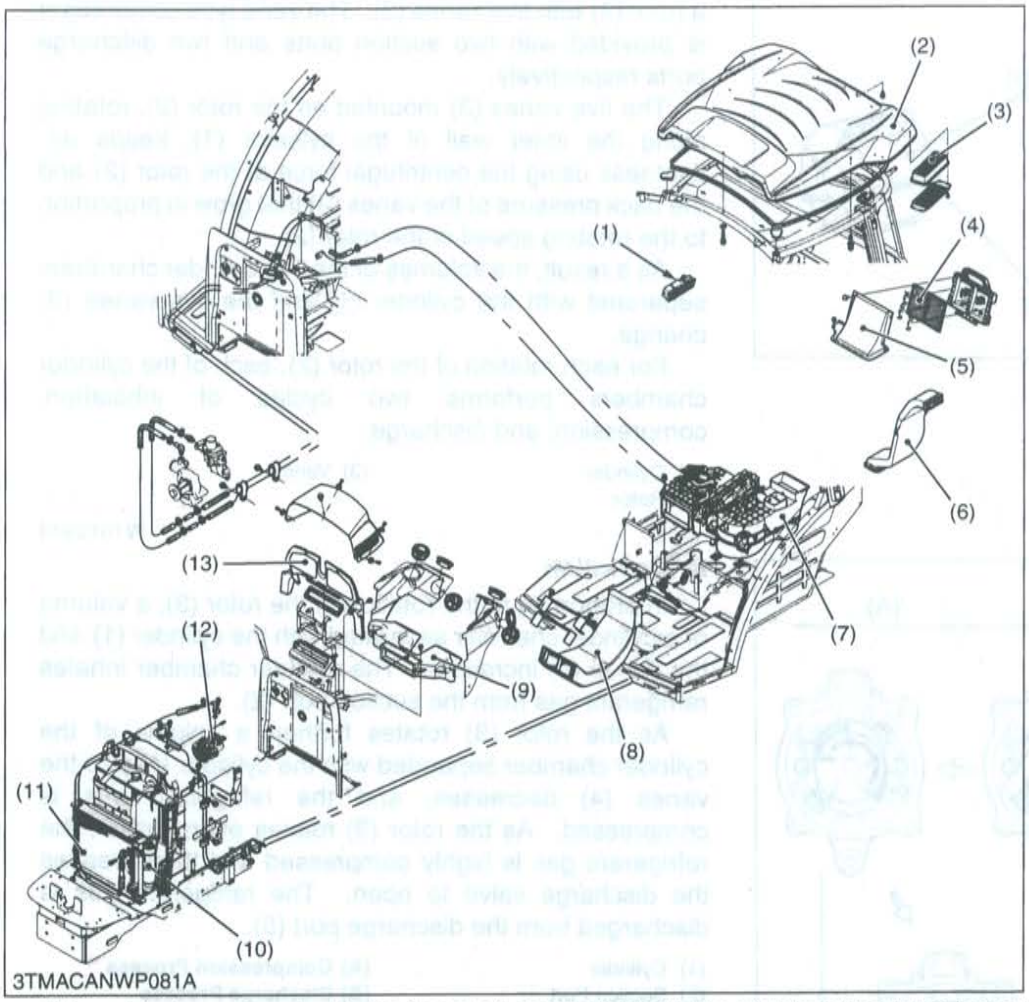
10 CABIN

MECHANISM

CONTENTS

1. AIR CONDITIONING SYSTEM

[1] STRUCTURE



(1) Control Panel
(2) Outer Roof
(3) Fresh Air Filter
(4) Inner Air Filter
(5) Inner Air Duct
(6) Fresh Air Duct
(7) Air Conditioner Unit
(8) Front Duct
(9) Dashboard Blow Port
(10) Receiver
(11) Condenser
(12) Compressor
(13) Defroster Blow Port

W1015904

This cabin is equipped with the inner air circulation/outside air inhalation type large capacity thin air conditioner.

The inner air inhaled from the inner air filter (4) provided behind the seats goes through the inner air duct (5) and goes into the air conditioner unit (7). The fresh air inhaled from the fresh air filter (3) goes through the center pillar on the left and goes into the air conditioner unit (7) via the fresh air duct (5).

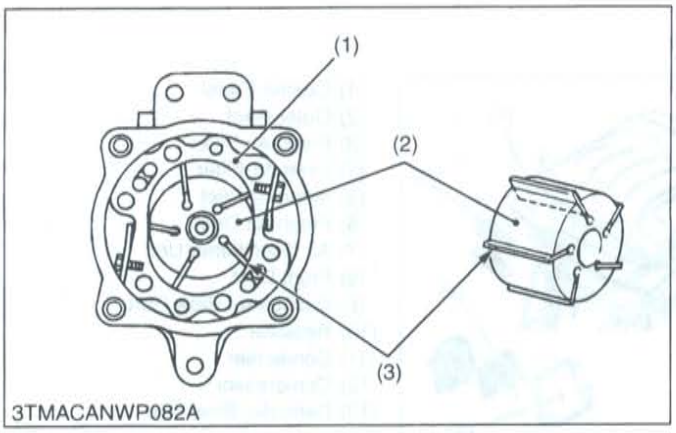
The inner air and fresh air inhaled into the air conditioner unit (7) is cooled and dehumidified in the cooling section of the air conditioner unit (7). The comfortable air, warmed moderately with the heater, comes from the air duct with low humidity.

The six dashboard air outlets allow opening and closing, and adjusting direction of winds. The defroster air outlet is opened and closed by moving the mode dial on the control panel (1).

Capacity (Cooling)	Factory spec.	3.95 kW
Capacity (Warming)	Factory spec.	4.30 kW
Kinds of refrigerant (Charge amount)	Factory spec.	R134a 0.85 to 0.95 kg 1.87 to 2.09 lbs
Pressure sensor (Low)	Factory spec.	0.196 MPa 2.0 kgf/cm^2 28.4 psi
Pressure sensor (High)	Factory spec.	3.14 MPa 32.0 kgf/cm^2 455 psi

W1012759

[2] COMPRESSOR



3TMACANWP082A

The vane type compressor installed on this cabin is composed of a cylinder (1) with an oval cross section and a rotor (2) with five vanes (3). The vane type compressor is provided with two suction ports and two discharge ports respectively.

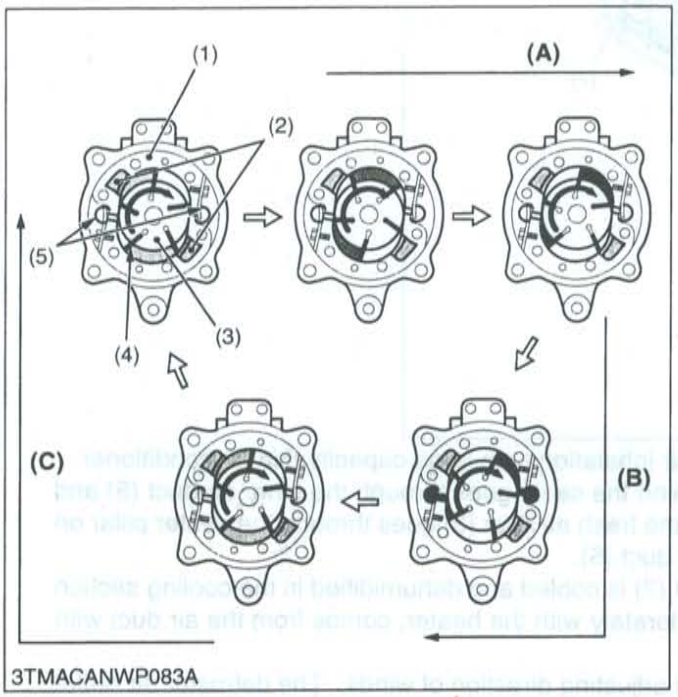
The five vanes (3) mounted on the rotor (2), rotating along the inner wall of the cylinder (1), keeps air-tightness using the centrifugal force of the rotor (2) and the back pressure of the vanes (3) that grow in proportion to the rotating speed of the rotor (2).

As a result, the volumes of the five cylinder chambers separated with the cylinder (1) and the five vanes (3) change.

For each rotation of the rotor (2), each of the cylinder chambers performs two cycles of inhalation, compression, and discharge.

(1) Cylinder
(2) Rotor
(3) Vane

W1012943



3TMACANWP083A

■ Operation

In proportion to the rotation of the rotor (3), a volume of a cylinder chamber separated with the cylinder (1) and the vanes (4) increases. The cylinder chamber inhales refrigerant gas from the suction port (2).

As the rotor (3) rotates further, a volume of the cylinder chamber separated with the cylinder (1) and the vanes (4) decreases, and the refrigerant gas is compressed. As the rotor (3) rotates even further, the refrigerant gas is highly compressed and then presses the discharge valve to open. The refrigerant gas is discharged from the discharge port (5).

(1) Cylinder
(2) Suction Port
(3) Rotor
(4) Vane
(5) Discharge Port
(A) Compression Process
(B) Discharge Process
(C) Suction Process

W1013091

■ Compressor Oil

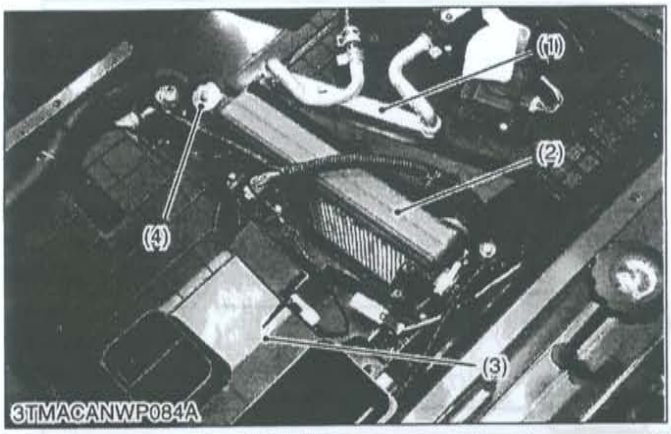
The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 does not dissolve in R134a, so it does not circulate through the cycle, and the lifespan of the compressor is considerably shortened.

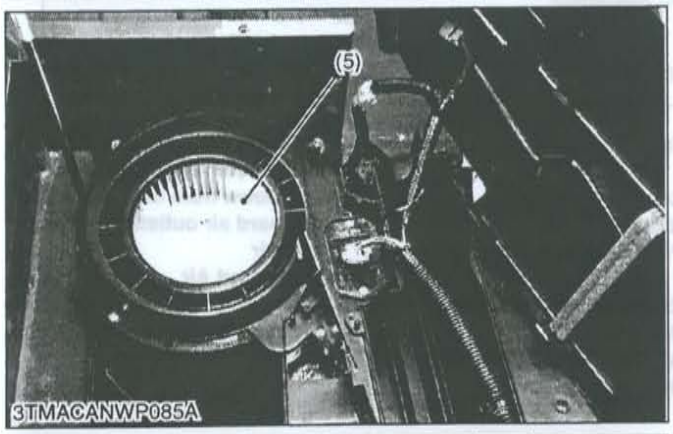
It is still essential to ensure that the correct refrigerant oil is used. R12 systems were lubricated with mineral oil, which is totally unsuitable for R134a systems. The letter require PAG oil, which mixes very well with the refrigerant and provides ideal lubrication throughout the system.

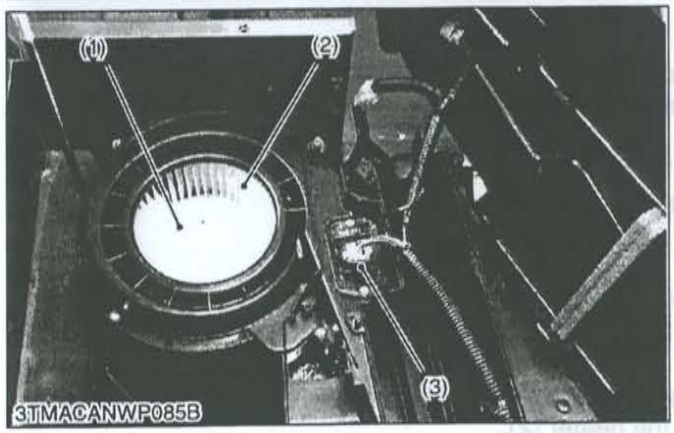
Quantity (Total)	Brand Name
100 to 120 cc 0.106 to 0.127 U.S.qts. 0.088 to 0.106 Imp.qts.	ND-OIL 8 <PAG* oil>

*PAG : Polyalkyleneglycol (Synthetic oil)

[3] AIR CONDITIONER UNIT







The air conditioner unit (3) consists of evaporator (2), expansion valve (4), heater core (1), blower (5). etc..

(1) Heater Core
(2) Evaporator
(3) Air Conditioner Unit
(4) Expansion Valve
(5) Blower

W1013727

■ A/C Blower

The blower is incorporated in the left-hand space of the air conditioner unit. It blows cool, warm of fresh air via the dashboard and defroster blow ports into the cabin.

The speed of the blower motor (1) can be adjusted in 4 steps by the resistor (3).

The blower fan (2) is centrifugal type. The air being sucked in parallel with the rotary shaft is blown in the centrifugal direction; in other words, perpendicular to the rotary shaft.

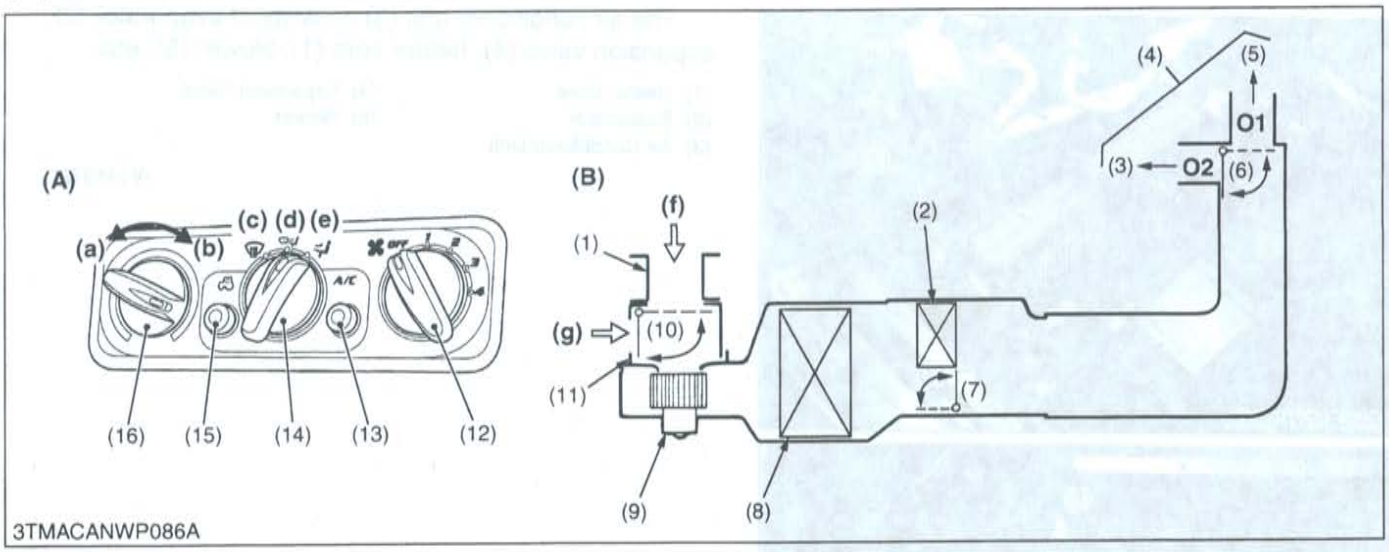
(1) Blower Motor
(2) Blower Fan
(3) Resistor

W1013861

■ NOTE

- **As for the mechanism and function of each component part, refer to "10. CABIN" section in the Workshop Manual of tractor mechanism (Code No. 9Y021-18200).**

[4] SYSTEM CONTROL



3TMACANWP086A

(1) Fresh Air Inlet Port
(2) Heater
(3) Dashboard
(4) Defroster and Dashboard
(5) Defroster
(6) **D3** : Air Outlet Door (Mode Door)
(7) **D2** : Temperature Door (Air Mixed Door)
(8) Evaporator
(9) Blower
(10) **D1** : Air Intake Door
(11) Recirculated Air Inlet Port
(12) Blower Switch
(13) Air Conditioner Switch (with Indicator)
(14) Mode Dial
(15) Recirculation/Fresh Air Selection Switch (with Indicator)
(16) Temperature Control Dial

(A) Control Panel
(B) Block Diagram of Air Flow Passage

(a) COOL
(b) WARM
(c) Air is blown from only the defroster air outlet
(d) Air is blown the dashboard and defroster air outlets
(e) Air is blown from only the dashboard air outlets
(f) Fresh Air
(g) Recirculated Air

O1 :Defroster Air Outlet
O2 :Dashboard Air Outlets

■ Recirculation / Fresh Air Selection Switch

● RECIRCULATION (Indicator : ON)

By pushing the recirculation / fresh air selection switch (15) to **"RECIRCULATION"** position (indicator : ON), door **D1** (10) shuts the fresh air inlet port (1). Air inside the cabin is recirculated.

● FRESH AIR (Indicator : OFF)

By pushing the recirculation / fresh air selection switch (15) to **"FRESH AIR"** position (indicator : OFF), door **D1** (10) opens the fresh air inlet port (1). Outside air comes into cabin.

■ Temperature Control Dial

● COOL

By moving the temperature control dial (16) to **"COOL"** position **(a)**, door **D2** (7) moves to close water valve and opens side passage. The air flows toward door **D3** (6) through the side passage.

● WARM

By moving the temperature control dial (16) to **"WARM"** position **(b)**, door **D2** (7) moves to open water valve and closes side passage. The air flows toward door **D3** (6) through the heater (2).

■ Mode Dial

● DEFROSTER

Moving the mode dial (14) to **(c)** position, the door **D3** (6) is moved to set up the air passage to outlet **O1**. Air comes out from outlet **O1**.

● DEFROSTER + DASHBOARD

Moving the mode dial (14) to **(d)** position, the door **D3** (6) is moved to establish the air passages to outlets **O1** and **O2**. Air comes out from both outlets.

● DASHBOARD

Moving the mode dial (14) to **(e)** position, the door **D3** (6) is moved to set up the air passage to outlet **O2**. Air comes out from outlet **O2**.

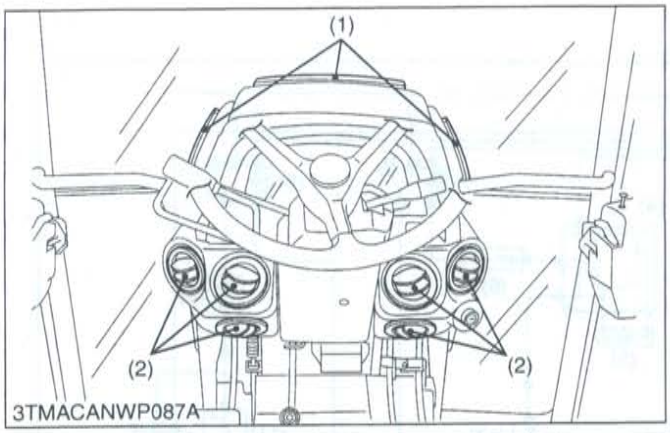
■ Blower Switch

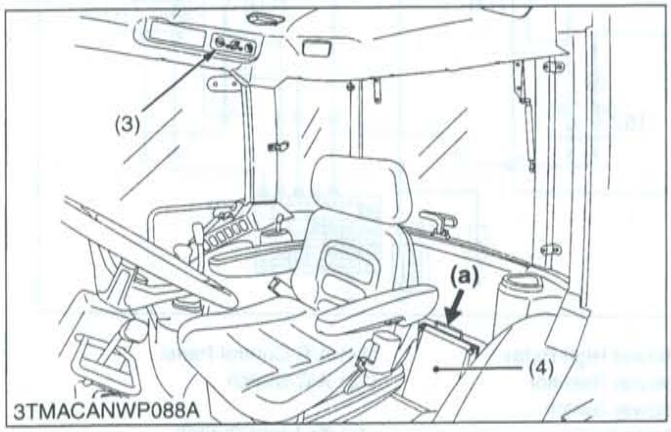
Air volume can be changed in four steps. At the "4" position, the largest air volume is obtained.

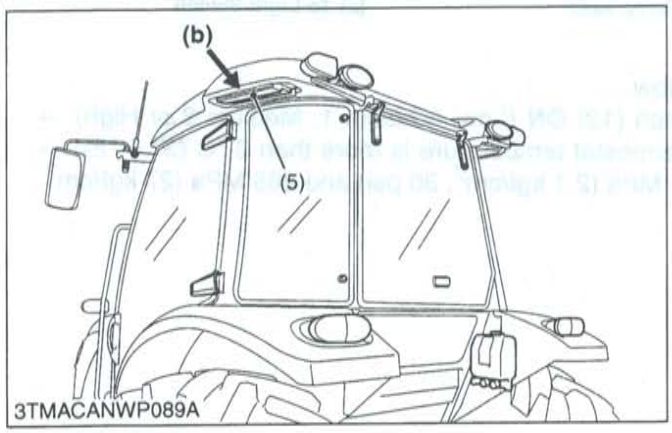
■ Air Conditioner Switch

Push this switch to activate the air conditioner. An indicator will light up when the switch is set to **"ON"**. Push switch again to turn air conditioner off, in which case the indicator light will be off.

[5] AIR FLOW







■ Flow

Air in the cabin and fresh air introduced into the cabin flow as shown below. Adjust the 7 air ports to obtain the desired condition.

■ IMPORTANT

- **Do not pour water directly into the fresh air port while washing the vehicle.**

(1) Defroster Air Outlet
(2) Dashboard Air Outlet
(3) Control Panel
(4) Inner Air Filter
(5) Fresh Air Filter

(a) Inner Air Recirculation
(b) Fresh Air Inlet

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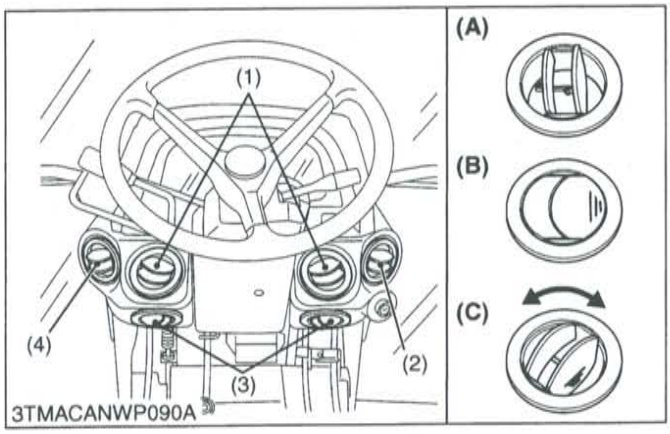
[6] AIR CONTROL VENT



■ Dashboard Air Outlet

The dashboard air outlet can be independently adjusted as required.

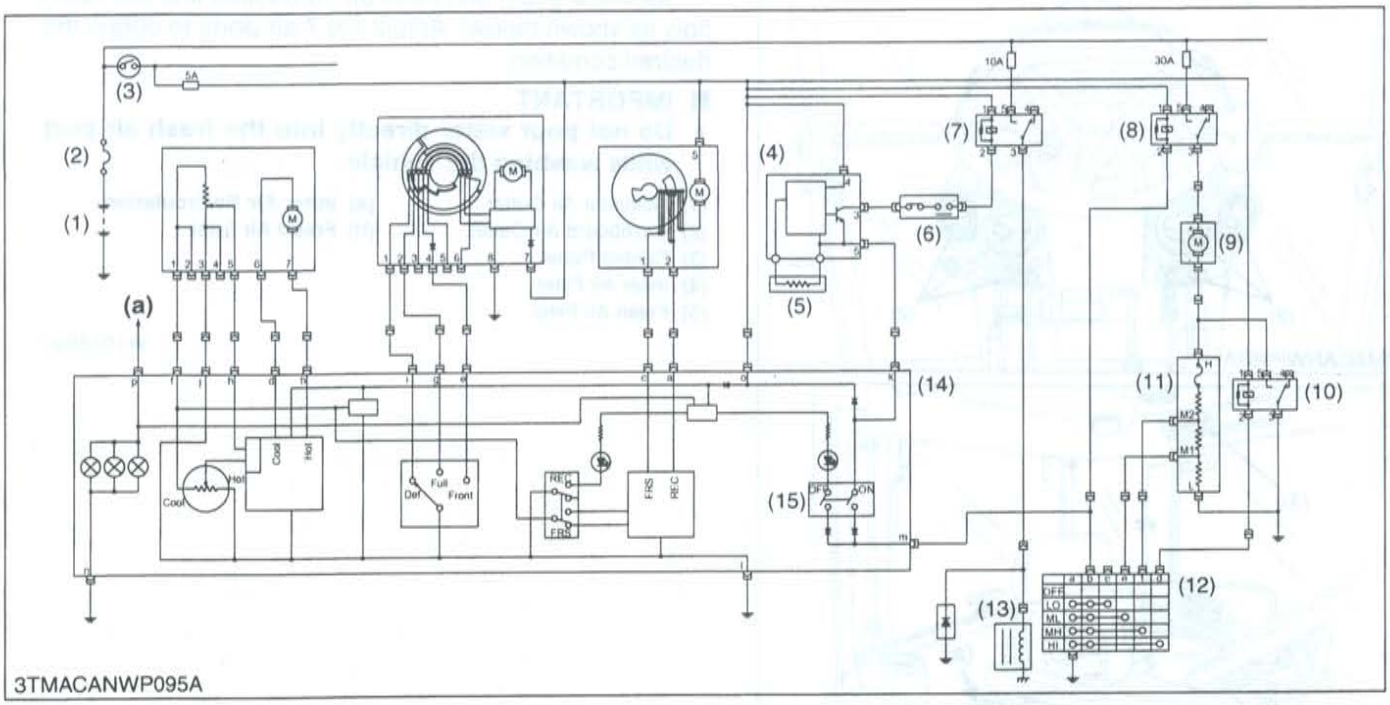
(1) Face Area Air Outlet
(2) Back Area Air Outlet
(3) Feet Area Air Outlet
(4) Back Area Air Outlet

(A) Open
(B) Shut
(C) Turn

W1015170

[7] ELECTRICAL SYSTEM

(1) Electrical Circuit



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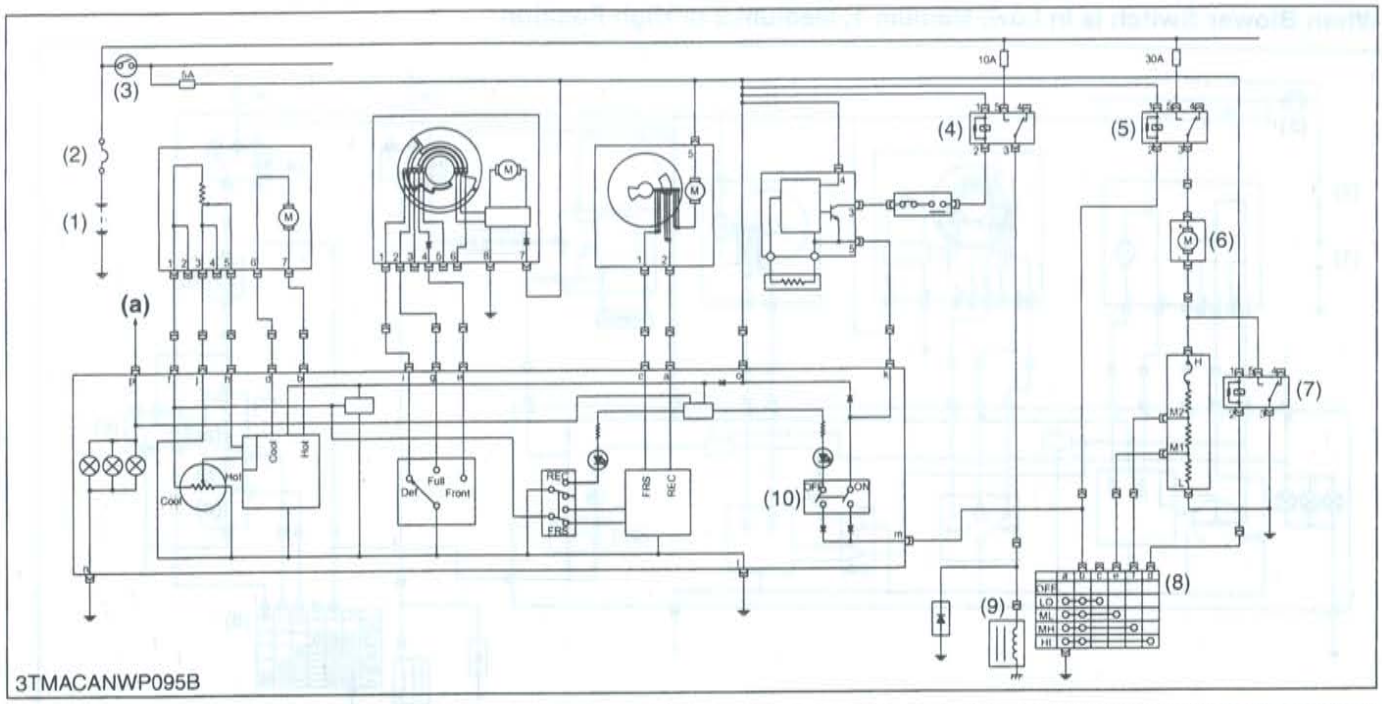
(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) Thermo Amplifier
(5) Frost Thermistor
(6) Pressure Switch
(7) Compressor Relay
(8) Blower Relay
(9) Blower Motor
(10) Blower High Relay
(11) Blower Resistor
(12) Blower Switch
(13) Compressor
(14) A/C Control Panel
(15) A/C Switch

(a) To Light Switch

The process of magnetic clutch being engaged is shown below.

Main Switch (3) **ON** → A/C Switch (15) **ON** → Blower Switch (12) **ON** (Low, Medium 1, Medium 2 or High) → Compressor Relay (7) **ON** → Thermo Amplifier (4) **ON** (the thermostat temperature is more than 3 °C (37.4 °F)) → Pressure Switch (6) **ON** (if refrigerant pressure is between 0.21 MPa (2.1 kgf/cm^2, 30 psi) and 265 MPa (27 kgf/cm^2, 384 psi) → Magnetic Clutch of Compressor Engaged.

(2) Blower Relay and Compressor Relay



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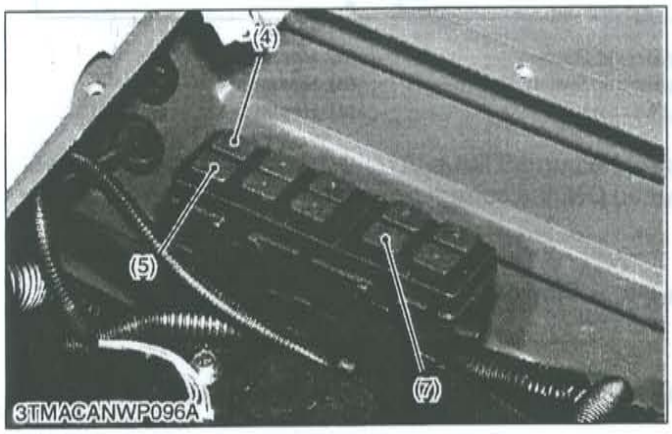

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Remove the seat, the seat under cover and the relays on the right side of the air conditioner unit : blower relay (5), blower high relay (7) and compressor relay (4). When the blower fan is adjusted for the air flow rate, the blower relay (5) and blower high relay (7) are activated by a signal from the blower switch (8) on the control panel.

Among the air conditioner components, current flows to the blower motor (6) and magnetic clutch. If all of these current were to be passes through the main switch (3) and supplied, the current would be too large for the main switch (3) so that there will be danger or burning out the main switch contact. If the current were to be passed directly from the battery (1), forgetting to turn off the blower motor (6) could result in a discharged battery (1).

To protect against such trouble, relays have been provided. These relays have been made so that when current flows through its coil, the contact close to supply the power from the battery (1). By employing these relays, the current flowing through the main switch (3) has been decreased as only a small current is required to actuate the relay. Thus there will be no danger of burning out the switch contact, and when the main switch (3) is opened, the relay contact will open at the same time. This action stops the current flow in the air conditioner circuit so that there will also be no chance of the battery discharging.

(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) Compressor Relay
(5) Blower Relay
(6) Blower Motor
(7) Blower High Relay
(8) Blower Switch
(9) Compressor
(10) A/C Switch

(a) To Light Switch

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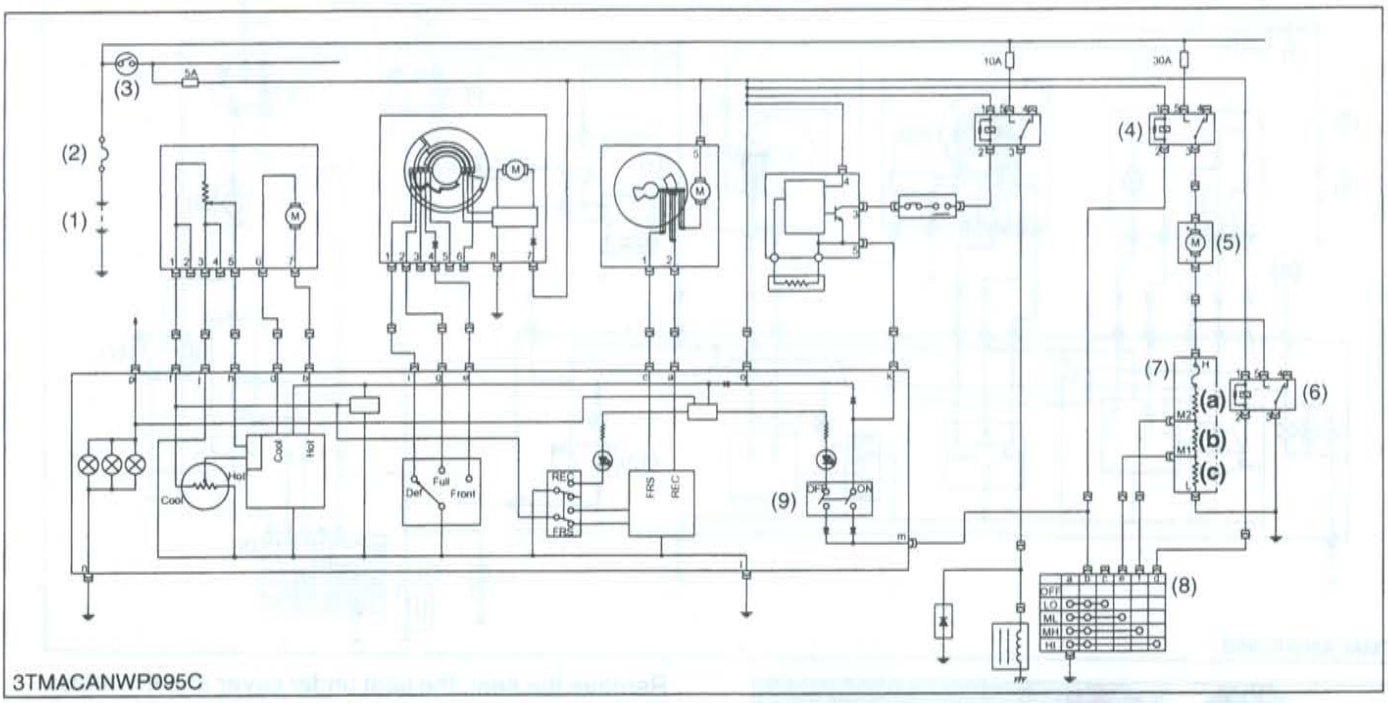
(3) Blower Switch

■ When Blower Switch is in Low, Medium 1, Medium 2 or High Position



(1) Battery
(2) Slow Blow Fuse
(3) Main Switch
(4) Blower Relay
(5) Blower Motor
(6) Blower High Relay
(7) Blower Resistor
(8) Blower Switch
(9) A/C Switch
(a) Resistor M2
(b) Resistor M1
(c) Resistor L

When the main switch (3) and blower switch (8) is turned **ON**, the current flows from battery (1) to blower relay coil and blower relay (4) is turned **ON**. As the blower relay (4) is turned **ON**, the current from battery (1) flows to the blower switch (8) through the blower motor (5) as follows.

● **Low Position**

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : **(a)**, **(b)** and **(c)** → Blower Switch (8) → Ground.

● **Medium 1 Position**

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : **(a)** and **(b)** → Blower Switch (8) → Ground.

● **Medium 2 Position**

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower Resistor (7) : **(a)** → Blower Switch (8) → Ground.

● **High Position**

Battery (1) → Slow Blow Fuse (2) → Main Switch (3) → Fuse → Blower Relay (4) → Blower Motor (5) → Blower High Relay (6) → Blower Switch (8) → Ground.

SERVICING

CONTENTS

1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	Bearing of compressor worn or damaged	Replace	10-S38
	Valves in compressor damaged	Replace	10-S38
	Belt slipping	Adjust or replace	G-29
	Compressor bracket mounting screws loosen	Tighten	–
	Piping resonant	Tighten or add clamp	–
Noisy (Compressor OFF)	Blower defective	Repair or replace	10-S27
	Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	10-S22

W1013580

AIR CONDITIONING SYSTEM

Does Not Cool (No Air Flow)	Fuse blown	Replace	–
	A/C main relay defective	Replace	9-S36
	A/C blower motor defective	Replace	10-S27
	A/C blower switch defective	Replace	10-S24
	Wiring harness disconnected or improperly connected	Repair	–
Does Not Cool (Compressor Does Not Rotate)	Fuse blown	Replace	–
	Magnetic clutch defective	Repair or replace	10-S22
	A/C switch defective	Replace	10-S5
	Pressure switch defective	Replace	10-S29
	Belt slipping	Adjust or replace	G-29
Does Not Cool (Others)	Insufficient refrigerant	Check with manifold gauge	10-S21
	Expansion valve defective	Replace	–
	Compressor defective	Replace	10-S38
Insufficient Cooling (Insufficient Air Flow)	Air filter clogged	Clean or replace	G-29
	Evaporator frosted	Clean or replace thermo switch	–
	A/C blower motor defective	Replace	10-S27
	A/C blower resistor defective	Replace	10-S27
Insufficient Cooling (Many Bubbles in Sight Glass)	Insufficient refrigerant	Check with manifold gauge	10-S21
	Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	10-S13
	Air mixed in	Check with manifold gauge	10-S15
Insufficient Cooling (No Bubbles in Sight Glass)	Too much refrigerant	Check with manifold gauge	10-S21

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AIR CONDITIONING SYSTEM (Continued)

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	Belt slipping	Adjust or replace	G-29
	Magnetic clutch defective	Repair or replace	10-S22
	Compressor defective	Replace	10-S38
Insufficient Cooling (Others)	Thermostat defective	Replace	–
	Water valve defective	Replace	–
	Condenser fin clogged with dust	Clean	G-29
	Expansion valve defective	Replace	–
Insufficient Heating	Water valve defective	Replace	–
	Temperature motor defective	Check and repair	10-S28
	Insufficient coolant	Replenish	G-10
Too Low Air Flow Rate (Blower Motor Does Not Run)	Blower fan switch defective	Check and repair	10-S24
	A/C main relay defective	Replace	9-S36
	Brush in poor contact	Replace	–
	Fuse blown out	Replace	–
	Wrong wiring or loose connections	Check and repair	–
Too Low Air Flow Rate (Flow Rate Does Not Change in 4 Steps)	Blower resistor defective	Replace	10-S27
	Relay defective	Replace	9-S36
	Blower fan switch defective	Replace	10-S24
Too Low Air Flow Rate (Others)	Blower is not tightened enough	Check and repair	10-S27
	Blower deformed	Replace	10-S27
	Blower in contact with casing	Check and repair	–
	Obstacle at or near suction port	Check and repair	–
	Evaporator frosted	Clean or replace	–
	Filter clogged	Clean or replace	G-29
	Blow duct clogged or missing	Check and repair	–
Insufficient Cooling (Compressor Magnetic Clutch Does Not Work)	Low battery voltage	Charge	–
	Rotor in contact with stator	Replace	10-S39
	Wrong wiring loose connections	Check and repair	–
	Relay defective	Replace	9-S36
	Coil shortage	Replace	–
	Ground malfunction	Check and Repair	10-S39
	Coil burst out	Replace	–

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AIR CONDITIONING SYSTEM (Continued)

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Hi-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
	Condenser clogged with dust and dirt	Clean	G-29
	Air mixed	Check with manifold gauge	10-S15
Insufficient Cooling (Hi-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21
	Compressor discharge valve damaged	Replace	10-S38
	Compressor gasket damaged	Replace	10-S38
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S38
Insufficient Cooling (Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
	Heat-sensitive tube in poor contact	Check and repair	–
	Expansion valve too open	Replace	–
Insufficient Cooling (Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21
	Gas leak at heat-sensitive tube	Replace	–
	Evaporator frosted	Clean or replace	–
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S38
	Expansion valve clogged	Replace	–
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	10-S21

W1014322

WINDSHIELD WIPER

Symptom	Probable Cause	Solution	Reference Page
Windshield Wiper Does Not Operate	Fuse blown (Short-circuit, burnt component inside motor or other part for operation)	Correct cause and replace	–
	Wiper motor defective (Broken armature, worn motor brush or seized motor shaft)	Replace	10-S48
	Wiper switch defective	Replace	10-S30
	Foreign material interrupts movement of link mechanism	Repair	10-S48
	Wiper arm seized or rusted	Lubricate or replace	10-S48
Windshield Wiper Operating Speed Is Too Low	Wiper motor defective (Short-circuit of motor armature, worn motor brush or seized motor shaft)	Replace	10-S48
	Low battery voltage	Recharge or replace	–
	Humming occurs on motor in arm operating cycle due to seized arm shaft	Lubricate or replace	10-S48
	Wiper switch contact improper	Replace	10-S30
Windshield Wiper Does Not Stop Correctly	Wiper motor defective (Contaminated auto-return contacts or improper contact due to foreign matter)	Replace	10-S48

W1066515

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
A/C Compressor Magnetic Clutch	Air Gap	0.30 to 0.65 mm 0.0118 to 0.0255 in.	–
Magnetic Clutch Stator Coil	Resistance	3.0 to 4.0 Ω	–
Refrigerating Cycle (Refrigerating Cycle is Normal Operating)	Pressure (**LO** Pressure Side)	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi	–
	Pressure (**HI** Pressure Side)	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi	–
Pressure Switch (Dual Type) (When pressure switch is turned **OFF**)	Setting Pressure (**LO** Pressure Side)	Less than approx. 0.196 MPa 2.0 kgf/cm^2 28.4 psi	–
	Setting Pressure (**HI** Pressure Side)	More than approx. 3.14 MPa 32 kgf/cm^2 455 psi	–
Air Conditioner Drive Belt	Tension	10 to 12 mm (de 0.39 to 0.48 in.) deflection at 98 N (10 kgf, 22 lbs) of force	–
Front Wiper	Rotating Speed	25 to 43 times/min.	–
Rear Wiper	Rotating Speed	25 to 43 times/min.	–

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 : Refer to "5. TIGHTENING TORQUES" at "G. GENERAL" section.)

Item	N·m	kgf·m	ft-lbs
Power steering joint shaft mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Rear wheel mounting nut	260 to 304	26.5 to 31.0	191.8 to 224.2
Cabin mounting screw and nut	124 to 147	12.6 to 15.0	91.2 to 108
High pressure pipe 1 mounting screw (compressor side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
Compressor mounting screw	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Magnetic clutch mounting screw	15.0 to 21.0	1.5 to 2.1	11.1 to 15.5
A/C unit mounting screw (M8)	9.8 to 15.7	1.0 to 1.6	7.2 to 11.6
Pressure pipe joint mounting screw (cooler unit side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
Low pressure pipe mounting screw (compressor side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
High pressure pipe 1 mounting screw (condenser side)	7.9 to 11.8	0.8 to 1.2	5.8 to 8.7
High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7	1.2 to 1.5	8.7 to 10.8
Wiper arm mounting nut (front wiper)	6.3 to 9.3	0.7 to 1.0	5.0 to 6.9
Wiper arm mounting nut (rear wiper)	7.9 to 9.3	0.8 to 1.0	5.8 to 6.9
Wiper motor mounting screw	7.9 to 9.3	0.8 to 1.0	5.8 to 6.9

W1012736

4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allow to handle the refrigerant.

⚠ CAUTION

- **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
- **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.**
- **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**
- **If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.**
- **In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.**
- **Beware of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.**
- **Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.**

■ IMPORTANT

- **If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.**
- **Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.**
- **Use only for R134a refrigerant service tool.**
- **Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.**
- **Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.**
- **When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.**
- **Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..**
- **Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.**
- **Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.**
- **R134a compressor oil absorbs moisture easily, so that be sure to seal after disconnecting the each parts.**
- **Do not use old-type refrigerant R12a or compressor oil for old-type refrigerant.**
- **When replacing the condenser, evaporator and receiver, etc., replenish the compressor oil to compressor according to the table below.**

(Refregerant)

Kinds of refrigerant (Charge amount)	Factory spec.	R134a 0.85 to 0.95 kg 1.87 to 2.09 lbs

(Compressor Oil)

Quantity (Total)	Brand Name
100 to 120 cc 0.106 to 0.127 U.S.qts 0.088 to 0.106 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG : Polyalkyleneglycol (Synthetic oil)

(Reference)

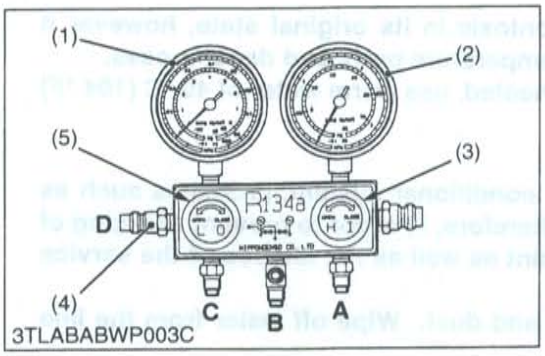
Replacing Parts	Replenish Quantity	Brand Name
Condenser	40 cc 0.042 U.S.qts. 0.035 Imp.qts.	ND-OIL 8 <PAG* oil>
Evaporator	40 cc 0.042 U.S.qts. 0.035 Imp.qts.	
Receiver	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	
Hose	10 cc 0.011 U.S.qts. 0.009 Imp.qts.	

*PAG : Polyalkyleneglycol (Synthetic oil)

W1012709

[1] HANDLING OF SERVICE TOOLS

(1) Manifold Gauge Set



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The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (5) and **HI** is for the high pressure side valve (3). By opening or closing the high and low pressure hand valves, the following circuits are established.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **HI** Pressure Side Valve
(4) Schrader Valve
(5) **LO** Pressure Side Valve

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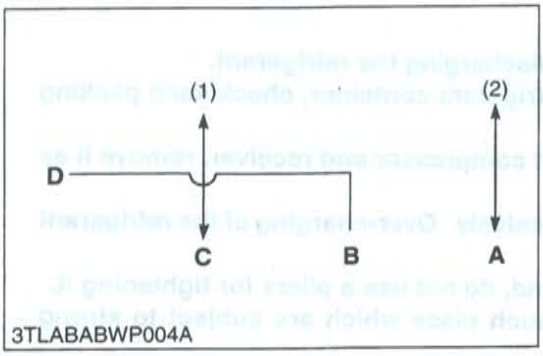

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■ **When LO Pressure Side Valve and HI Pressure Side Valve are Closed**

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**

- **Schrader valve (D) must be opened.**

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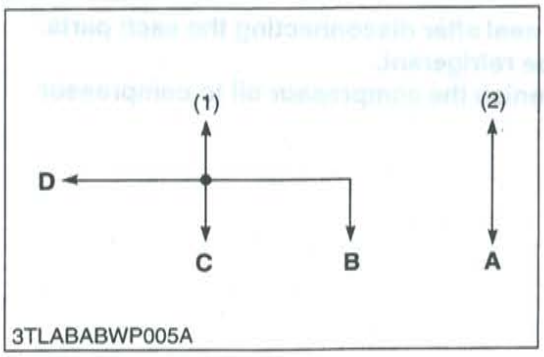

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■ **When LO Valve is Opened and HI Valve is Closed**

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
→ Port (**B**)
→ Port (**D**)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**

- **Schrader valve (D) must be opened.**

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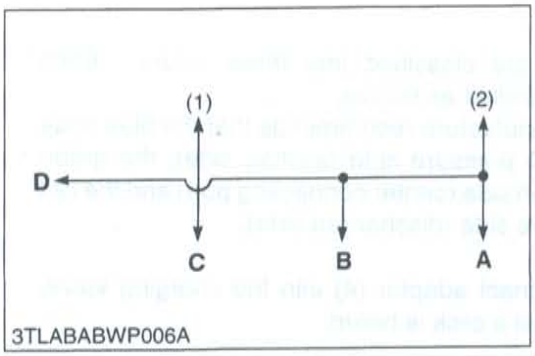

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■ **When LO Valve is Closed and HI Valve is Opened**
Two circuits are established.
Port (**C**) → **HI** pressure gauge (2)
→ Port (**B**)
→ Port (**D**) (Schrader valve must be opened)
Port (**A**) → **LO** pressure gauge (1)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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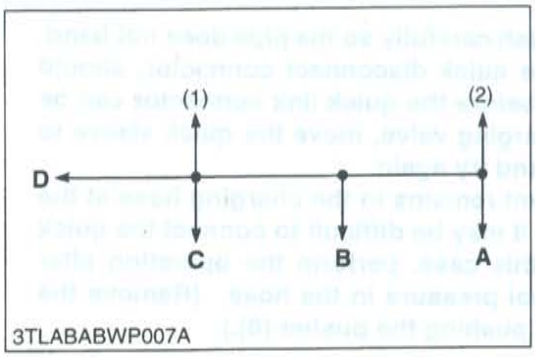

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■ **When LO and HI Valve is Opened**
Two circuits are established.
Port (**A**) → **HI** pressure gauge (2)
→ **LO** pressure gauge (1)
→ Port (**B**)
→ Port (**C**)
→ Port (**D**) (Schrader valve must be opened)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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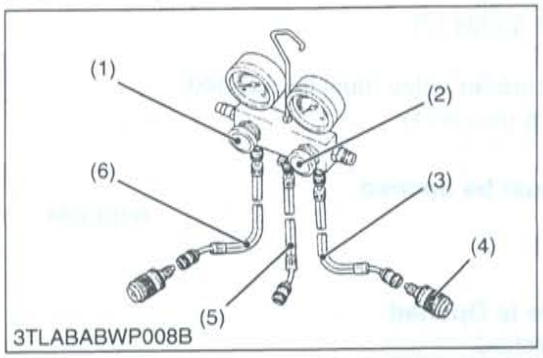
(2) Refrigerant Charging Hose



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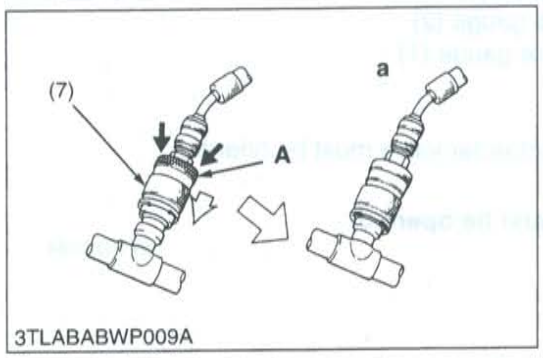

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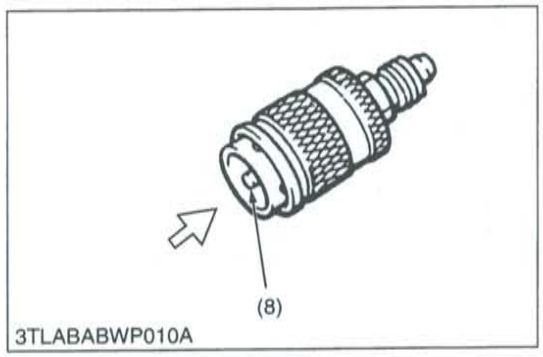

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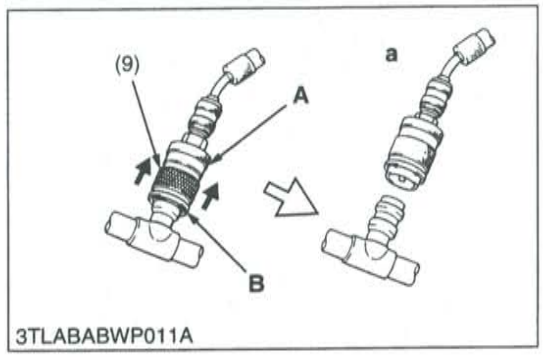


3TLABABWP011A

The charging hoses are classified into three colors. Each charging hose must be handled as follows :

- The air conditioner manufacture recommends that the blue hose (6) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (3) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (4) into the charging valve, and push on part **A** until a click is heard.

■ **NOTE**

- **When connecting, push carefully so the pipe does not bend.**
- **When connecting the quick disconnect connector, should the sleeve (7) move before the quick link connector can be connected to the charging valve, move the quick sleeve to its original position and try again.**
- **When some refrigerant remains in the charging hose at the time of connections, it may be difficult to connect the quick link connector. In this case, perform the operation after removing any residual pressure in the hose. (Remove the residual pressure by pushing the pusher (8).)**

(When reassembling)

- While holding on to part **A** of the quick disconnect adaptor, slide part **B** up.

■ **NOTE**

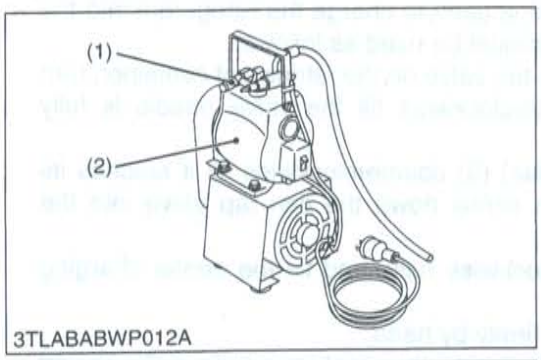
- **After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.**

(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Red Hose
(4) Quick Disconnect Adaptor
(5) Green Hose
(6) Blue Hose
(7) Sleeve
(8) Pusher
(9) Sleeve

a : CLICK

W1014039

(3) Vacuum Pump Adaptor



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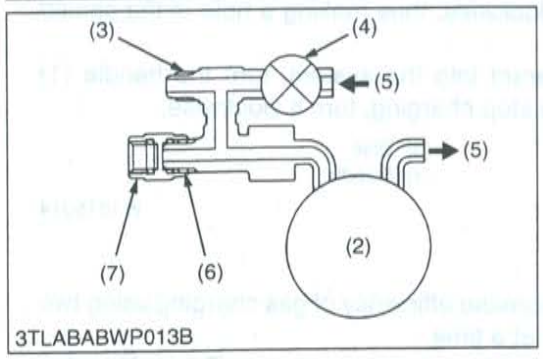


3TLABABWP013B

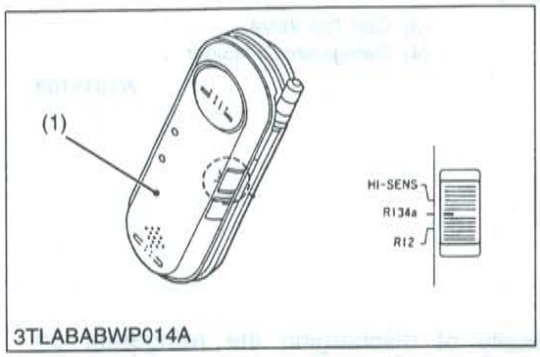
Objective of the Vacuum Pump Adaptor

1. After vacuum has been created in the air conditioning cycle, when the vacuum pump is stopped, since there is vacuum in hoses within the gauge manifold, the vacuum pump oil flows back into the charging hose. If the refrigerant is refilled with the system still in this state, the vacuum pump oil left in the charging hose enters the air conditioner cycle together with the refrigerant. Vacuum pump adaptor with a solenoid valve is used to prevent this back-flow of oil from the vacuum pump. The role of the solenoid valve is that when the current passes through the solenoid valve, the valve closes to keep out the outside air and allow the vacuum to build up, but when the current stops, the valve opens to allow in air and end the vacuum.
2. Attaching this adaptor to the R12 vacuum pump currently being used allows the pump to be used with both R134a and R12.

(1) Vacuum Pump Adaptor
(2) Vacuum Pump
(3) For R134a
(4) Magnetic Valve
(5) Air
(6) For R12
(7) Blind Cap

W1014539

(4) Electric Gas Leak Tester



3TLABABWP014A

The current R12 gas leak tester has poor sensitivity for R134a and cannot be used. Therefore, a new electric gas leak tester with greater sensitivity has been designed and can be used with both R134a and R12.

(Reference)

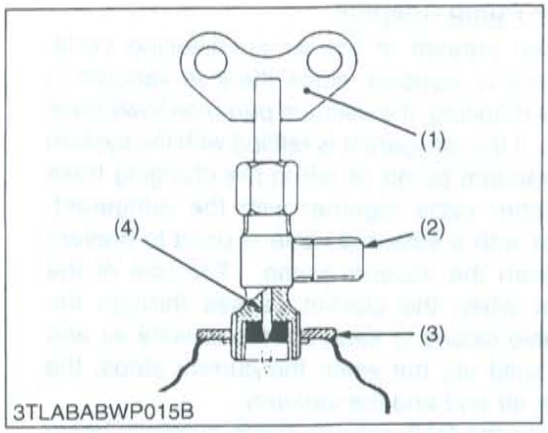
Leak tester with halide torch

- Since the reaction with chlorine within the refrigerant is used to detect gas leaks, R134a, which contains no chlorine, cannot be detected.

(1) Electric Gas Leak Tester

W1014905

(5) Can Tap Valve



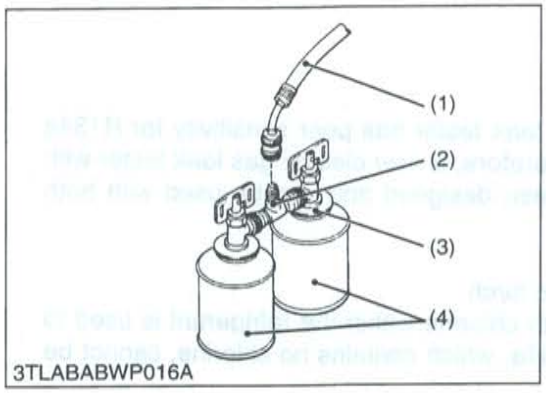
The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows :

1. Before putting the can tap valve on the refrigerant container, turn the handle (1) counterclockwise till the valve needle is fully retracted.
2. Turn the plate nut (disc) (3) counterclockwise till it reaches its highest position, then screw down the can tap valve into the sealed tap.
3. Turn the place nut clockwise fully, and fix the center charging hose to the valve.
4. Tighten the place nut firmly by hand.
5. Turn the handle (1) clockwise, thus making a hole in the sealed tap.
6. To charge the refrigerant into the system, turn the handle (1) counterclockwise. To stop charging, turn it clockwise.

(1) Butterfly Handle
(2) Connection
(3) Disc
(4) Needle

W1015014

(6) T-joint



T-joint (2) is used to increase efficiency of gas charging using two refrigerant containers (4) at a time.

1. Install two refrigerant container service valves to T-joint (2) sides and connect the charging hose (1) to it.

(1) Charging Hose (Green)
(2) T-joint
(3) Can Tap Valve
(4) Refrigerant Container

W1015169

(7) R134a Refrigerant Recover and Recycling Machine

When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine. (Do not release the refrigerant into the atmosphere.)

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine, eliminate mixing R134a equipment, refrigerant and refrigerant oils with R12 systems to prevent compressor damage.**

W1015488

5. CHECKING AND CHARGING REFRIGERANT CYCLE

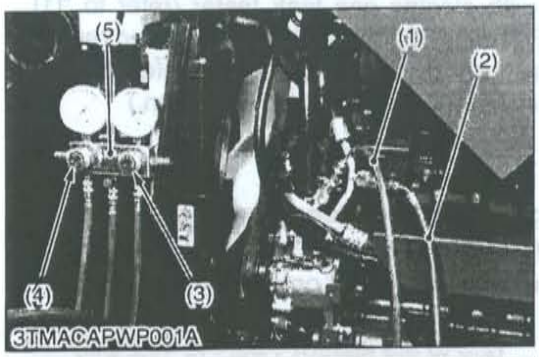
[1] CHECKING WITH MANIFOLD GAUGE

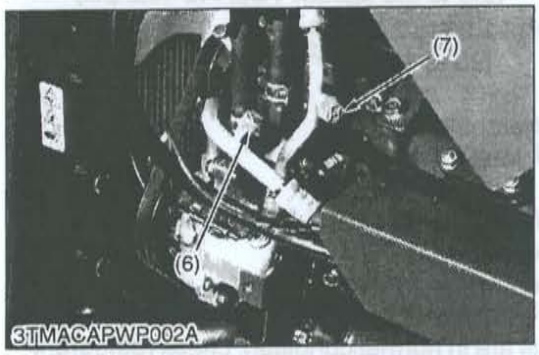
■ **IMPORTANT**

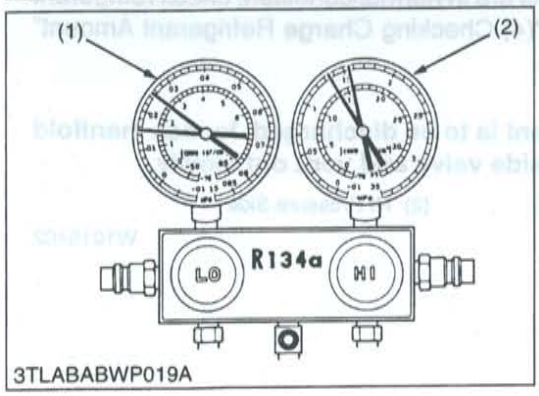
- **The gauge indications described in the following testing are those taken under the same condition, so it should be noted that the gauge readings will differs somewhat with the ambient conditions.**

Condition

- Ambient temperature : **30 to 35 °C (86 to 95 °F)**
- Engine speed : Approx. **1500 min^{-1} (rpm)**
- Temperature control lever : **Maximum cooling position**
- Blower switch : **HI position**







Manifold Gauge Connecting and Test Preparation

1. Close the manifold gauge **HI** and **LO** pressure side valve (3), (4) tightly.
2. Connect the charging hose (red) (2) to the **HI** pressure side charging valve (7) and connect the charging hose (blue) (1) to the **LO** pressure side charging valve (6).

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerating cycle.**

3. Start the engine and set at approx. **1500 min^{-1} (rpm)**.
4. Turn on the A/C switch and set the temperature control dial to **maximum cooling** position.
5. Set the blower switch to **HI** position.

(1) Charging Hose (Blue)
(2) Charging Hose (Red)
(3) **HI** Pressure Side Valve
(4) **LO** Pressure Side Valve
(5) Manifold Gauge
(6) **LO** Pressure Side Charging Valve
(7) **HI** Pressure Side Charging Valve

W1015662

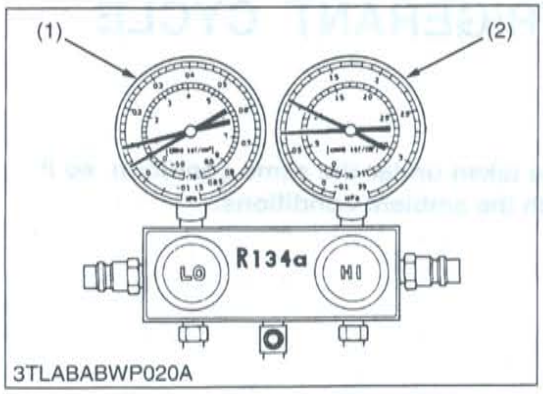
Normal Operating

If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.20 MPa (1.5 to 2.0 kgf/cm^2, 21 to 28 psi) and that at the **HI** pressure side (2) around 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi).

Gas pressure	Factory spec.	Low pressure side	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi
		High pressure side	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi

(1) **LO** Pressure Side
(2) **HI** Pressure Side

W1015870



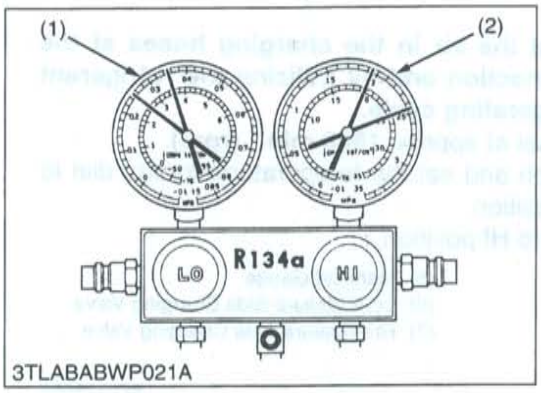
3TLABABWP020A

Insufficient Refrigerant

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too low.
     LO pressure side (1) : 0.05 to 0.10 MPa
     (0.5 to 1.0 kgf/cm^2, 7.1 to 14.2 psi)
     HI pressure side (2) : 0.69 to 0.98 MPa
     (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
   - Bubbles seen in sight glass.
   - Air discharged from air conditioner sightly cold.
2. Probable cause
   - Gas leaking from some place in refrigerant cycle.
3. Solution
   - Check for leakage with electric gas leak tester (refer to "[1] HANDLING OF SERVICE TOOLS" in this section) and repair.
   - Recharge refrigerant to the proper level. (Refer to "(4) Checking Charge Refrigerant Amount" in this section.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1016070



3TLABABWP021A

Excessive Refrigerant or Insufficient Condenser Cooling

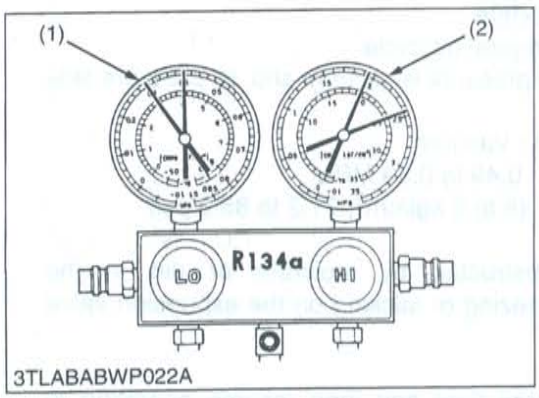
1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1) : 0.20 to 0.35 MPa
     (2.0 to 3.5 kgf/cm^2, 28.4 to 49.8 psi)
     HI pressure side (2) : 1.96 to 2.45 MPa
     (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
2. Probable cause
   - Overcharging refrigerant into cycle.
   - Condenser cooling faulty.
3. Solution
   - Clean condenser. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)
   - Adjust air conditioner belt to proper tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)
   - If the above two items are in normal condition, check refrigerant quantity. (Refer to "(4) Checking Charge Refrigerant Amount" in this section.)

■ **NOTE**

- **If excessive refrigerant is to be discharged, loosen manifold gauge LO pressure side valve and vent out slowly.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1016402



3TLABABWP022A

Air Entered in the Cycle

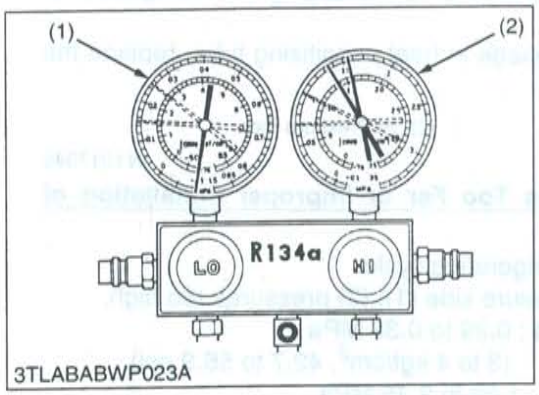
1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1) : 0.20 to 0.35 MPa
     (2.0 to 3.5 kgf/cm^2, 28.4 to 49.8 psi)
     HI pressure side (2) : 1.96 to 2.45 MPa
     (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   - **LO** pressure side (1) piping not cold when touched.
2. Probable cause
   - Air entered in refrigerating cycle.
3. Solution
   - Replace receiver.
   - Check compressor oil contamination and quantity.
   - Evacuate and recharge new refrigerant. (Refer to "(3) Charging the Refrigerant" in this section.)

■ **NOTE**

- **The above cycle can be seen when the cycle is charged without evacuation.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1016771



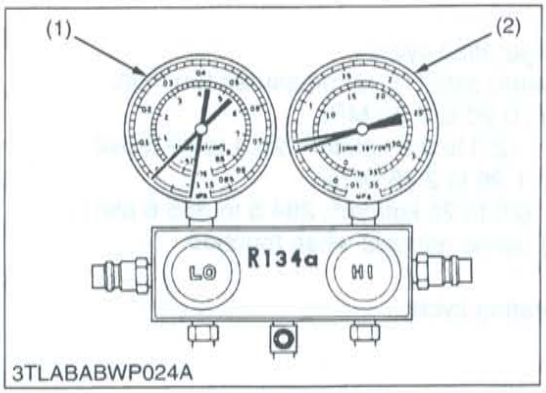
3TLABABWP023A

Moisture Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - The air conditioner operates normally at the beginning, but over time, **LO** pressure side (1) pressure is **vacuum** and **HI** pressure side (2) is low pressure.
     LO pressure side (1) : Vacuum
     HI pressure side (2) : 0.69 to 0.98 MPa
     (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   - The moisture in the refrigerating cycle freezes in the expansion valve orifice and causes temporary blocking. After a time, the ice melts and condition returns to normal.
3. Solution
   - Replace receiver.
   - Remove moisture in cycle by means of repeated evacuation. (Refer to "(2) Evacuating the System" in this section.)
   - Recharge new refrigerant to the proper level. (Refer to "(3) Charging the Refrigerant" in this section.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1017013



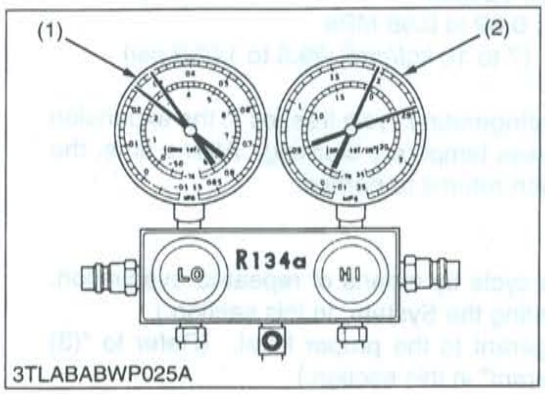
3TLABABWP024A

Refrigerant Fails to Circulate

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1) pressure is vacuum and, **HI** pressure side (2) is low pressure.
     LO pressure side (1) : Vacuum
     HI pressure side (2) : 0.49 to 0.59 MPa
     (5 to 6 kgf/cm^2, 71.2 to 85.3 psi)
2. Probable cause
   - Refrigerant flow obstructed by moisture or dirt in the refrigerating cycle freezing or sticking on the expansion valve orifice.
3. Solution
   Allow to stand for same time and then resume operation to decide whether the plugging is due to moisture or dirt.
   - If caused by moisture, correct by referring to instructions in previous.
   - If caused by dirt, remove the expansion valve and blow out the dirt with compressed air.
   - If unable to remove the dirt, replace the expansion valve. Replace the receiver. Evacuate and charge in proper amount of new refrigerant. (Refer to "(3) Charging the Refrigerant" in this section.)
   - If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1017346



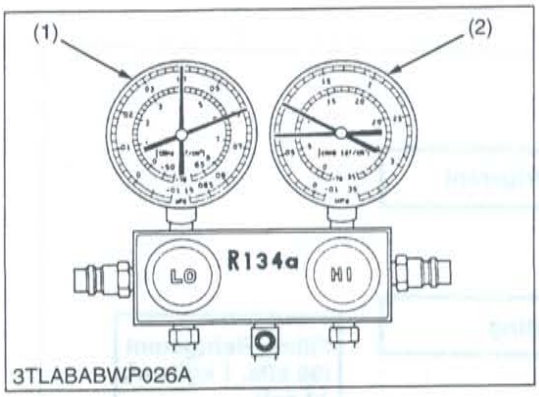
3TLABABWP025A

Expansion Valve Opens Too Far or Improper Installation of Heat Sensitizing Tube

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1) : 0.29 to 0.39 MPa
     (3 to 4 kgf/cm^2, 42.7 to 56.9 psi)
     HI pressure side (2) : 1.96 to 2.45 MPa
     (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   - Frost or heavy dew on low pressure side piping.
2. Probable cause
   - Expansion valve trouble or heat sensitizing tube improperly installed.
   - Flow adjustment not properly done.
3. Solution
   - Check installed condition of heat sensitizing tube.
   - If installation of heat sensitizing tube is correct, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

W1017612



Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1) : 0.39 to 0.59 MPa (4 to 6 kgf/cm^2, 56.9 to 85.3 psi)
   - **HI** pressure side (2) : 0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   - Leak in compressor.
3. Solution
   - Replace compressor. (Refer to "(2) Removing Compressor Assembly" in this section.)

■ **NOTE**

- **Manifold gauge indications (left side figure) at faulty compressing by compressor.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

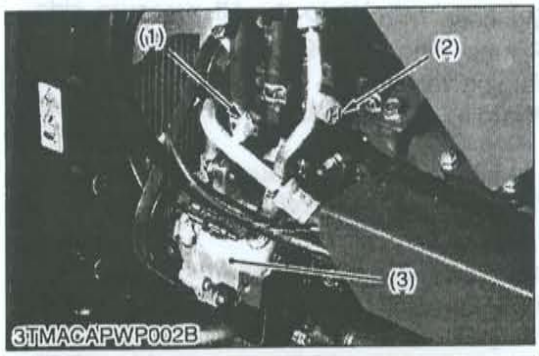
W1017960

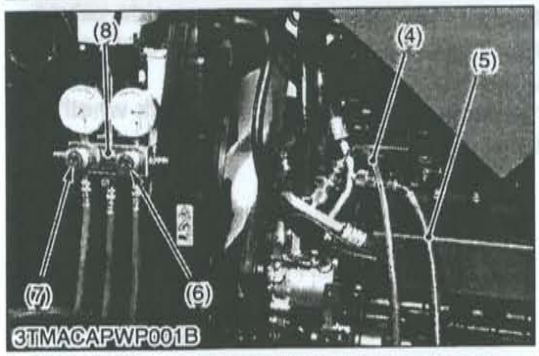
[2] DISCHARGING, EVACUATING AND CHARGING

■ **IMPORTANT**

- **When discharging, evacuating or charging the refrigerating system, be sure to observe the "4. PRECAUTION AT REPAIRING REFRIGERANT CYCLE". (Refer to "4. PRECAUTION AT REPAIRING REFRIGERANT CYCLE" in this section.)**

(1) Discharging the Refrigerant





Prepare for the R134a refrigerant recovery and recycling machine (9).

1. Connect low pressure side hose (blue) (4) from the recovery and recycling machine (9) to **LO** pressure side charging valve (1). Connect high pressure side hose (red) (5) to **HI** pressure side charging valve (2).
2. Follow the manufacturers instructions and discharge the system.

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine (9). Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 system to prevent compressor damage.**

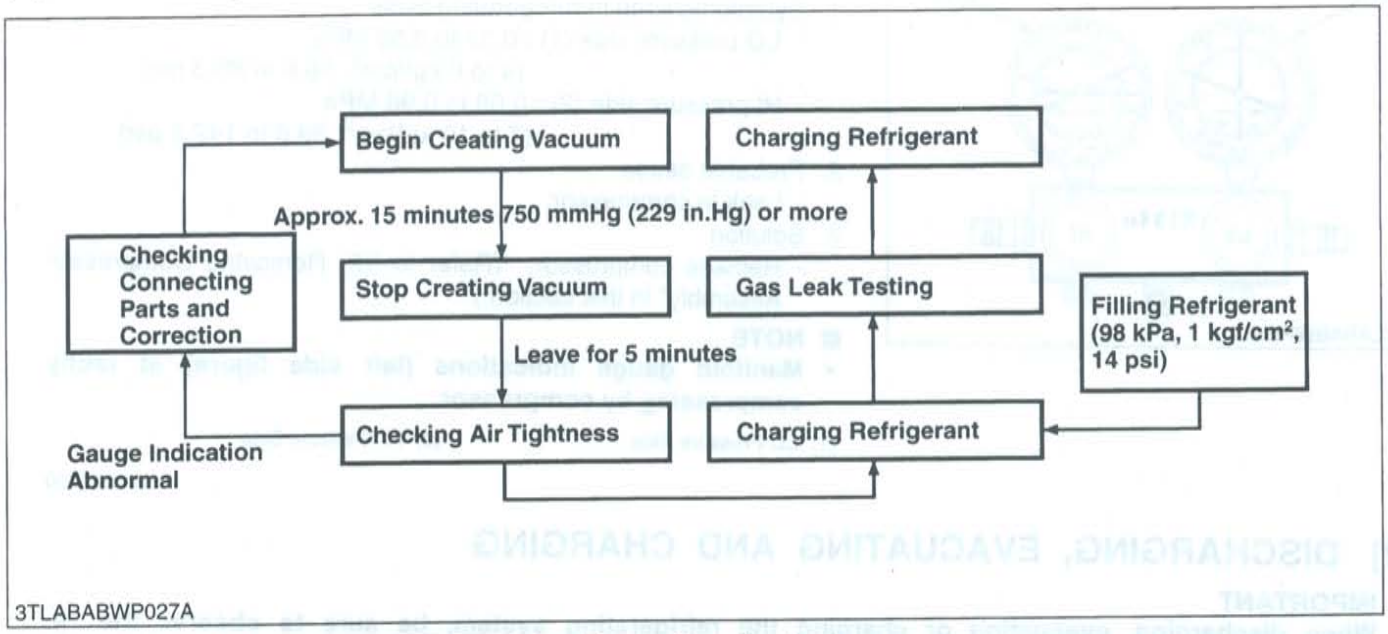
⚠ **CAUTION**

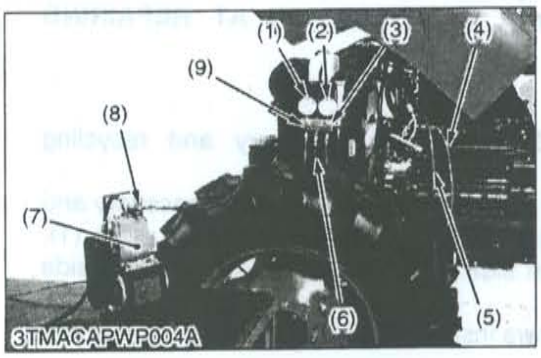
- **Protect fingers and eyes with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.**

(1) **LO** Pressure Side Charging Valve
(2) **HI** Pressure Side Charging Valve
(3) Compressor
(4) Charging Hose (Blue)
(5) Charging Hose (Red)
(6) **HI** Pressure Side Valve
(7) **LO** Pressure Side Valve
(8) Manifold Gauge
(9) Refrigerant Recovery and Recycling Machine

W1018328

(2) Evacuating the System





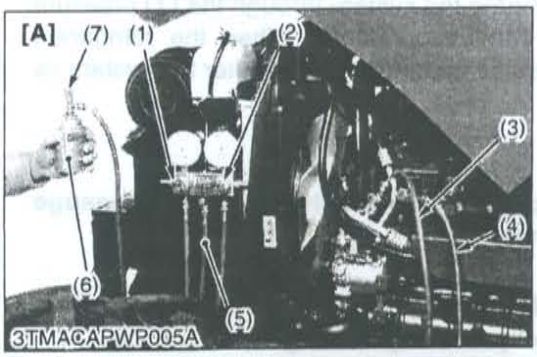
Evacuating the System

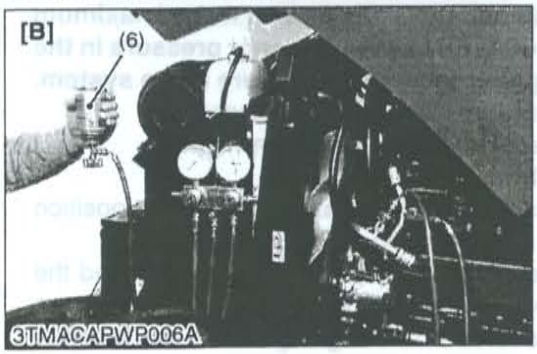
1. Discharge refrigerant from the system by R134a refrigerant recovery and recycling machine. (Refer to "(1) Discharging the Refrigerant" in this section.)
2. Connect the charging hose (red) (4) to the **HI** pressure side charging valve and connect the charging hose (blue) (5) to the **LO** pressure side charging valve.
3. Connect the center charging hose (green) (6) to a vacuum pump inlet.
4. Open both valves (3) and (9) of manifold gauge fully. Then run the vacuum pump (7) to evacuate the refrigerant cycle. (For approx. 15 minutes.)
5. When **LO** pressure gauge (1) reading is more than 750 mmHg (299 in.Hg), stop the vacuum pump (7) and close both valves (3), (9) of manifold gauge fully.
6. Wait for over 5 minutes with the **HI** and **LO** pressure side valves (3) and (9) of gauge manifold closed, and then check that gauge indicator does not return to 0.
7. If the gauge indicator is going to approach to 0, check whether there is a leaking point and repair if it is, and then evacuate it again.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **HI** Pressure Side Valve
(4) Charging Hose (Red)
(5) Charging Hose (Blue)
(6) Charging Hose (Green)
(7) Vacuum Pump
(8) Vacuum Pump Adaptor
(9) **LO** Pressure Side Valve

W1018495

(3) Charging the Refrigerant





Charging an Empty System (Liquid)

This procedure is for charging an empty system through the **HI** pressure side with the refrigerant in the liquid state.

⚠ CAUTION

- **Never run the engine when charging the system through the HI pressure side.**
- **Do not open the LO pressure valve when refrigerant R134a is being charged in the liquid state (refrigerant container is placed upside-down).**

■ IMPORTANT

- **After charging the refrigerant in the liquid state with approx. 500 g (1.1 lbs) through the HI pressure side, be sure to recharge the refrigerant in the vapor state to specified amount through the LO pressure side.**

1. Close the **HI** and **LO** pressure side valves (1) and (2) of manifold gauge after the system is evacuated completely.
2. Connect the center charging hose (green) (5) to the can tap valve (7) fitting, and then loosen the center charging hose (green) (5) at the center fitting of manifold gauge until hiss can be heard. Allow the air to escape for few seconds and tighten the nut.
3. Open the **HI** pressure side valve (2) fully, and keep the container upside-down to charge the refrigerant in the liquid state from the **HI** pressure side.
4. Charge the refrigerant in the liquid state with approx. 500 g (1.1 lbs) from the **HI** pressure side.

■ NOTE

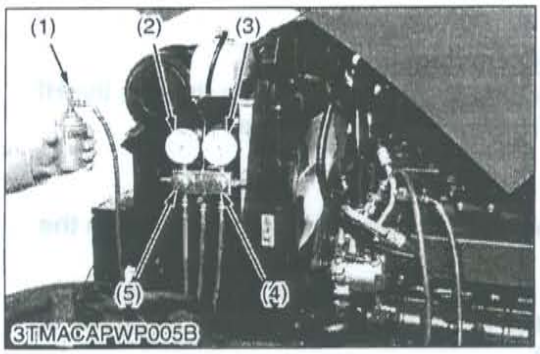
- **If LO pressure gauge does not show a reading, the system is clogged and must be repaired.**

5. Close the **HI** pressure side valve (2) of manifold gauge and can tap valve of refrigerant container.

(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Charging Hose (Red)
(4) Charging Hose (Blue)
(5) Charging Hose (Green)
(6) Refrigerant Container (R134a)
(7) Can Tap Valve

(A) Refrigerant Container "Upside"
(B) Refrigerant Container "Down Side"

W1018931



Charging an Empty or Partially Charged System (Vapor)

This procedure is to charge the system through the **LO** pressure side with refrigerant in the vapor state. When the refrigerant container is placed right side up, refrigerant will enter the system as a vapor.

⚠ CAUTION

- **Never open the HI pressure side valve of manifold gauge while the engine is running.**

■ NOTE

- **Do not turn the refrigerant container upside-down when charging the system by running the engine.**
- **Put refrigerant container into a pan of warm water (maximum temperature 40 °C (104 °F)) to keep the vapor pressure in the container slightly higher than vapor pressure in the system.**

1. Check that the **HI** pressure side valve (4) is closed.
2. Start the engine and set an approx. **1500 min^{-1} (rpm)**.
3. Turn on the A/C switch.
   Set the temperature control lever to **maximum cooling** position and the blower switch to **HI** position.
4. Open the **LO** pressure side valve (5) of manifold gauge and the can tap valve (1) on refrigerant container and charge the refrigerant until air bubbles in the sight glass of the receiver vanish.
5. After charging the specified amount of refrigerant into the system, close the **LO** pressure side valve (5) of manifold gauge and can tap valve (1), then stop the engine.
6. Check for gas leak with an electric gas leak tester. (Refer to "(4) Electric Gas Leak Tester" in this section.)

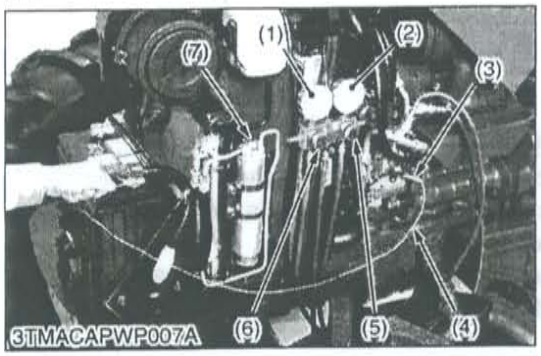
(Reference)

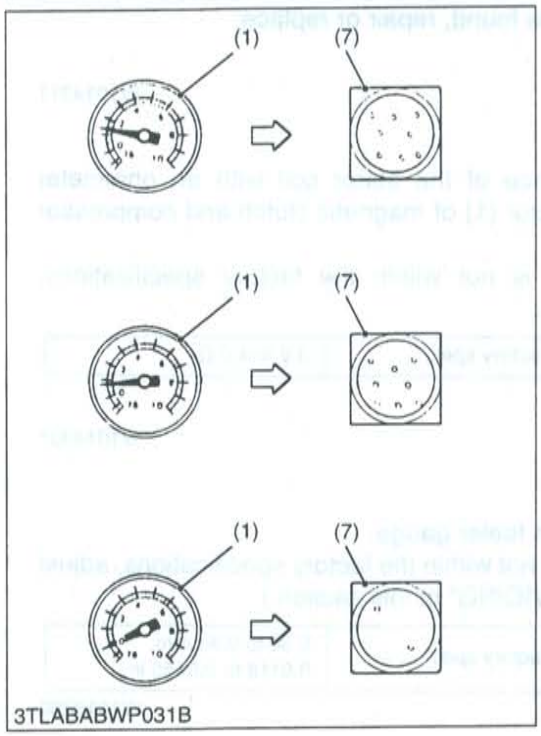
- Specified amount of refrigerant (total) :
- Manifold gauge indication at fully charged system (at ambient temperature: 30 °C (86 °F))
  HI pressure side : 1.27 to 1.66 MPa
  13 to 17 kgf/cm^2
  185 to 242 psi
  LO pressure side : 0.15 to 0.20 MPa
  1.5 to 2.0 kgf/cm^2
  21 to 28 psi

(1) Can Tap Valve
(2) **LO** Pressure Gauge
(3) **HI** Pressure Gauge
(4) **HI** Pressure Side Valve
(5) **LO** Pressure Side Valve

W1019245

(4) Checking Charge Refrigerant Amount





After charging the refrigerant, check for amount of charging refrigerant as follows.

■ **NOTE**

- **The pressure on the following checking is the gauge indications at ambient temperature 30 °C (86 °F), so it should be noted that the pressure will differ some what with the ambient temperature.**

1. Disconnect the **1P** connector (3) of magnetic clutch.
2. Start the engine and set a approx. **1500 min^{-1} (rpm)**.
3. Connect the **1P** connector (3) of magnetic clutch to battery directly, and then set the blower switch to **HI** position.
4. Leave the system for approx. **5 minutes** until the refrigerant cycle becomes stable, keeping pressure on the **HI** pressure side from 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi).
5. When the refrigerant cycle is stabilizer, turn off the blower switch and let the compressor alone to run. Then pressure on the **LO** pressure side gradually drops. At this time, if pressure on the **HI** pressure side is maintained from 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi), air bubbles which pass through the sight glass (7) becomes as stated below depending on refrigerant charged amount.

■ **Insufficient refrigerant charge**

Air bubbles pass continuously the sight glass when pressure on the **LO** pressure side is over 99.0 kPa (1.01 kgf/cm^2, 14.4 psi). In this case, charge the refrigerant from the **LO** pressure side.

■ **Properly refrigerant charge**

Air bubbles pass through the sight glass continuously when pressure on the **LO** pressure side is within 59 to 98 kPa (0.6 to 1.0 kgf/cm^2, 9 to 14 psi).

If the charge refrigerant amount is proper, no air bubble is observed on the sight glass at pressure on the **LO** pressure side over 99.0 kPa (1.01 kgf/cm^2, 14.4 psi) when the blower switch is turned on. When the blower switch is turned off, bubbles pass through the sight glass in case pressure on the **LO** pressure side is within 59 to 98 kPa (0.6 to 1.0 kgf/cm^2, 9 to 14 psi).

■ **Excessive refrigerant charge**

Air bubbles pass through the sight glass time to time or no air bubble is observed when pressure on the **LO** pressure side is under 59 kPa (0.6 kgf/cm^2, 9 psi).

In this case, discharge excessive refrigerant gradually from the **LO** pressure side.

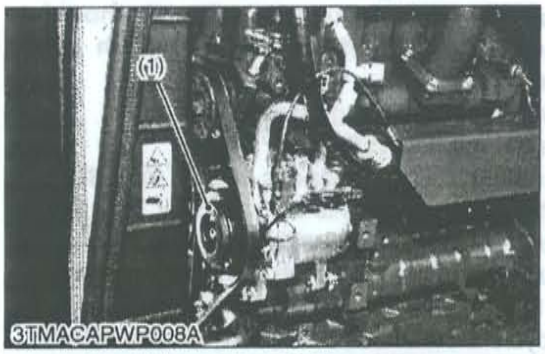
(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **1P** Connector
(4) To Battery
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve
(7) Sight Glass

W1019604

6. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Compressor

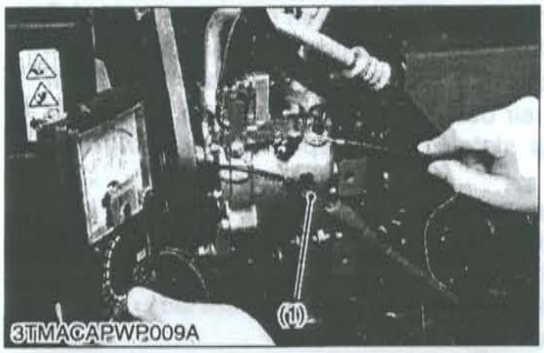


Operation of Magnetic Clutch

1. Turn off the A/C switch after starting the engine.
2. Check whether abrasion or abnormal noise is heard when only the magnetic clutch pulley is running.
3. Check that the magnetic clutch (1) does not slip when the A/C switch and blower switch are turned **ON** (when the air conditioner is in operation).
4. If anything abnormal is found, repair or replace.

(1) Magnetic Clutch

W1014211



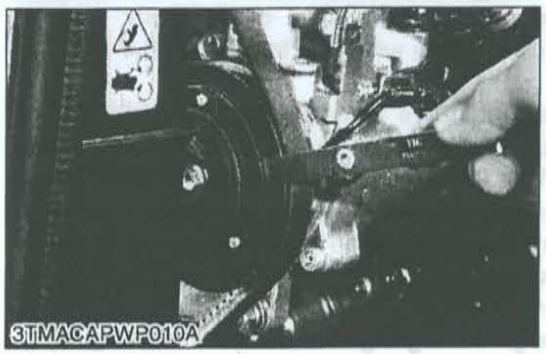
Stator Coil

1. Measure the resistance of the stator coil with an ohmmeter across the **1P** connector (1) of magnetic clutch and compressor body.
2. If the measurement is not within the factory specifications, replace the stator coil.

Stator coil resistance	Factory spec.	3.0 to 4.0 Ω

(1) **1P** Connector

W1014331



Air Gap

1. Check the air gap with feeler gauge.
2. If the measurement is not within the factory specifications, adjust it. (Refer to "[3] SERVICING" in this section.)

Air gap	Factory spec.	0.30 to 0.65 mm 0.0118 to 0.0255 in.

W1018230

(2) Relay (A/C Compressor, Front Working Light, Front Wiper, Blower, Blower Hi, ACC, Auxiliary Power)

Connector Voltage

1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

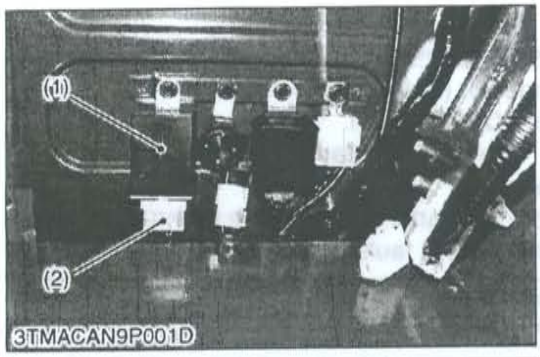
W1044440

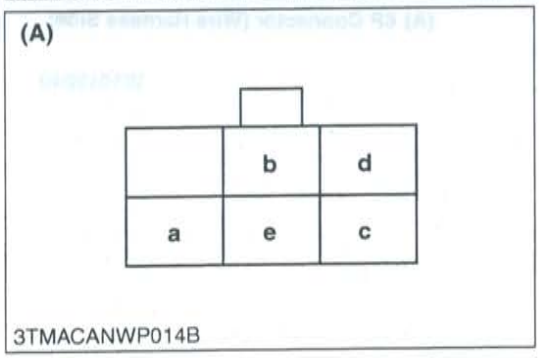
Relay Test

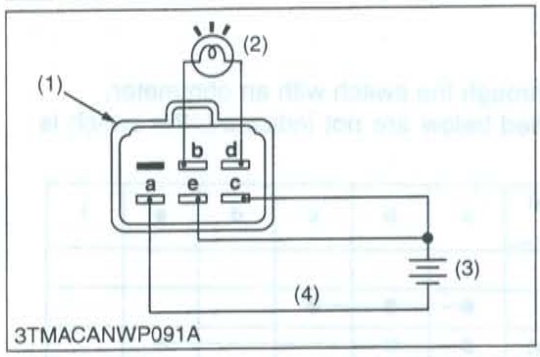
1. Refer to "4. CHECKING AND ADJUSTING" at "9. ELECTRICAL SYSTEM" section.

W1043756

(3) Wiper Relay







Connector Voltage

1. Disconnect the **6P** connector (2) from wiper relay (1).
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the connector terminal **c** and chassis.
4. Measure the voltage with a voltmeter across the connector terminal **e** and chassis.
5. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal **c** – chassis	Approx. battery voltage
	Terminal **e** – chassis	Approx. battery voltage

(1) Wiper Relay
(2) **6P** Connector

(A) 6P Connector (Wire Harness Side)

W1016209

Wiper Relay Checking

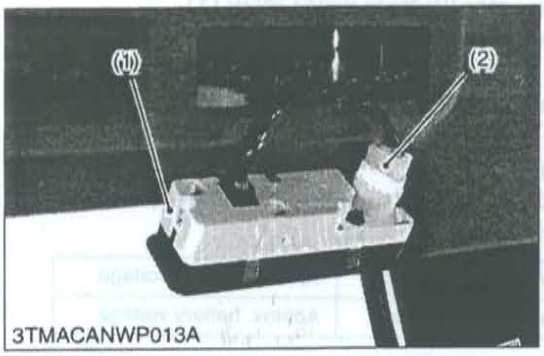
1. Remove the wiper relay.
2. Connect jumper leads across the wiper relay, bulb (2) and 12 V battery (3) as shown in the figure left.
3. When the jumper lead (4) is connected with terminal **a**, the bulb (2) should light up. When it is disconnected, the bulb (2) should light off.
4. If the bulb does not light up or light off correctly, the relay is faulty.

Ampere	Bulb	When jumper lead is connected	Light up
		When jumper lead is disconnected	Light off

(1) **6P** Connector (Wiper Relay Side)
(2) Bulb
(3) Battery
(4) Jumper Lead

W1019080

(4) Control Panel (Blower Switch, A/C Switch, Mode Control Dial, Temperature Control Dial and Recirculation/Fresh Air Selection Switch)



3TMACANWP013A

Blower Switch Connector Voltage

1. Disconnect the **6P** connector (2) from blower switch.
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the connector terminal **a** and terminal **b**.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay, fuse or main switch is faulty.

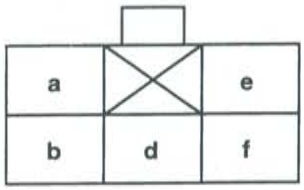
Voltage	Terminal **a** – Terminal **b**	Approx. battery voltage

(1) Control Panel
(2) **6P** Connector

(A) 6P Connector (Wire Harness Side)

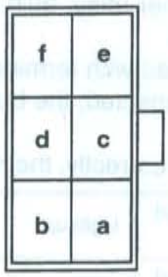
W1019240

(A)



3TMACANWP014A

(A)



3TMACANWP015A

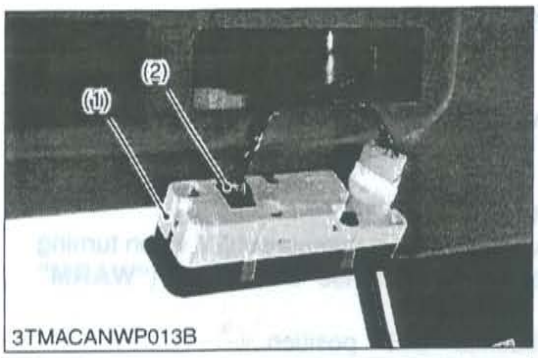
Blower Switch Test

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is faulty.

Position \ Terminal		a	b	c	d	e	f
A/C blower switch	OFF						
	● (Low)	●	●	●			
	● (Medium Low)	●	●			●	
	● (Medium High)	●	●				●
	● (High)	●	●		●		

(A) 6P Connector (Blower Switch Side)

W1019735



3TMACANWP013B

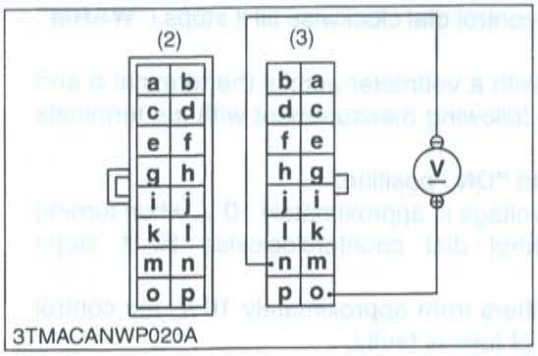
Connector Voltage

1. Disconnect the **16P** connector (2) from control panel switch.
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the terminal **o** and terminal **n**.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay or fuse is faulty.

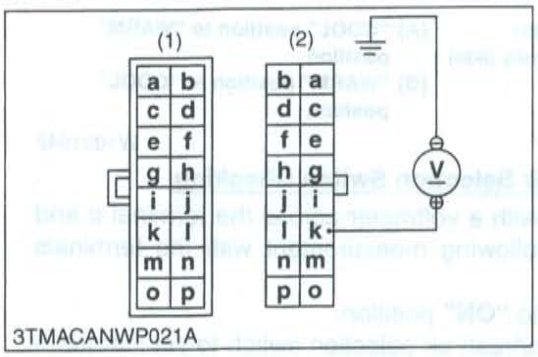
Voltage	Terminal **n** – Terminal **o**	Approx. battery voltage

(1) Control Panel
(2) **16P** Connector (Switch Side)
(3) **16P** Connector (Wire Harness Side)

W1020794



3TMACANWP020A



3TMACANWP021A

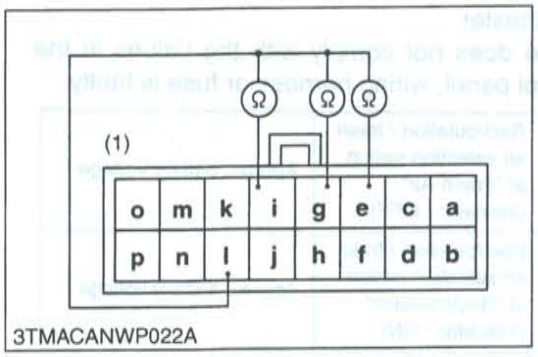
A/C Switch Checking

1. Measure the voltage with a voltmeter across the terminal **k** and chassis.
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch to **"ON"** position.
4. Press the air conditioner switch to set it to **"OFF"** position (indicator : OFF), and then measure a voltage using a circuit tester.
5. Press the air conditioner switch to set it at **"ON"** position (indicator : ON), and then measure a voltage using a circuit tester.
6. If a measured voltage does not comply with the values in the table below, the control panel, wiring harness or fuse is faulty.

Voltage	Terminal **k** – Chassis	A/C switch at **ON**	Approx. battery voltage
		A/C switch at **OFF**	Approx. 1 V

(1) **16P** Connector (Switch Side)
(2) **16P** Connector (Wire Harness Side)

W1020998



3TMACANWP022A

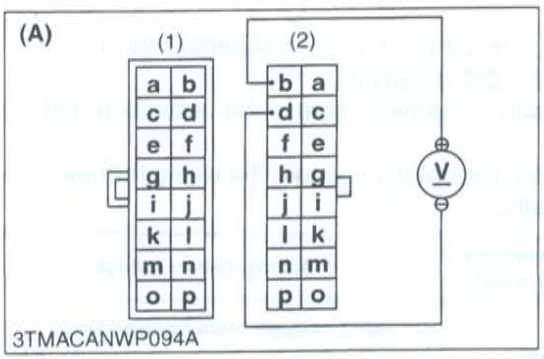
Mode Control Dial Checking

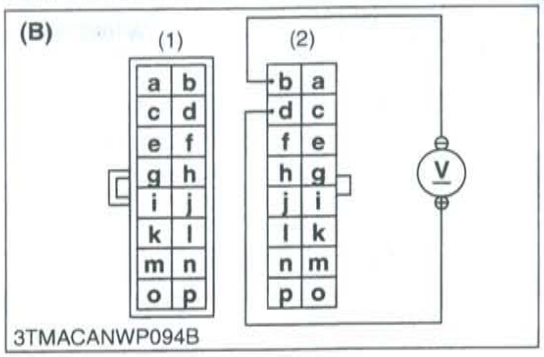
1. Disconnect the **16P** connector from control panel switch.
2. Check the continuity through the switch with an ohmmeter.
3. If the continuity specified below is not indicated, the switch is faulty.

Position \ Terminal		e	g	i	l
Mode switch	**FRONT**	●			●
	FULL		●		●
	DEF			●	●

(1) **16P** Connector (Switch Side)

W1042432





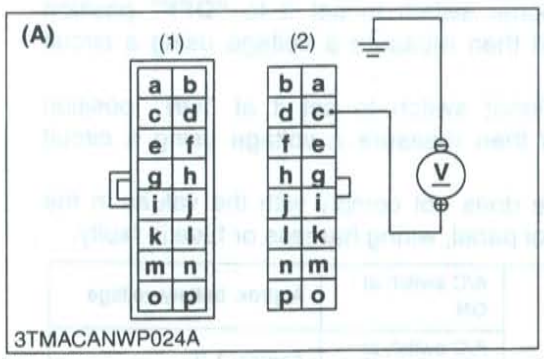
Temperature Control Dial Checking

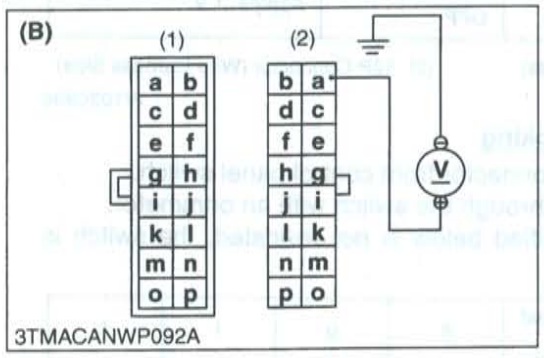
1. Turn the temperature control dial counterclockwise till it stops (at **"COOL"** position).
2. Measure the voltage with a voltmeter across the terminal **b** and terminal **d**. Make the following measurement with the terminals connected.
3. Turn the main switch to **"ON"** position.
4. Check that an output voltage is approximately 10 V when turning the temperature control dial clockwise till it stops (**"WARM"** position).
5. Turn the main switch back to **"OFF"** position.
6. Turn the temperature control dial clockwise till it stops (**"WARM"** position).
7. Measure the voltage with a voltmeter across the terminal **d** and terminal **b**. Make the following measurement with the terminals connected.
8. Turn the main switch to **"ON"** position.
9. Check that an output voltage is approximately 10 V, when turning the temperature control dial counterclockwise till it stops (**"COOL"** position).
10. If an output voltage differs from approximately 10 V, the control panel, wiring harness of fuse is faulty.

(1) **16P** Connector (Switch Side)
(2) **16P** Connector (Wire Harness Side)

(A) "COOL" position to "WARM" position
(B) "WARM" position to "COOL" position

W1021942





Recirculation / Fresh Air Selection Switch Checking

1. Measure the voltage with a voltmeter across the terminal **c** and chassis. Make the following measurement with the terminals connected.
2. Turn the main switch to **"ON"** position.
3. Press the recirculation/fresh air selection switch to set it at fresh air position (indicator : OFF), and then measure a voltage using a circuit tester.
4. Turn the main switch back to **"OFF"** position.
5. Measure the voltage with a voltmeter across the terminal **a** and chassis. Make the following measurement with the terminals connected.
6. Turn the main switch to **"ON"** position.
7. Press the recirculation/fresh air selection switch to set it at recirculation position (indicator : ON), and then measure a voltage using a circuit tester.
8. If a measured voltage does not comply with the values in the table below, the control panel, wiring harness or fuse is faulty.

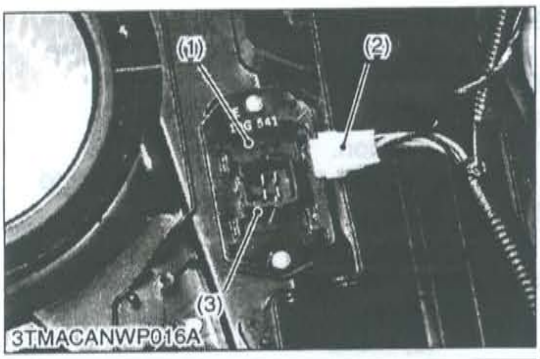
Voltage	Terminal **c** – Chassis	Recirculation / fresh air selection switch at "Fresh Air" (indicator : OFF)	Approx. battery voltage
	Terminal **a** – Chassis	Recirculation / fresh air selection switch at "Recirculation" (indicator : ON)	Approx. battery voltage

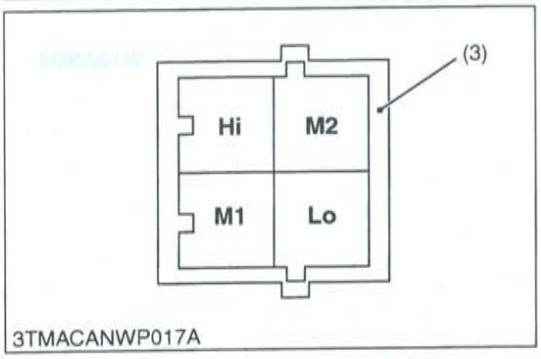
(1) **16P** Connector (Switch Side)
(2) **16P** Connector (Wire Harness Side)

(A) Fresh Air (Indicator : OFF)
(B) Recirculation (Indicator : ON)

W1022089

(5) Blower Resistor





Blower Resistor Check

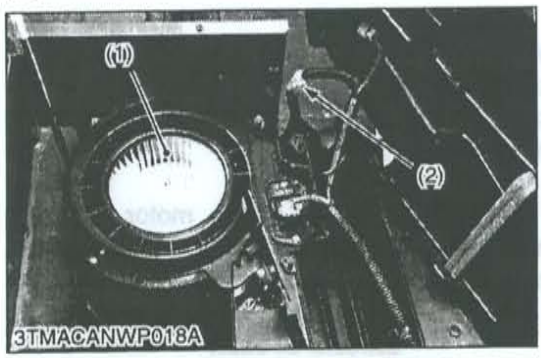
1. Disconnect the **4P** connector (2) from blower resistor (1).
2. Measure each resistance from terminal **Hi**.
3. If the factory specifications are not indicated, replace blower resistor.

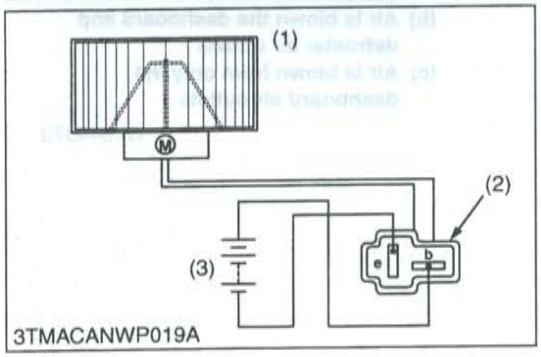
Resistance	Factory spec.	Terminal **Hi** – Terminal **M2**	Approx. 0.22 Ω
		Terminal **Hi** – Terminal **M1**	Approx. 0.69 Ω
		Terminal **Hi** – Terminal **Lo**	Approx. 1.69 Ω

(1) Blower Resistor
(2) **4P** Connector (Wire Harness Side)
(3) **4P** Connector (Blower Resistor Side)

W1020387

(6) Blower Motor





Blower Motor Test

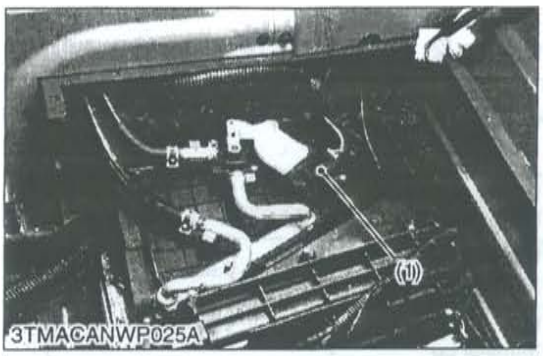
1. Turn the blower motor (1) by hand and check whether it turns smoothly.
2. Disconnect the **2P** connector (2) of blower motor (1).
3. Connect a jumper lead from battery (3) positive terminal to connector terminal **b**.
4. Connect a jumper lead from battery negative terminal to connector terminal **e** momentarily.
5. If the blower motor does not run, check the motor.

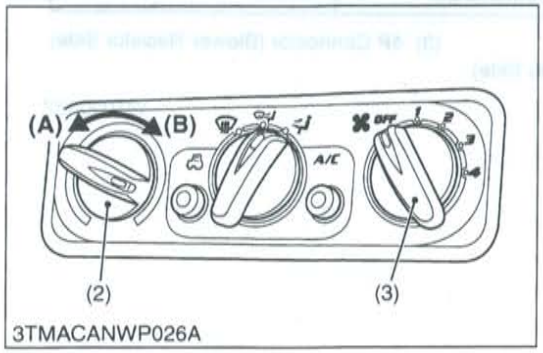
(1) Blower Motor
(2) **2P** Connector (Blower Motor Side)
(3) Battery (12 V)

b : Terminal b
e : Terminal e

W1020120

(7) Temperature Motor





Temperature Motor Checking

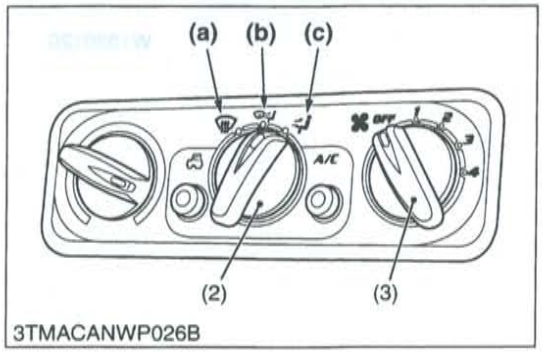
1. Confirm whether the temperature control dial (2) is defective. (Refer to "(4) Control Panel" in this section.)
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch (3) at **1** position.
4. Turn the temperature control dial from **"COOL"** position **(A)** to **"WARM"** position **(B)**. At the time, confirm the motor is operating.
5. If the motor does not operate, replace it.

(1) Temperature Motor
(2) Temperature Control Dial
(3) Blower Switch

(A) COOL
(B) WARM

W1023638

(8) Mode Motor



Mode Motor Checking

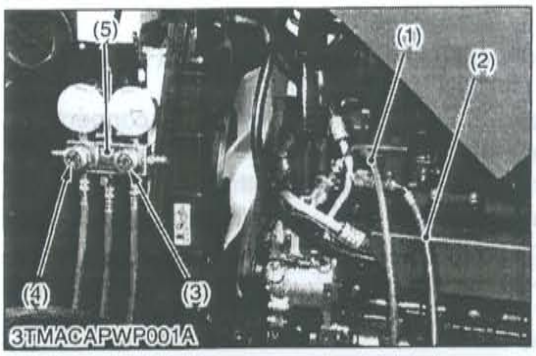
1. Confirm whether the mode switch (2) is defective. (Refer to "(4) Control Panel" in this section.)
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch at **1** position.
4. Turn the mode switch each **(a)**, **(b)** and **(c)**.
5. Confirm whether the position where the mode motor (1) is stopped synchronize with mode switch (2).
6. If the motor does not move, replace it.

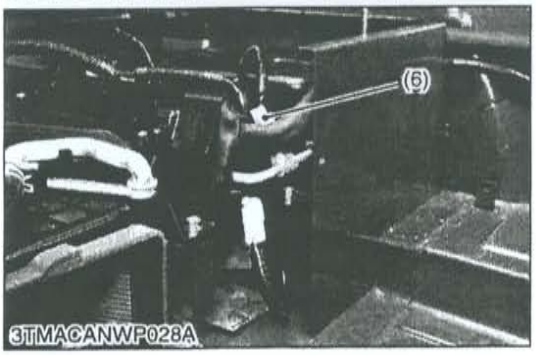
(1) Mode Motor
(2) Mode Switch
(3) Blower Switch

(a) Air is blown from only the defroster air outlet
(b) Air is blown the dashboard and defroster air outlets
(c) Air is blown from only the dashboard air outlets

W1044370

(9) Pressure Switch





Pressure Switch

1) HI Pressure Side

1. Connect the manifold gauge (5) to compressor as following procedure.
   Close the **HI** and **LO** pressure valves (3), (4) of manifold gauge tightly, and connect the charging hoses (2), (1) (red and blue) to the respective compressor service valves. (Refer to "[1] HANDLING OF SERVICE TOOLS" in this section)

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.**

2. Start the engine and set at approx. 1500 min^{-1} (rpm). Turn on the A/C switch, then set the blower switch to **HI** position.
3. Raise pressure on the **HI** pressure side of the refrigerant cycle by covering the condenser front with a corrugated carboard, and the pressure switch is activated and the compressor magnetic clutch is turned off. At this time, read the **HI** pressure gauge of the manifold gauge. If this pressure reading differs largely with the setting pressure, replace the pressure switch with a new one.

Setting pressure	Factory spec.	Pressure switch **OFF**	More than approx. 3.14 MPa 32 kgf/cm^2 455 psi

2) LO Pressure Side

1. Disconnect **2P** connector (6) of pressure switch.
2. Measure the resistance with an ohmmeter across the connector terminals.
3. If 0 ohm is not indicated at normal condition, there is no refrigerant in the refrigerating cycle because gas leaks or pressure switch is defective.

(Reference)

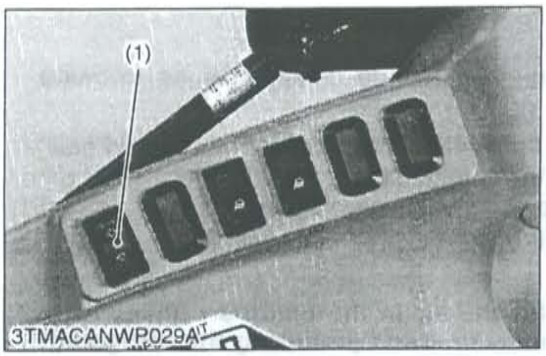
Setting pressure	Factory spec.	Pressure switch **OFF**	Less than approx. 0.196 MPa 2.0 kgf/cm^2 28.4 psi

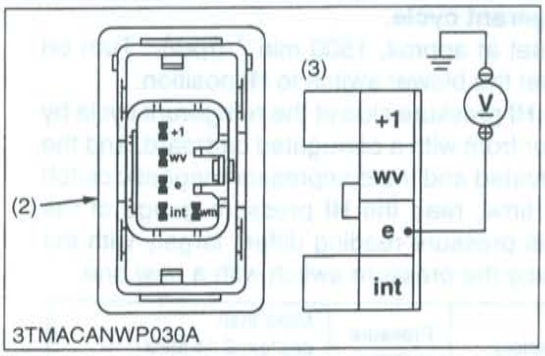
- The resistance of pressure switch is 0 ohm in normal condition, but it becomes infinity if the pressure is out of factory spec.. Because the pressure switch starts to work.

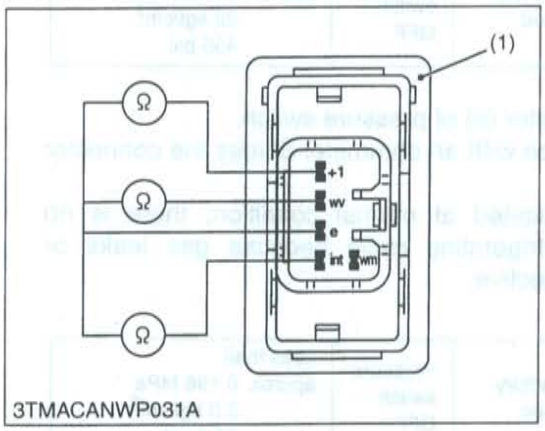
(1) Charging Hose (Blue)
(2) Charging Hose (Red)
(3) **HI** (High Pressure Side) Charging Valve
(4) **LO** (Low Pressure Side) Charging Valve
(5) Manifold Gauge
(6) **2P** Connector

W1020509

(10) Front Wiper Switch







Connector Voltage

1. Disconnect the **6P** connector from front wiper switch (1).
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the connector terminal **e** of wiring harness side and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal **e** – Chassis	Approx. battery voltage

(1) Front Wiper Switch
(2) **6P** Connector (Switch Side)
(3) **6P** Connector (Wire Harness Side)

W1022044

Front Wiper Switch Checking

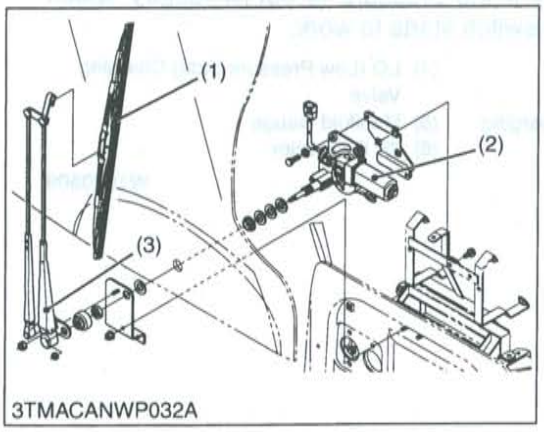
1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position \ Terminal		int	+1	e	wv	wm
Front wiper switch	**WASH** I		●	●	●	●
	ON		●	●		
	OFF					
	INT	●		●		
	WASH II	●		●	●	●

(1) **6P** Connector (Switch Side)

W1021874

(11) Front Wiper Motor



Front Wiper Motor

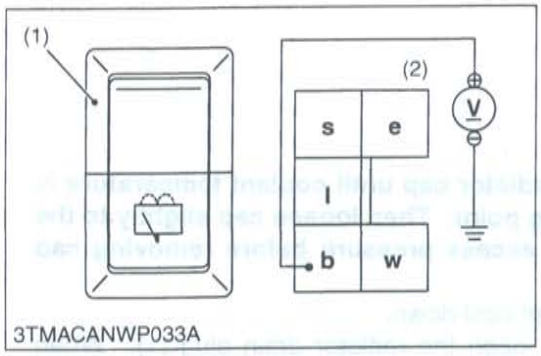
1. Raise up the front wiper arm (3).
2. Turn the main switch to **"ON"** position.
3. Push the front wiper switch to **"ON"** position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

No. of wiper arm swing frequency at no load	Factory spec.	25 to 43 times/min.

(1) Wiper Blade
(2) Wiper Motor
(3) Wiper Arm

W1022632

(12) Rear Wiper Switch (If Equipped)



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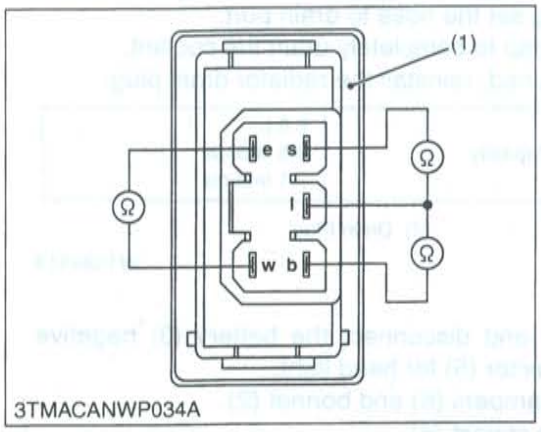


3TMACANWP034A

Connector Voltage

1. Disconnect the **5P** connector from rear wiper switch (1).
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the connector terminal **b** of the wiring harness side and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal **b** – Chassis	Approx. battery voltage

(1) Rear Wiper Switch (2) **5P** Connector (Switch Side)

W1024597

Rear Wiper Switch Checking

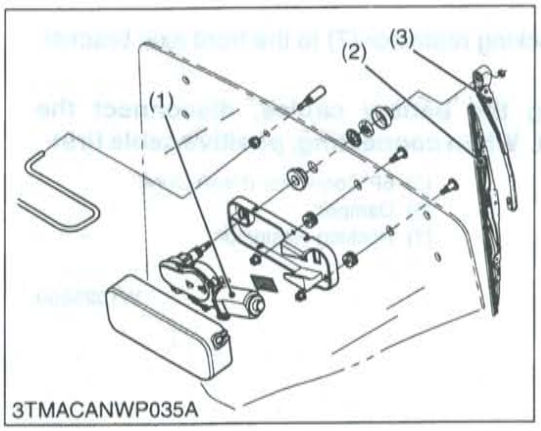
1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position \ Terminal		e	w	b	l	s
Rear wiper switch	**WASH I**	●	●		●	●
	ON			●	●	
	OFF				●	●
	WASH II	●	●	●	●	

(1) **5P** Connector (Switch Side)

W1023782

(13) Rear Wiper Motor (If Equipped)



3TMACANWP035A

Rear Wiper Motor

1. Raise up the rear wiper arm (3).
2. Turn the main switch to **"ON"** position.
3. Push the front wiper switch to **"ON"** position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

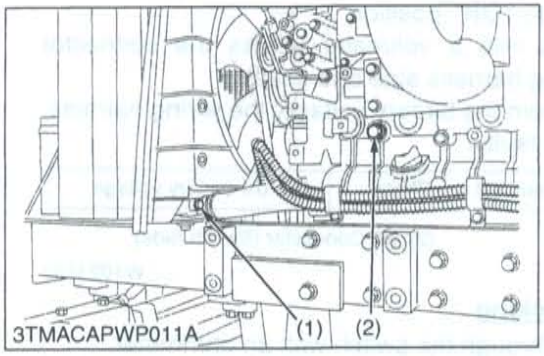
No. of wiper arm swing frequency at no load	Factory spec.	25 to 43 times/min.

(1) Wiper Motor (3) Wiper Arm
(2) Wiper Blade

W1024574

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Cabin from Tractor



Draining Coolant

⚠ CAUTION

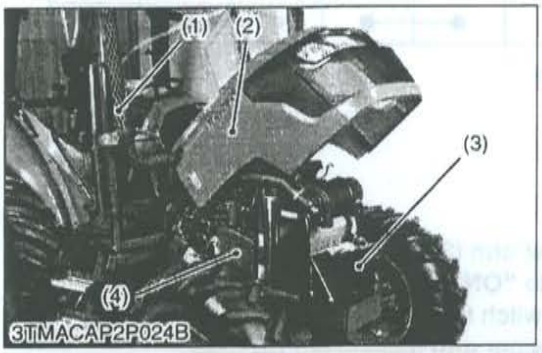
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. To drain the coolant, open the radiator drain plug (1). When opening the drain plug set the hose to drain port.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

Coolant	Capacity	8.0 L 8.5 U.S.qts 7.1 Imp.qts

(1) Drain Plug (2) Drain Plug

W1024819

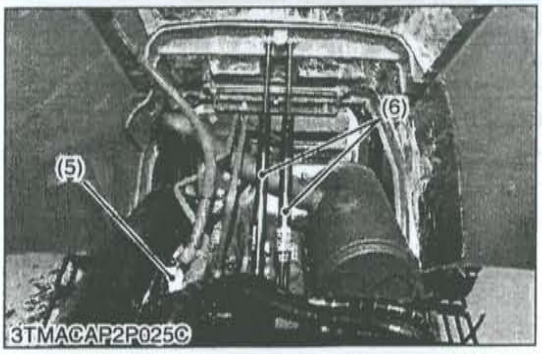


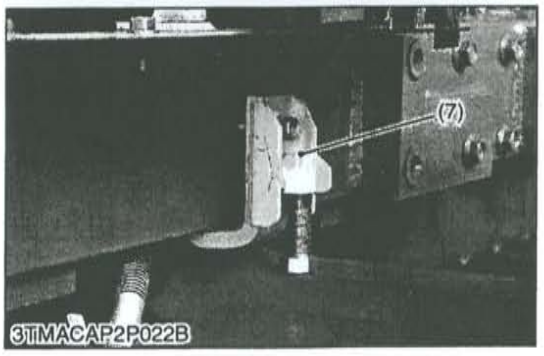
Preparation 1

1. Open the bonnet (2) and disconnect the battery (3) negative terminal and **6P** connector (5) for head light.
2. Remove the bonnet dampers (6) and bonnet (2).
3. Remove the both side covers (4).
4. Remove the muffler pipe (1) mounting screws and remove the muffler pipe (1).
5. Install the front axle rocking restrictor (7) to the front axle bracket.

■ IMPORTANT

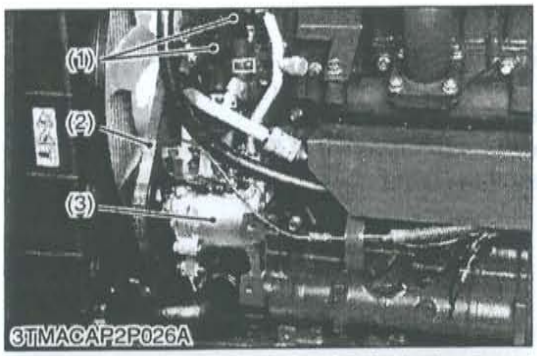
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, positive cable first.**

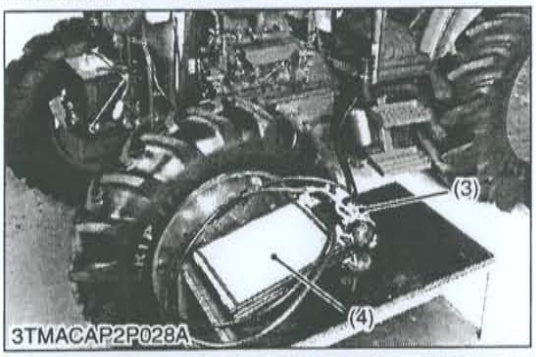


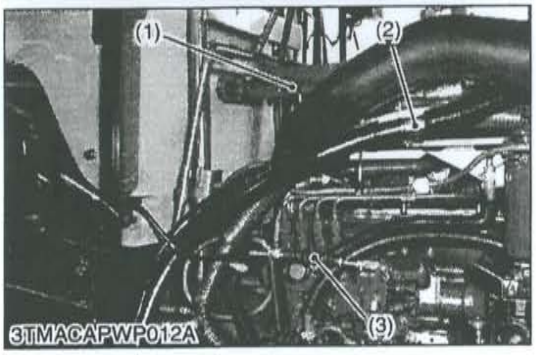


(1) Muffler Pipe
(2) Bonnet
(3) Battery
(4) Side Cover
(5) **6P** Connector (Head Light)
(6) Damper
(7) Rocking Restrictor

W1025500







Preparation 2

■ **Without discharging the refrigerant from system**

1. Remove the air conditioner belt (2).
2. Remove the compressor (3) and condenser (4) without removing the air conditioner hoses.
3. Disconnect the heater hoses (1).

(When reassembling)

- Take care not to damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the air condenser belt tension. (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.)

(1) Heater Hose
(2) Belt
(3) Compressor
(4) Condenser

W1029723

Preparation 3

1. Remove the steering joint shaft (1).
2. Remove the hose clamp (2).
3. Disconnect the accelerator wire (3).

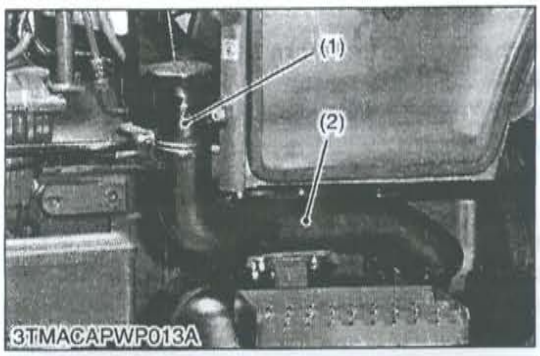
(When reassembling)

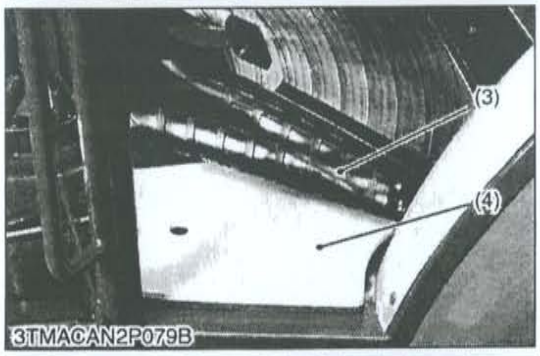
- Be sure to fix the heater hose to the original position. Note the inlet hose and outlet hoses.

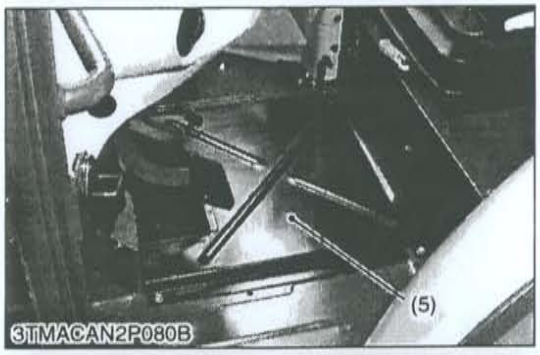
Tightening torque	Power steering joint shaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs

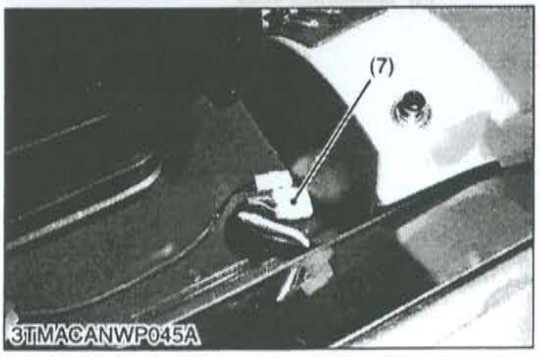
(1) Power Steering Joint Shaft
(2) Hose Clamp
(3) Accelerator Wire

W1052713







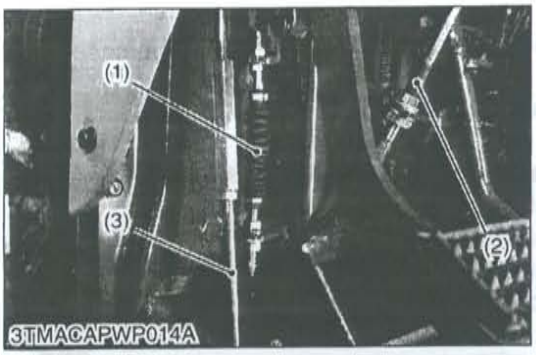


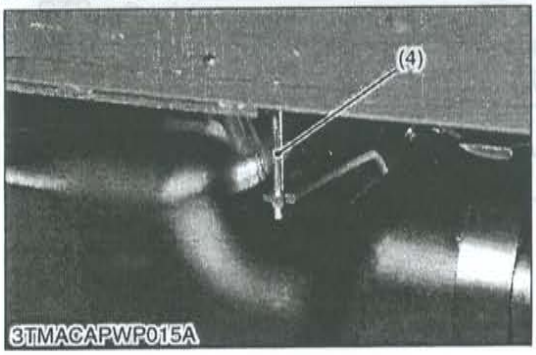
Preparation 4

1. Remove the fuel filling port (1).
2. Remove the floor mat 1 (3) and mat 2 (4).
3. Remove the floor cover (5).
4. Disconnect the connectors (6) and pull out them from cabin.
5. Disconnect the connector (7) and pull out them from cabin.

(1) Fuel Filling Port
(2) Fuel Filling Hose
(3) Floor Mat 1
(4) Floor Mat 2
(5) Floor Cover
(6) Connector
(7) Connector

W1027792





Preparation 5

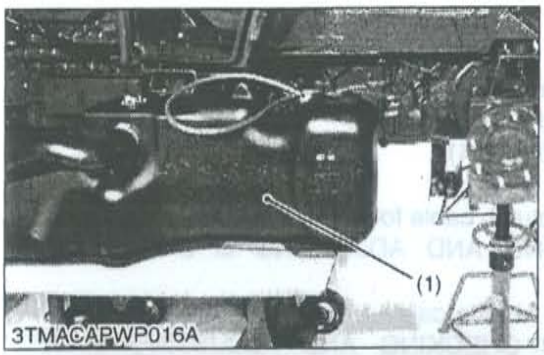
1. Disconnect the clutch cable (1).
2. Disconnect the shuttle cable (2).
3. Remove the brake rod (3) (R.H., L.H.).
4. Remove the 4WD shift rod (4).

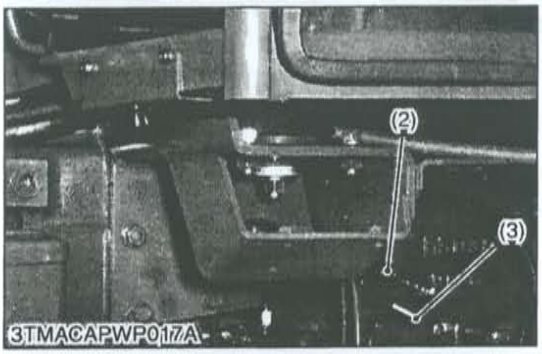
(When reassembling)

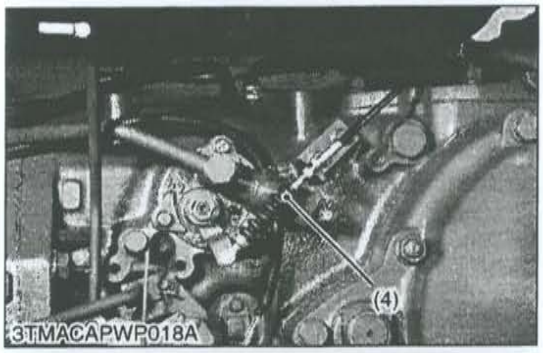
- Be sure to adjust the clutch cable for the clutch pedal free travel. (Refer to "4. CHECKING AND ADJUSTING" at "2. CLUTCH" section.)
- Be sure to adjust the shuttle cable for the shuttle lever neutral position. (Refer to "4. CHECKING AND ADJUSTING" at "3. TRANSMISSION" section.)

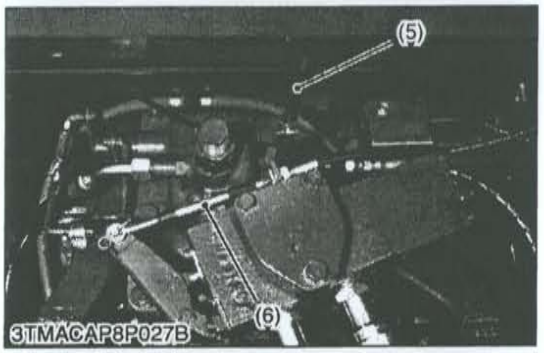
(1) Clutch Cable
(2) Shuttle Cable
(3) Brake Rod
(4) 4WD Shift Rod

W1028272









Preparation 6

1. Place the disassembling stand under the transmission case and drawbar bracket.
2. Remove the rear wheels (R.H., L.H.).
3. Remove the fuel tank (1).
4. Disconnect the shuttle cable (2) and clutch cable (3).
5. Disconnect the PTO clutch cable (4).
6. Disconnect the auxiliary control wire (6).
7. Disconnect the lowering speed adjusting rod (5).
8. Disconnect the ground cable (7).

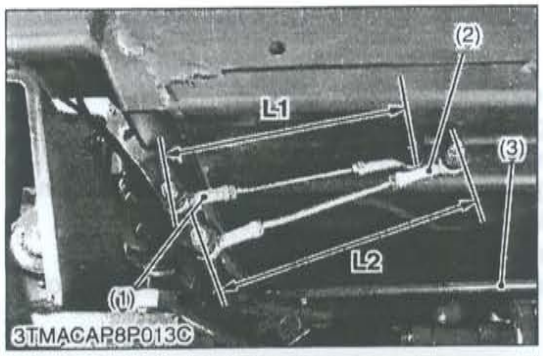
(When reassembling)

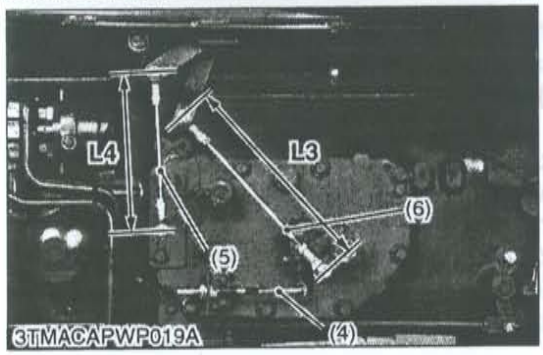
- Be sure to adjust the PTO clutch lever movement by the PTO clutch cable (4). (Refer to "4. CHECKING AND ADJUSTING" at "2. CLUTCH" section.)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 191.8 to 224.2 ft-lbs

(1) Fuel Tank
(2) Shuttle Cable
(3) Clutch Cable
(4) PTO Clutch Cable
(5) Lowering Speed Adjusting Rod
(6) Auxiliary Control Wire
(7) Ground Cable

W1031848





Preparation 7

1. Disconnect the position control rod (1) and draft control rod (2).
2. Disconnect the select cable (4).
3. Remove the differential lock rod (3).
4. Disconnect the range gear shift rod (5).
5. Disconnect the main gear shift rod (6).

■ **NOTE**

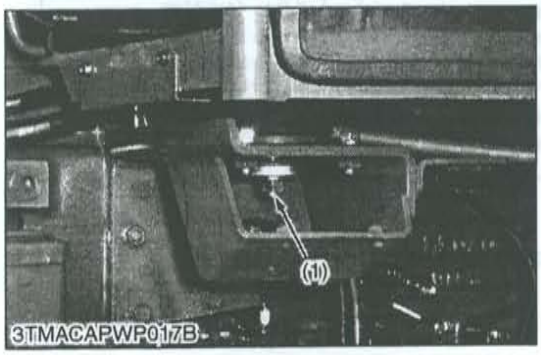
- **After assembling check the speed change lever movement and adjust them if necessary.**
- **After assembling check the hydraulic control system. (Refer to "4. CHECKING AND ADJUSTING" at "8. HYDRAULIC SYSTEM" section.)**

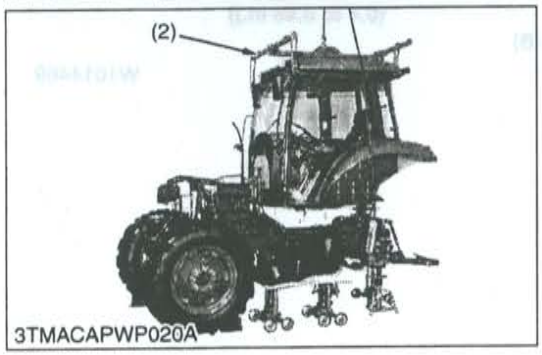
(When reassembling)

Length (**L1**)	Factory spec.	Approx. 185 mm 7.283 in.
Length (**L2**)	Factory spec.	Approx. 182 mm 7.165 in.
Length (**L3**)	Factory spec.	Approx. 368 mm 14.5 in.
Length (**L4**)	Factory spec.	Approx. 193 mm 7.6 in.

(1) Position Control Rod
(2) Draft Control Rod
(3) Differential Lock Rod
(4) Select Cable
(5) Range Gear Shift Rod
(6) Main Gear Shift Rod

W1035187





Dismounting Cabin

1. Remove the cabin mounting all screws and nut (1).
2. Set the cabin dismounting tool (2) to the cabin.
3. Dismounting the cabin from tractor body.

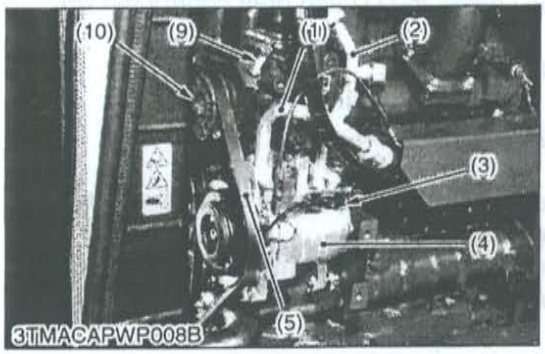
(When reassembling)

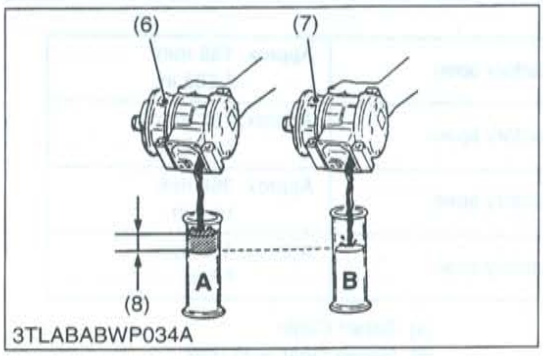
Tightening torque	Cabin mounting screw and nut	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 ft-lbs

(1) Cabin Mounting Nut
(2) Cabin Dismounting Tool

W1029973

(2) Removing Compressor Assembly





Compressor Assembly

1. Discharge the refrigerant from the system. (Refer to "(1) Discharging the Refrigerant" in this section.)
2. Disconnect the low pressure pipe (suction) (1) and high pressure pipe 1 (discharge) (2) from the compressor, then cap the open fitting immediately to keep moisture out of the system.
3. Disconnect the **1P** connector (3) of magnetic clutch.
4. Remove the air conditioner belt (5) and remove the compressor (4) with stay.

(When reassembling)

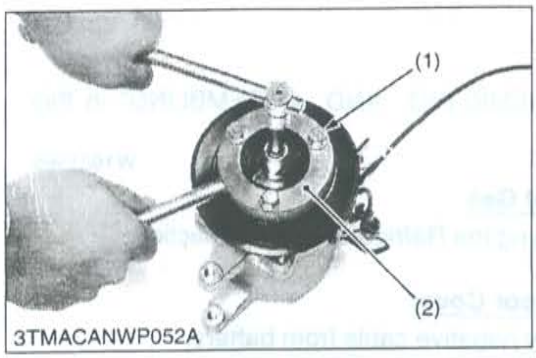
- After reassembling the compressor, be sure to adjust the air conditioner belt tension and recharge the refrigerant to the system. (Refer to "(3) Charging the Refrigerant" in this section.)
- Apply compressor oil (DENSO CO. ND-OIL8 or equivalent) to the O-rings and take care not to damage them.
- **"S"** letter is marked on the compressor for connecting the low pressure pipe (suction side).
- **"D"** letter is marked on the compressor for connecting the high pressure pipe (discharge side).
- When replacing the compressor with a new one, meet the oil amount with old one.
- Push on the belt between the pulleys with a finger. Deflection (**L**) of 10 to 12 mm (0.4 to 0.48 in.) under a 98 N (10 kgf, 22 lbs) load is appropriate.

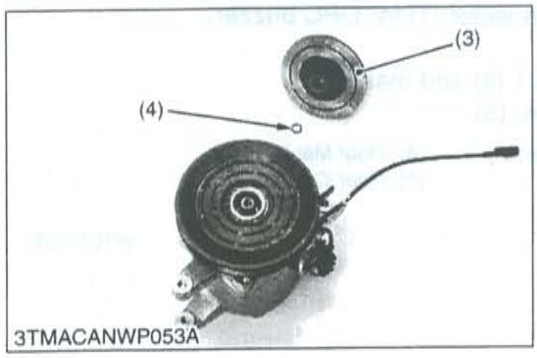
Tightening torque	High pressure pipe 1 and low pressure pipe mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs
	Compressor mounting screws	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

(1) Low Pressure Pipe
(2) High Pressure Pipe 1
(3) **1P** Connector (Magnetic Clutch)
(4) Compressor
(5) Air Conditioner Belt
(6) New Compressor
(7) Old Compressor
(8) Remove the Excess Oil (**A-B**)
(9) Adjusting Bolt
(10) Lock Nut

A : Oil Flow New Compressor
B : Oil Flow Replace Compressor
L : Deflection (10 to 12 mm (0.4 to 0.48 in.))

W1014469





Hub Plate

1. Three stopper bolts (1) are set in stopper magnet clutch (2) at the position corresponding to the shape of compressor. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. The stopper magnet clutch (2) is hung on hub plate (3) and it is fixed that the compressor rotates.
3. Remove the magnetic clutch mounting screw.
4. Remove the hub plate (3) and air gap adjustment shim (4).

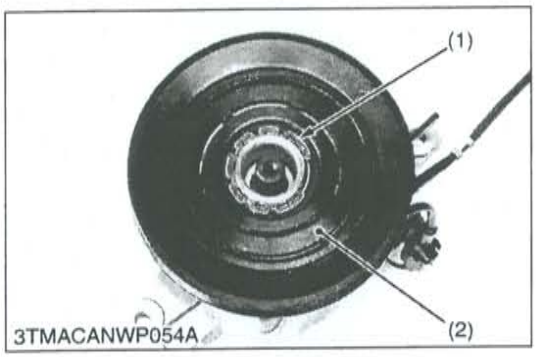
(When reassembling)

- Do not apply grease or oil on the hub plate facing.
- Do not use the magnetic clutch mounting screw again.
- It is confirmed to turn rotor by hand after assembling and not contact with stator and hub plate.
- Check and adjust the air gap before tight the magnet clutch mounting screw to the specified torque. (Refer to "[3] SERVICING" in this section.)

Tightening torque	Magnetic clutch mounting screw	15.0 to 21.0 N·m 1.5 to 2.1 kgf·m 11.1 to 15.5 ft-lbs

(1) Stopper Bolt
(2) Stopper Magnet Clutch
(3) Hub Plate
(4) Shim

W1059166



Rotor

1. Remove the external circlip (1).
2. Remove the rotor (2).

(When reassembling)

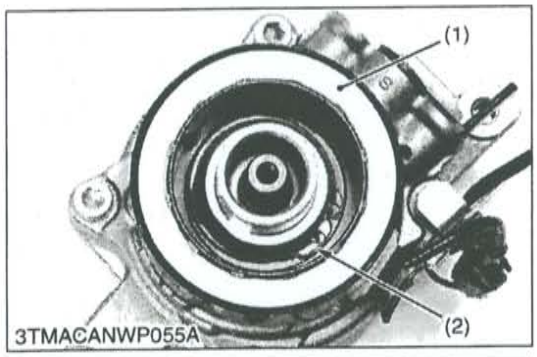
- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of rotor.
- The width of expanding of external circlip is set in boss of shaft as a minimum.

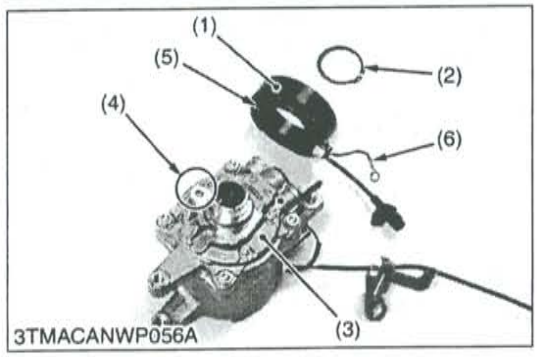
(Reference)

- Code No. for external circlip : T1065-87450

(1) External Circlip
(2) Rotor

W1059753





Stator

1. Remove the lead wire (6) from compressor body.
2. Remove the external circlip (2).
3. Remove the stator (1).

(When reassembling)

- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of front housing.
- The width of expanding of external circlip is set is boss of shaft as a minimum.
- Match and assemble the concave part (4) of the front housing (3) and the pin (5) of stator.

(Reference)

- Code No. for external circlip : T1065-87440

(1) Stator
(2) External Circlip
(3) Front Housing
(4) Concave Part
(5) Pin
(6) Lead Wire

W1059953

(3) Removing Air Conditioner Unit

Draining Coolant

1. Refer to "[2] DISASSEMBLING AND ASSEMBLING" in this section.

W1031565

Discharging Refrigerant Gas

1. Refer to "(1) Discharging the Refrigerant" in this section.

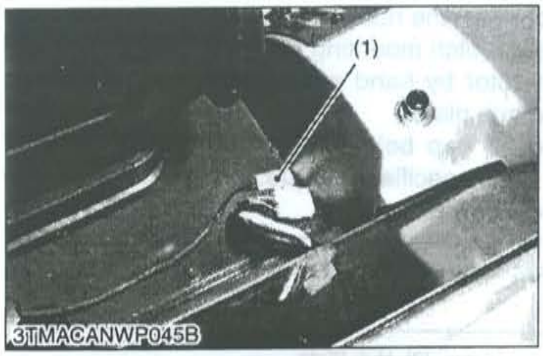
W1031483

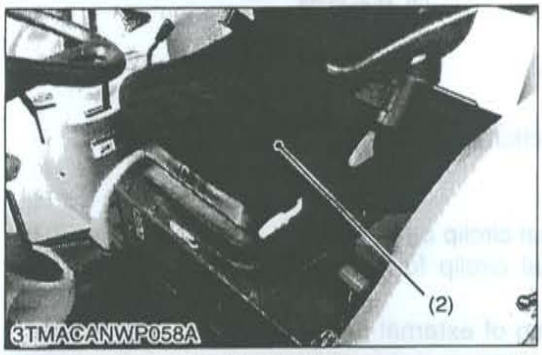
Seat, Floor Mats and Floor Cover

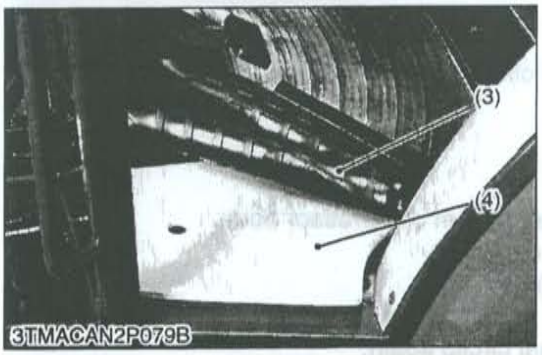
1. Disconnect the battery negative cable from battery.
2. Disconnect the **2P** connector (1) for OPC buzzer.
3. Remove the seat (2).
4. Remove the floor mat 1 (3) and mat 2 (4).
5. Remove the floor cover (5).

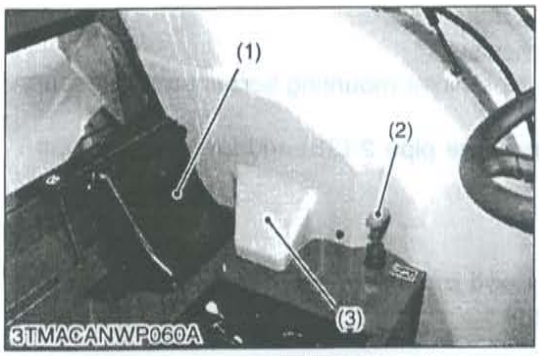
(1) **2P** Connector (OPC Buzzer)
(2) Seat
(3) Floor Mat 1
(4) Floor Mat 2
(5) Floor Cover

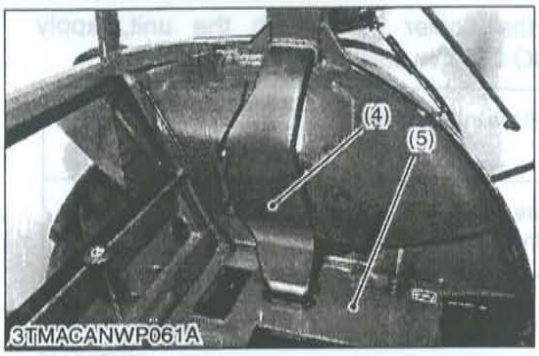
W1031630

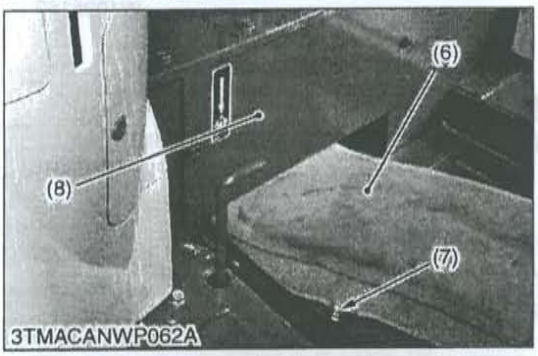










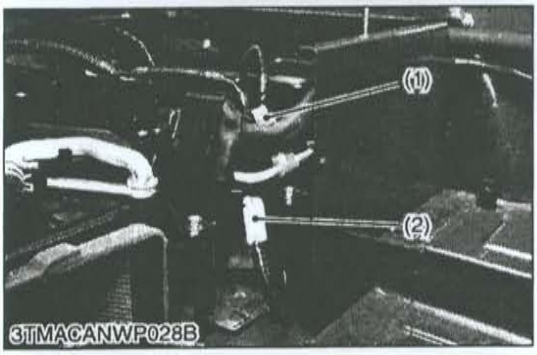


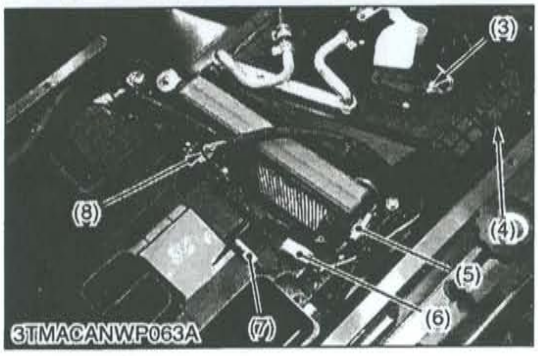
Air Conditioner Ducts and Covers

1. Remove the duct 1 (1).
2. Remove the DT shift lever grip (2).
3. Remove the inner cover (L.H.) (3).
4. Remove the duct 2 (4).
5. Remove the seat under cover 1 (5).
6. Remove the seat under cover 2 (8).
7. Remove the duct 3 mounting screw (7) for removing duct 3 (6).

(1) Duct 1
(2) DT Shift Lever Grip
(3) Inner Cover (L.H.)
(4) Duct 2
(5) Seat Under Cover 1
(6) Duct 3
(7) Screw
(8) Seat Under Cover 2

W1031865



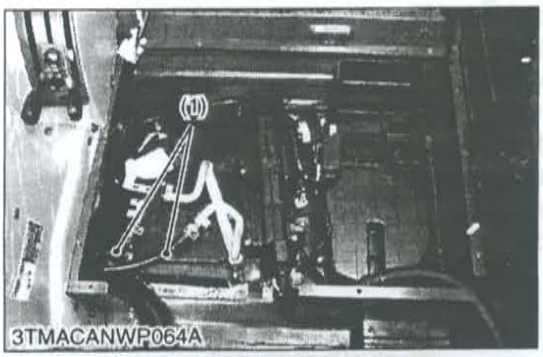


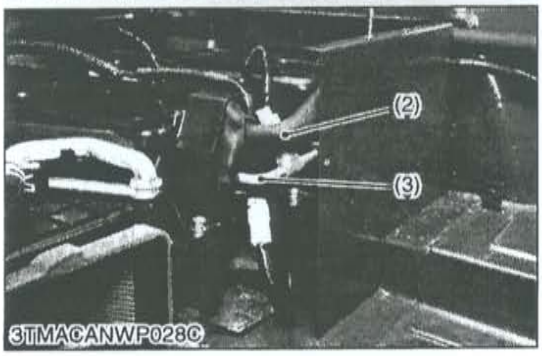
Wiring Harness

1. Disconnect the **2P** connector (1) for pressure switch.
2. Disconnect the **2P** connector (2) for blower motor.
3. Disconnect the **4P** connector (8) for blower resistor.
4. Disconnect the **5P** connector (7) for recirculation/fresh air selection motor.
5. Disconnect the **7P** connector (3) for air mix control motor.
6. Disconnect the **1P** connector (5) for thermistor.
7. Disconnect the **5P** connector (6) for thermostat.
8. Disconnect the relay box (4) from cabin.

(1) **2P** Connector (Pressure Switch)
(2) **2P** Connector (Blower Motor)
(3) **7P** Connector (Air Mix Control Motor)
(4) Relay Box
(5) **1P** Connector (Thermistor)
(6) **5P** Connector (Thermostat)
(7) **5P** Connector (Recirculation/Fresh Air Selection Motor)
(8) **4P** Connector (Blower Resistor)

W1032388





Air Conditioning Unit

1. Disconnect the heater hoses (1).
2. Remove the pressure pipes joint mounting screw and pressure pipes joint.
3. Disconnect the high pressure pipe 2 (3) and low pressure pipe (2).
4. Take off the unit.

■ **NOTE**

- **Open parts are cap and moisture is prevented from going into the system at once.**

(When reassembling)

- When reconnecting the cooler pipes with the unit, apply compressor oil (DENSO OIL8 or equivalent) to O-rings.

Tightening torque	A/C unit mounting screw (M8)	9.8 to 15.7 N·m 1.0 to 1.6 kgf·m 7.2 to 11.6 ft-lbs
	Pressure pipe joint mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs

(1) Heater Hose
(2) Low Pressure Pipe
(3) High Pressure Pipe 2 (Cooler Pipe (Liquid)) (High Pressure)

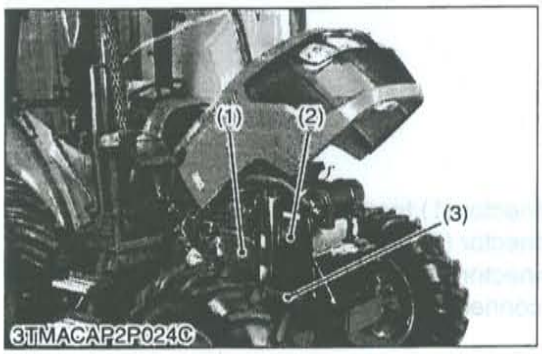
W1025169

(4) Removing Air Conditioner Pipes

Discharging Refrigerant Gas

1. Refer to "(1) Discharging the Refrigerant" in this section.

W1033151

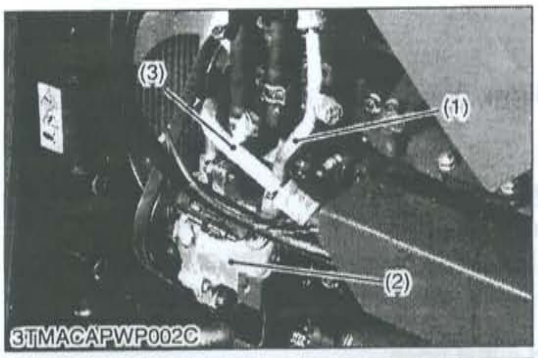


Cover and Guide

1. Remove the both side panel guides (3).
2. Remove the both side panels (2).
3. Remove the both side covers (1).

(1) Side Cover
(2) Side Panel
(3) Side Panel Guide

W1033208



High Pressure Pipe 1, 2 and Low Pressure Pipe

1. Disconnect the low pressure pipe (3) and high pressure pipe 1 (1) from the compressor (2), then cap the open fittings immediately to keep moisture out of the system.
2. Slide the condenser (4).
3. Disconnect the high pressure pipe 1 (1) from the condenser (4) and cap the open fittings immediately to keep moisture out of the system.
4. Disconnect the high pressure pipe 2 (6) from the receiver (5) and cap the open fittings immediately to keep moisture out of the system.

(When reassembling)

- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	Low pressure pipe mounting screw (compressor side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs
	High pressure pipe 1 mounting screw (compressor side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs
	High pressure pipe 1 mounting screw (condenser side)	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs
	High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.7 to 10.8 ft-lbs

(1) High Pressure Pipe 1
(2) Compressor
(3) Low Pressure Pipe
(4) Condenser
(5) Receiver
(6) High Pressure Pipe 2

W1033365

Seat, Mats and Floor Cover

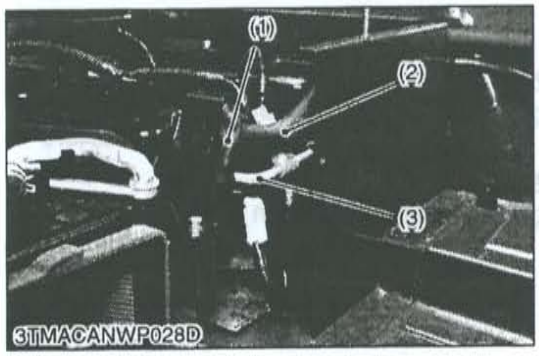
1. Refer to "(3) Removing Air Conditioner Unit" in this section.

W1033832

Air Conditioner Ducts and Covers

1. Refer to "(3) Removing Air Conditioner Unit" in this section.

W1033899



High Pressure Pipe 2 and Low Pressure Pipe

1. Remove the rubber (1) and pressure pipes joint mounting screw.
2. Remove the pressure pipes joint.
3. Disconnect the high pressure pipe 2 (3) and low pressure pipe (2), then cap the open fitting immediately to keep moisture out of the system.
4. Pull out the high pressure pipe 2 (3) and low pressure pipe (2) from the bottom of the cabin and take out the pressure pipes.

(When reassembling)

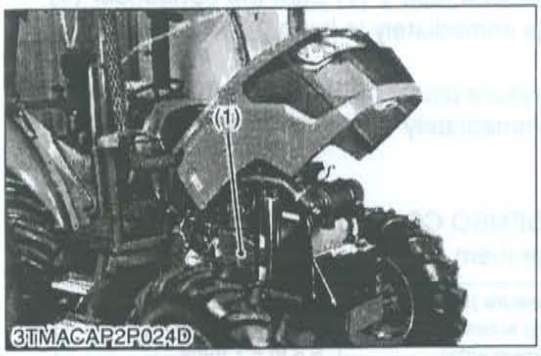
- Replace the rubber (1) with a new one.
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

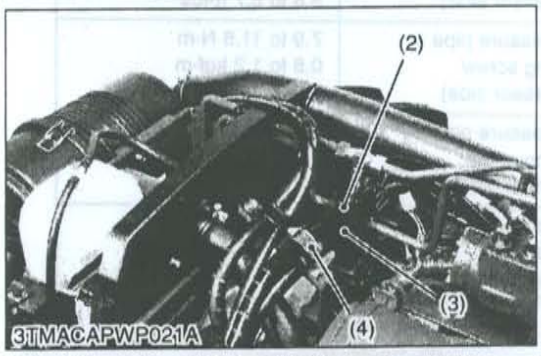
Tightening torque	Pressure pipe joint mounting screw	7.9 to 11.8 N·m 0.8 to 1.2 kgf·m 5.8 to 8.7 ft-lbs

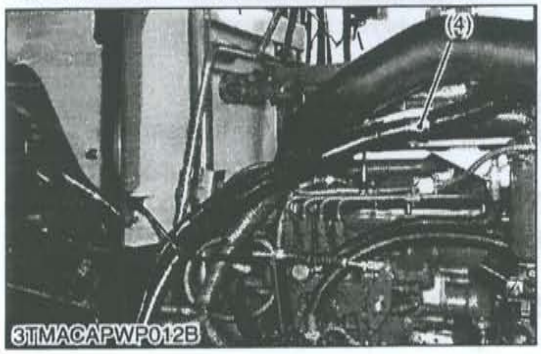
(1) Rubber
(2) Low Pressure Pipe
(3) High Pressure Pipe 2

W1033968

(5) Removing Heater Hoses







Draining Coolant

1. Refer to "[2] DISASSEMBLING AND ASSEMBLING" in this section.

W1034298

Side Cover (R.H.) and Heater Hoses

1. Remove the side cover (R.H.) (1).
2. Disconnect the heater hoses (2) and (3) from the engine.
3. Remove the clamps (4).

(When reassembling)

- Note the inlet hose and outlet hose.

(1) Side Cover (R.H.)
(2) Heater Hose 1
(3) Heater Hose 2
(4) Clamp

W1034358

Seat, Mats and Floor Cover

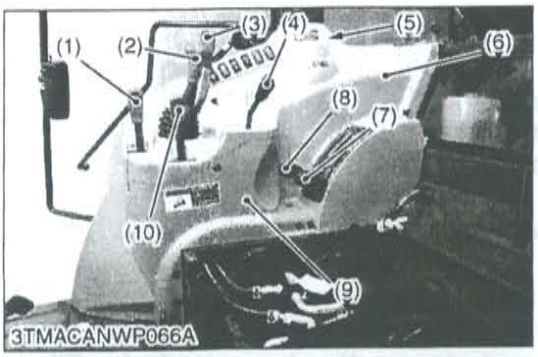
1. Refer to "(3) Removing Air Conditioner Unit" in this section.

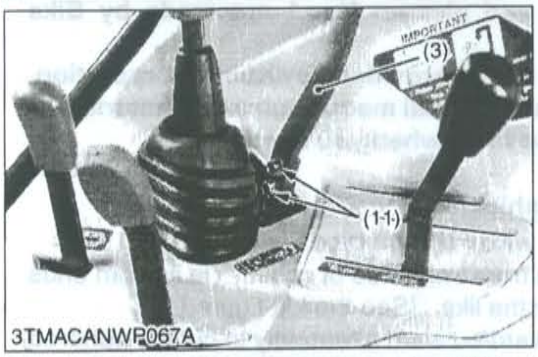
W1034679

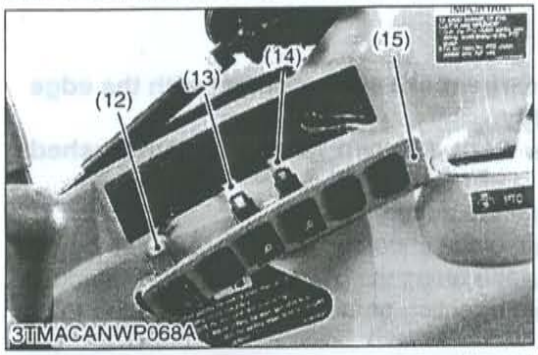
Air Conditioner Ducts and Covers

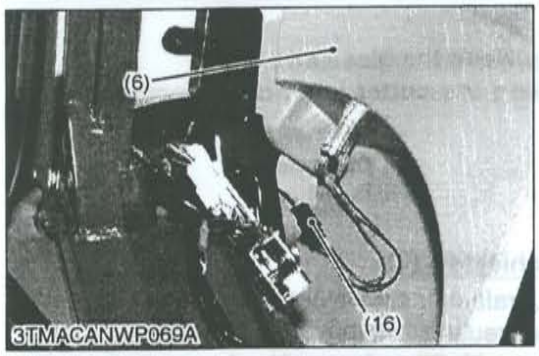
1. Refer to "(3) Removing Air Conditioner Unit" in this section.

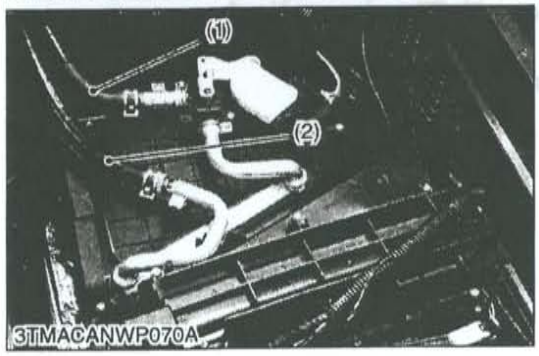
W1034615











Inner Cover (R.H.)

1. Remove the hand accelerator lever grip (10).
2. Remove the range gear shift lever grip (1).
3. Remove the main shift lever grip (2).
4. Remove the auxiliary control lever grip (4).
5. Remove the PTO control lever grip (5).
6. Remove the position control lever grip (8) and draft control lever grip (7).
7. Remove the parking brake lever 1 (3) mounting screw (11) from parking brake lever 2.
8. Pull out the switch board (15).
9. Disconnect the **5P** connector (12) from front wiper switch.
10. Disconnect the **3P** connector (white) (13) from front working light switch.
11. Disconnect the **3P** connector (blue) (14) from rear working light switch.
12. Remove the inner cover 2 (9).
13. Disconnect the **2P** connector (16) from cigar lighter and remove the inner cover 1 (R.H.) (6).

(1) Range Gear Shift Lever Grip
(2) Main Shift Lever Grip
(3) Parking Brake Lever 1
(4) Auxiliary Control Lever Grip
(5) PTO Control Lever Grip
(6) Inner Cover (R.H.)
(7) Draft Control Lever Grip
(8) Position Control Lever Grip
(9) Inner Cover 2
(10) Hand Accelerator Lever Grip
(11) Screw
(12) **5P** Connector (Front Wiper Switch)
(13) **3P** Connector (Front Working Light Switch)
(14) **3P** Connector (Rear Working Light Switch)
(15) Switch Board
(16) **2P** Connector (Cigar Lighter)

W1034733

Removing Heater Hoses

1. Disconnect the heater hoses (1) and (2).
2. Pull out the heater hoses (1) and (2) from the bottom of the cabin.
3. Take out the heater hoses (1) and (2).

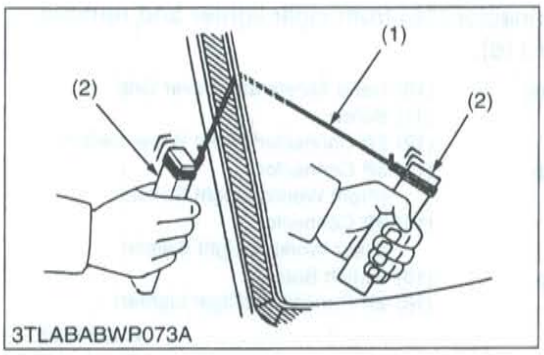
(When reassembling)

- When connecting the heater hose with A/C unit, hose should be put into the A/C unit pipe more than 30 mm (1.2 in.).
- Be sure to fix the heater hoses (1) and (2) to the original position. Note the inlet hose and outlet hoses.

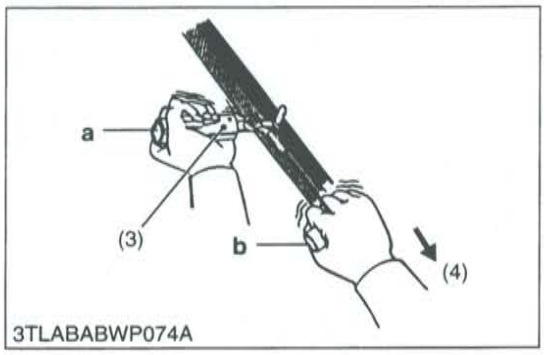
(1) Heater Hose 1
(2) Heater Hose 2

W1030250

(6) Cab Windshield



3TLABABWP073A



3TLABABWP074A

Preparation

1. Prepare the followings.
   - Cutter knife 1 piece
   - Scraper 1 piece
   - Gun for coating 1 piece
   - Sika Tack-Ultrafast or equivalent
   - Sika-cleaner No. 1
   - Gummed tape

■ **NOTE**

- **Sika Tack-Ultrafast and cleaner No. 1 are made by Sika Corporation.**
- **These materials can not be provided by Kubota Corporation.**
- **Therefore, please find the local made equivalent materials in your country and use them when you need.**

W1053361

Before Replacing Windshields (1)

[In case of using piano wire (When glass is cracked)]

1. Thread the piano wire from the inside of cabin. Tie its both ends to a wooden blocks or the like. (See the left figure.)
2. Pull the piano wire inward/outward alternately to cut the adhered part.

■ **NOTE**

- **Do not let the piano wire make sliding contact with the edge of glass plate forcibly.**

[In case of using cutter knife (When glass is totally crushed finely)]

1. Insert the knife (3) into the adhered part.
2. Keep the edge of knife blade square to the glass edge at the part (**a**). Slide the knife blade along the glass surface and the edge. Pull the part (**b**) in the direction parallel to the glass edge to cut them off.

■ **NOTE**

- **Find a wider gap between the glass and body.**
- **Take care of handling the cutter knife not to damage your hand.**

(1) Piano Wire
(2) Wood Peace
(3) Cutter Knife
(4) Pulling

W1035600

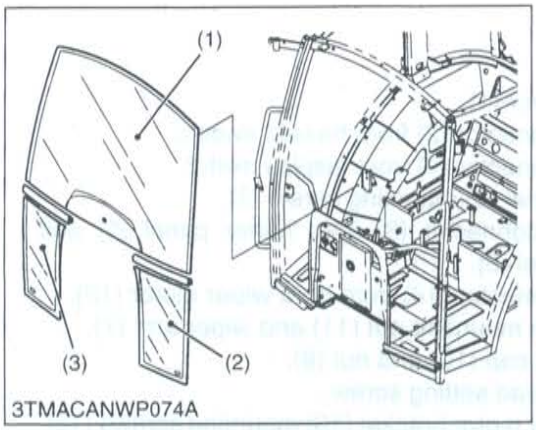
Before Replacing Windshields (2)

1. When the Sika Tack-Ultrafast or equivalent attached to the cabin frame and the glass are reused, remove the bond clearly.
2. Clean the frame surface with Sika-cleaner No. 1.

■ **NOTE**

- **Remove the bond completely.**

W1035852



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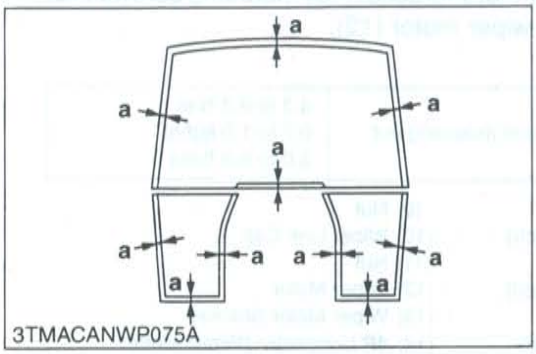

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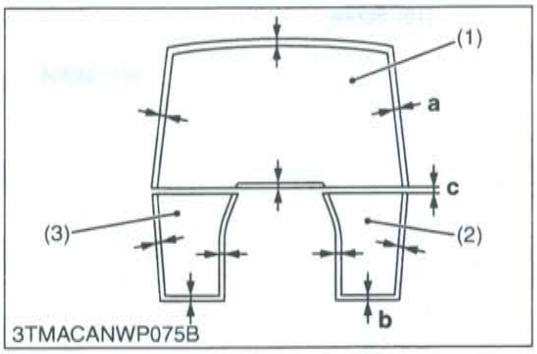

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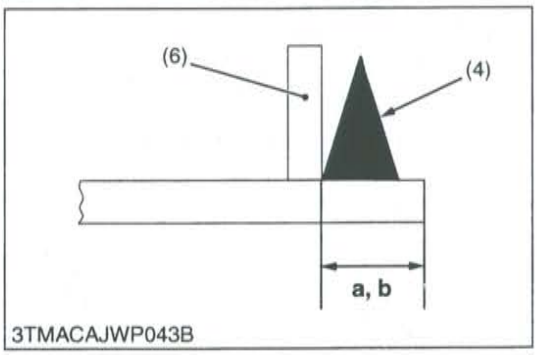

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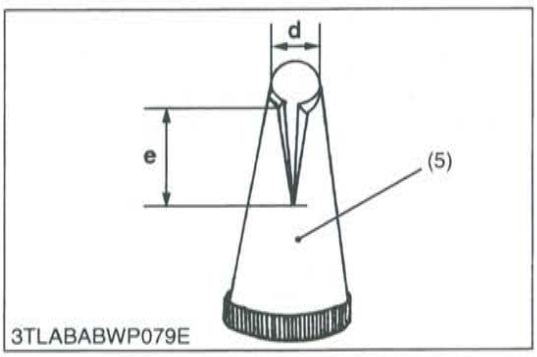


3TLABABWP079E

Before Replacing Windshields (3)

1. Check that the glasses are not damaged and cracked.
2. Turn over the glass and clean this surface of the glass by Sika-cleaner No. 1.
3. The cleaning area of the rear surface is indicated **"a"** in the figure left.

■ **NOTE**

- **If not cleaning the glass, it may result in adhesive failure.**

(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)

a : 25 mm (1.0 in.)

W1035931

Applying Sika Tack-Ultrafast

1. Apply a Sika Tack-Ultrafast (or equivalent) on the glasses as shown in figure left.

■ **NOTE**

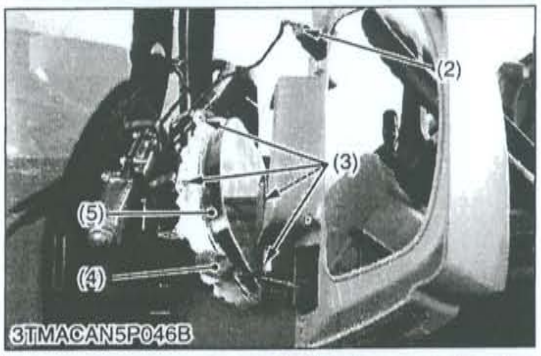
- **Apply the Sika Tack-Ultrafast (or equivalent) with the jig having the specified tip shape as shown in the figure left.**
- **Apply it with a uniform speed to minimize unevenness.**
- **Follow the instruction manual of Sika Tack-Ultrafast.**

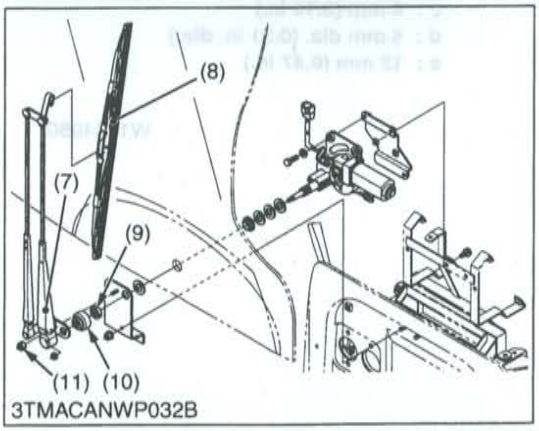
(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)
(4) Sika Tack-Ultrafast
(5) Jig
(6) Shield

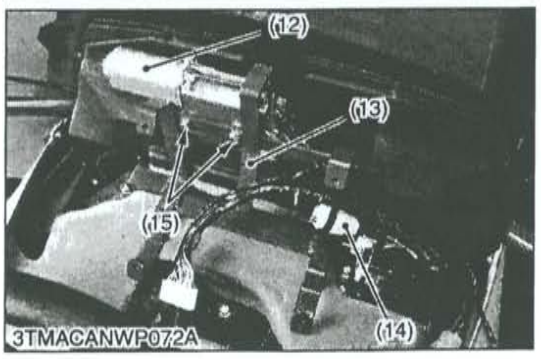
a : 10 mm (0.39 in.)
b : 12 mm (0.47 in.)
c : 4 mm (0.16 in.)
d : 8 mm dia. (0.31 in. dia.)
e : 12 mm (0.47 in.)

W1054050

(7) Wiper Motor







Front Wiper Motor

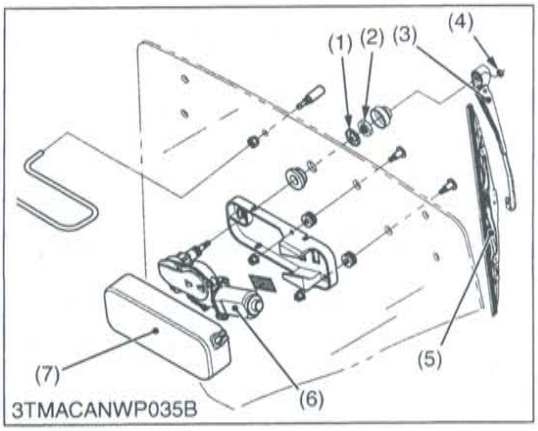
1. Remove the panel cover (1).
2. Disconnect the **5P** connector (2) from hazard switch.
3. Disconnect the **3P** connector (4) from display switch.
4. Remove the meter panel (5) mounting screw (3).
5. Disconnect the **40P** connector (6) from meter panel (5) and remove the meter panel (5).
6. Disconnect the **4P** connector (14) from front wiper motor (12).
7. Remove the wiper arm mounting nut (11) and wiper arm (7).
8. Remove the wiper link cap (10) and nut (9).
9. Disconnect the earth lead setting screw.
10. Remove the front wiper motor bracket (13) mounting screws (15), then take out the front wiper motor (12).

(When reassembling)

Tightening torque	Wiper arm mounting nut	6.3 to 9.3 N·m 0.7 to 1.0 kgf·m 5.0 to 6.9 ft-lbs

(1) Panel Cover
(2) **5P** Connector (Hazard Switch)
(3) Screw
(4) **3P** Connector (Display Switch)
(5) Meter Panel
(6) **40P** Connector (Meter Panel)
(7) Wiper Arm
(8) Wiper Blade
(9) Nut
(10) Wiper Link Cap
(11) Nut
(12) Wiper Motor
(13) Wiper Motor Bracket
(14) **4P** Connector (Wiper Motor)
(15) Screw

W1036304



Rear Wiper Motor (If equipped)

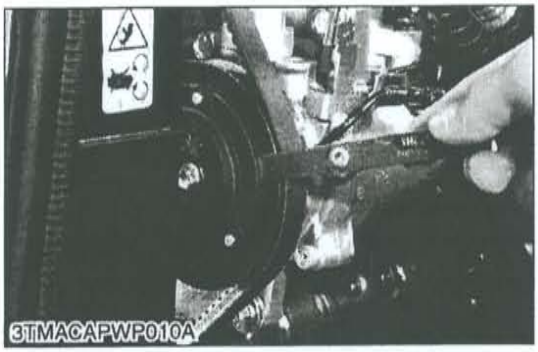
1. Remove the wiper motor cover (7).
2. Disconnect the **4P** connector from rear wiper motor.
3. Remove the wiper arm mounting nut (4) and wiper arm (5).
4. Remove the wiper link cap (1) and nut (2).
5. Remove the rear wiper motor mounting screws, then take out the rear wiper motor (6).

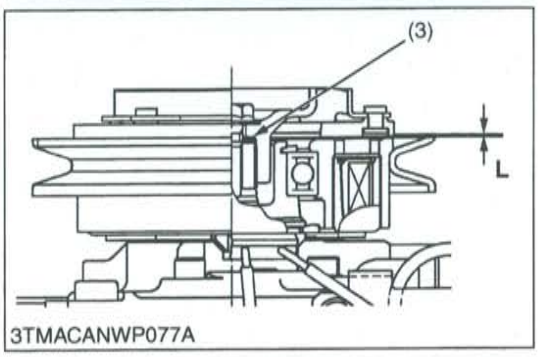
Tightening torque	Wiper arm mounting nut	7.9 to 9.3 N·m 0.8 to 1.0 kgf·m 5.8 to 6.9 ft-lbs
	Wiper motor mounting screw	7.9 to 9.3 N·m 0.8 to 1.0 kgf·m 5.8 to 6.9 ft-lbs

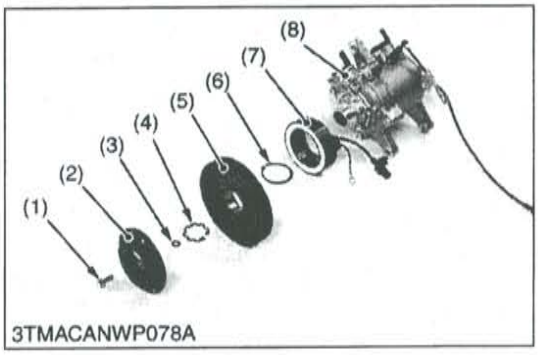
(1) Wiper Link Cap
(2) Nut
(3) Wiper Arm
(4) Nut
(5) Wiper Blade
(6) Rear Wiper Motor
(7) Wiper Motor Cover

W1031819

[3] SERVICING







Adjustment of Air Gap

1. Measure the air gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim (3) is added or deleted.

Air gap (L)	Factory spec.	0.30 to 0.65 mm 0.0118 to 0.0255 in.

(Reference)

Adjusting Shim Size	Code No.
0.10 mm (0.0039 in.)	T1065-87340
0.15 mm (0.0059 in.)	T1065-87350
0.40 mm (0.016 in.)	T1065-87360
0.60 mm (0.024 in.)	T1065-87370
1.0 mm (0.0394 in.)	T1065-87380

(1) Magnetic Clutch Mounting Screw
(2) Hub Plate
(3) Shim
(4) External Snap Ring
(5) Rotor
(6) External Snap Ring
(7) Stator
(8) Compressor Body

L : Air Gap

W1060178

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KUBOTA TRACTOR CORPORATION

CORPORATE OFFICE: 3401 DEL AMO BOULEVARD, TORRANCE, CA 90503
WESTERN DIVISION: 1175 S. Guild Ave., Lodi, CA 95240 • (209) 334-9910
CENTRAL DIVISION: 14855 F.A.A. Blvd., Fort Worth, TX 76155 • (817) 871-0900
NORTHERN DIVISION: One Kubota Way, Groveport, OH 43125 • (614) 835-1100
SOUTHEAST DIVISION: 1025 Northbrook Parkway, Suwanee, GA 30024 • (770) 995-8855

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